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Prepared by:



**Utah Big Game Range Trend Studies
2022
Wildlife Management Units
16A, 17A, 19A, 19B, 19C, 20, 21A, 21B & 23**

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Showy Goldeneye (*Heliomeris multiflora*) by Jason Cox (2022)

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Reports for study sites, with accompanying photographs, are available online at <http://wildlife.utah.gov/range-trend.html>.

PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-67

Grant Name: Utah Wildlife Habitat Research and Monitoring

Project Name: Utah Wildlife Habitat Monitoring

Need: The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Division's big game management program. The health and vigor of big game populations are closely correlated to the quality and quantity of forage in key areas. The majority of the permanent range trend studies will be located on deer and elk winter ranges, however on certain management units, studies are located on spring and/or summer ranges, if vegetation composition on these ranges is the limiting factor for big game populations. Range trend data are used by wildlife biologists for habitat improvement planning purposes, reviewing BLM and USFS allotment management plans, and as one of several sources of information for revising deer and elk herd management unit plans. Range trend data may also be gathered where habitat information is necessary for other wildlife species such as Greater sage-grouse.

Purpose: Monitor, evaluate, and report range trend at designated key areas throughout the state, and inform Division biologists, public land managers and private landowners of significant changes in plant community composition in these areas.

Expected Results or Benefits: Range trend studies in each region will be re-monitored every five years, and vegetation condition and trend assessments will be made for key areas. DWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate the impact of land management programs on big game habitat and use the information in the development of management plans. Annual reports will be readily available on the Division's website, digitally stored, and in hard copies located in DWR regional offices, BLM and USFS offices, and public libraries. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give DWR biologists and public land managers' additional information to address local resource management problems.

REMARKS

The work completed during the 2022 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Central and Southern Regions. Most trend studies surveyed in these management units were established in the 1980s and reread at 5-year intervals.

The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies, which adds to the value of this interagency report:

Bureau of Land Management

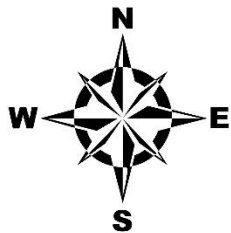
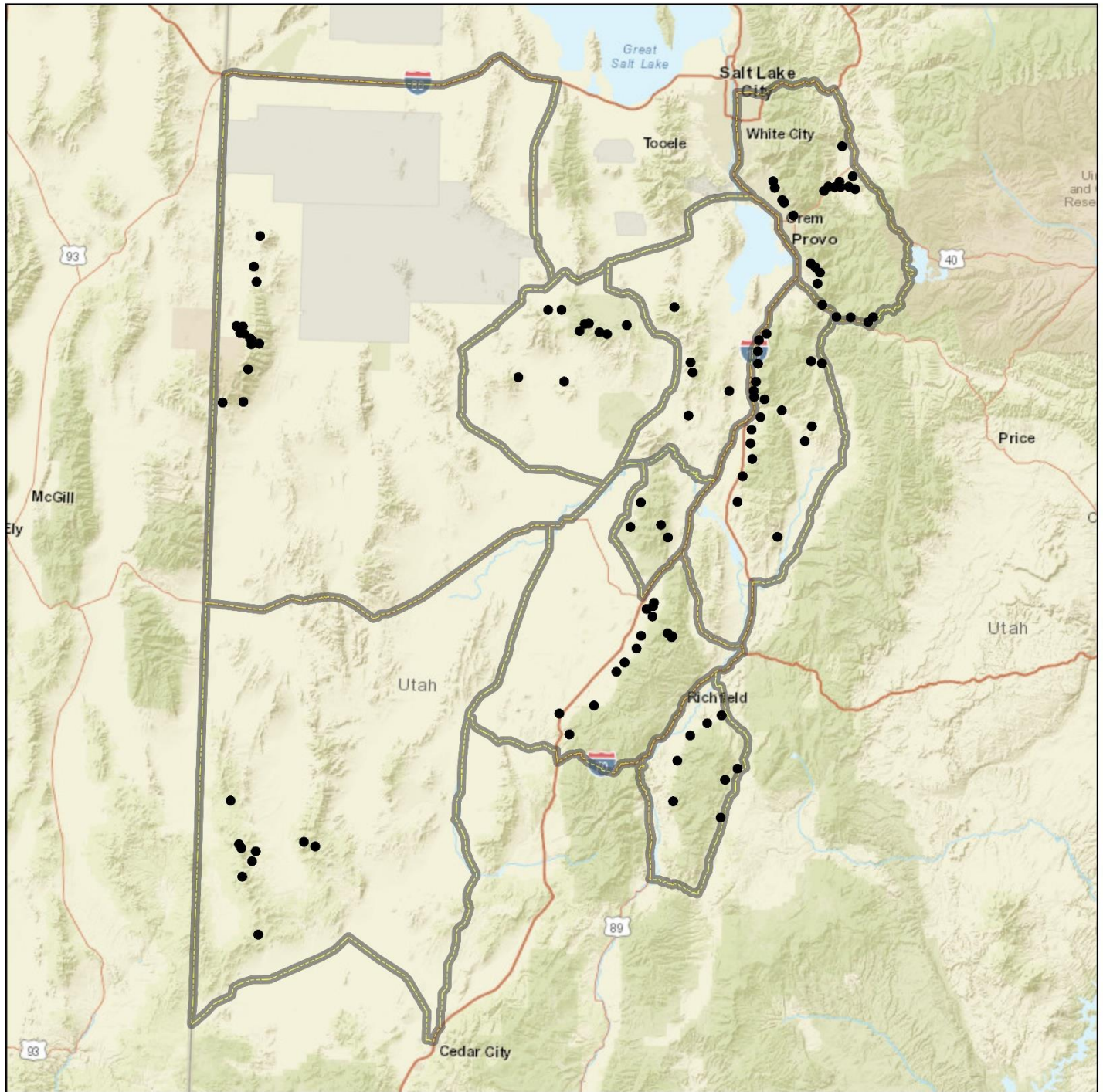
- Salt Lake Field Office
- Fillmore Field Office
- Richfield Field Office

United States Forest Service

- Uinta-Wasatch-Cache National Forest
- Fishlake National Forest

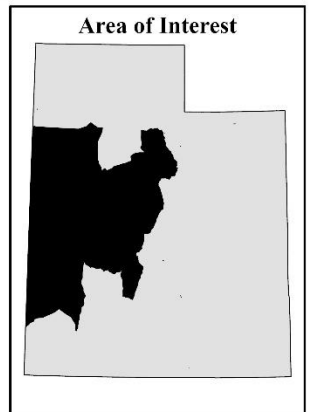
Private landowners were cooperative in allowing access to study sites located on their land.

RANGE TREND STUDY SITES SURVEYED IN 2022



Project, Status

- RT, Active
- ▭ Wildlife Management Unit Boundaries



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

RANGE TREND STUDY METHODS

Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetation or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be places where big game animals have demonstrated a definite pattern of use during normal climatic conditions over a long period. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by Utah Division of Wildlife Resources (DWR), Bureau of Land Management (BLM), and US Forest Service (USFS) personnel. Historically, range trend studies were established in conjunction with permanently marked pellet group transects. Once a “key” area is selected, then specific placement for sampling will be determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. Half-high steel fence posts or similar material permanently marks all sampling baselines. The first, or “0-foot baseline stake”, is marked with a metal tag for proper identification of the transect.

Study sites for the Watershed Restoration Initiative (WRI) are placed to monitor vegetation treatment projects. Studies are established to assess conditions prior to treatment. Each study is re-read approximately every 3-5 years following treatment.

Vegetation Composition

Study Site Setup: Study sites are setup to determine vegetation composition. The standard study site setup consists of a 500-foot baseline (five consecutive 100-foot transects) and a 100-foot belt that crosses perpendicular to each transect. Each 100-foot belt is placed at predetermined footmark along each transect and is centered on the 50-foot mark of each belt. When a standard study setup will not fit within the desired study location, the baseline can be modified by doglegging, splitting or shortening the baseline. If the baseline is shortened by removing one or more 100-foot transect(s), the corresponding belt should be moved to another transect. Regardless how the baseline is setup, all five belts need to be included in study site setup. A rebar stake is placed at the beginning of each belt to ensure that future sampling is in consistent alignment with the originally sampled belt.

1/4 m² quadrat: A 1/4 m² quadrat is centered every 5 feet along the left side of the belt, starting at the 5-foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species. However, prior to 1992 no data was collected for annual species.

Quadrat Cover: Cover is determined using an ocular cover estimation procedure using seven cover classes (Bailey and Poulton 1968, Daubenmire 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100% (Figure 1). For example, to estimate vegetation cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the percent cover for a given site.

Nested Frequency: Nested frequency values for the quadrat range from 1-5 according to which area or sub-quadrat the plant species or cover type is rooted in. The notation for each sub-quadrat is as follows: 5 = 1% of the area, 4 = 5% of the area, 3 = 25% of the area, 2 = 50% of the area, and 1 = the remainder of the quadrat. Each time a particular plant species or cover type occurs within the quadrat, it is scored relative to which of the smallest nested quadrats it is rooted in (in the case of vegetation) or where it first occurs (for all other cover types). The highest possible score is 5 for each quadrat occurrence and 100 per belt, for a possible score of 500 for each species or cover type at a given site (Figure 2).

Higher nested frequency scores represent a higher abundance for that plant species or cover type. These summed values are used to help determine changes in trend

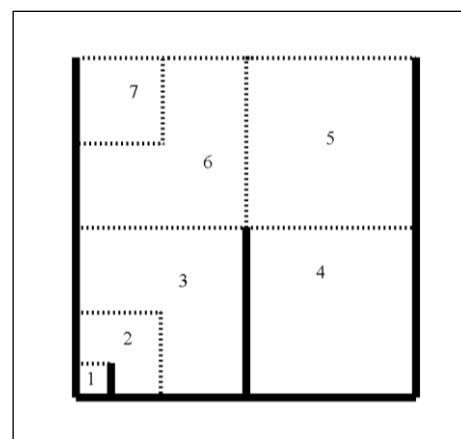


Figure 1 Cover classes of the 1/4 m² sampling quadrat

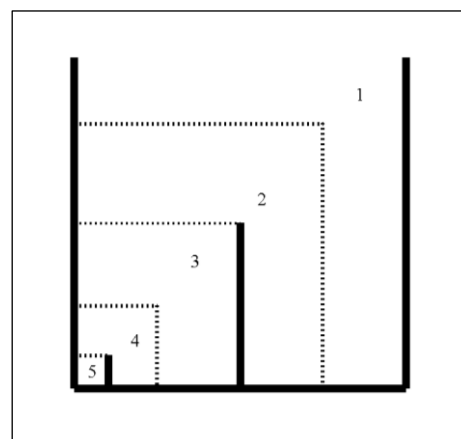


Figure 2 Nested frequency sub-quadrats of the 1/4 m² sampling quadrat

and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Smith et al., 1987; Smith et al., 1986; Mosley et al., 1986). Plant cover and density values are not reliable indicators of trend for herbaceous species and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used independently and do not necessarily indicate changes in composition and/or distribution of key plant species.

Line Intercept Cover: Total canopy cover of shrubs or trees is also estimated using the line-intercept method (U.S. Department of Interior Bureau of Land Management 1999). The total distance intersecting the line by a particular species of tree or shrub along each belt is divided by the total length of the line to give percent canopy cover. A six-inch gap rule is used in measuring intercept; gaps less than six inches between the same tree or shrub species are included in total measurement (Boyd et al., 2007).

Shrub Density & Characterization: Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100-foot belt. All shrubs rooted within each strip are counted and categorized using a modified Cole Browse Method (U.S. Department of Interior Bureau of Land Management 1999):

Seedling:	Plants up to three years old, which have become firmly established, usually less than 1/8-inch diameter.
Young:	Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/4-inch diameter.
Mature:	Complex branching, rounded growth form, larger size, seed is produced on healthy plants. Generally larger than 1/4-inch diameter.
Decadent:	Plant, regardless of age, that is in a state of decline, usually evidenced by 25% or more dead branches.
Dead:	A plant that is no longer living.

Data Collection for Aspen Density by Size Class: Starting in 2011, aspen density was estimated using an aspen classification method by Jones, Burton, and Tate (2005). All aspen stems within 67 cm of each side of 100-foot distance tape are counted and recorded in the following size classes:

Size Class I:	less than or equal to 1.5 feet (18 inches). This class size represents the annual or recent recruitment of suckers due to suckering at root buds.
Size Class II:	greater than 1.5 feet to 5 feet. This class size represents the survival of suckers and the progression of recruitment of existing suckers that are vulnerable to browsing of the terminal leader.
Size Class III:	greater than 5 feet and up to 1 inch dbh. This class size represents the aspen regeneration grown above the height range that is vulnerable to browsing; the minimum height for size class III represents the maximum browse line height for herbivores present.
Size Class IV:	greater than 1 inch dbh. Class IV captures information for all remaining cohorts in the plot.

Shrubs are also rated according to their availability and the amount of use they display, and placed in one of nine form classes:

1. All available, lightly hedged
2. All available, moderately hedged
3. All available, heavily hedged
4. Largely available, lightly hedged
5. Largely available, moderately hedged
6. Largely available, heavily hedged
7. Mostly unavailable
8. Unavailable due to height
9. Unavailable due to hedging

Degree of hedging is measured by the percentage of the twigs or branches that are browsed.

Lightly hedged*:	0 to 40 percent of twigs browsed
Moderately hedged*:	41 to 60 percent of twigs browsed
Heavily hedged*:	Over 60 percent of twigs browsed
Largely available:	One-third to two-thirds of plant available to animal
Mostly unavailable:	Less than one-third of plant available to animal
Unavailable:	In classifying browse to a form class, unavailability may be the result of height, location, or density

*Degree of hedging is based on leader use over the past three years: current annual growth is not included.

Shrubs are also rated on their health and placed into one of four vigor classes:

1. Normal and vigorous
2. Insect infested or diseased
3. Poor vigor
 - Chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.
4. Dying
 - Substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

Height and Crown

Each mature shrub species closest to every 10-foot mark along a sampling belt is measured to determine average height and crown. This allows a maximum sample of 50 plants per species to be measured at a given site depending on their respective densities. Height and Crown measurements were discontinued prior to the 2021 field season.

Point-Center Quadrat Method: Tree density is determined using the point-center quarter method (Mitchell, 2007; Dahdouh-Guebas and Koedam, 2006; Pollard, 1971; Cottam and Curtis, 1956) at 100-foot intervals along the baseline measuring to a maximum of 15 meters. The strip method that is used to estimate shrub density can, in most cases, effectively inventory seedling and young tree densities. However, the strip method is less effective at estimating density of mature trees that are often widely distributed.

Animal Occupancy: The pellet group transect utilizes (50) 100ft² circular plots that are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre (hectare) (Neff, 1968). Quadrat frequency of wildlife and livestock droppings is also captured within the 1/4 m² quadrat. Rabbit pellet groups are not included in the pellet group transects but are sampled in quadrat frequency.

Other Information: Management background information, photographs, and knowledgeable plant identification add to the dataset for each site. Management and background information for each site is obtained from the administering agency. Repeat photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Starting in 2016, species identification and classification is reported following the USDA Plant Database taxonomic nomenclature (USDA, NRCS, 2016). Prior to 2015, species identification mostly followed "A Utah Flora" (Welsh et al., 2003). In some cases, most notably *Agropyron sp.* and *Purshia sp.*, the species names used were those found in the Range Trend Study Plant Species List (Giunta, 1983), Intermountain Flora (Cronquist et al., 1977), and the Intermountain Range Plant Names and Symbols (Plummer et al., 1977) and were retained to maintain continuity and alleviate confusion with earlier published reports.

TREND DETERMINATION

The methods described above rely on relative and absolute measurements of plant composition as determined from the frequency, cover, and density data. In addition, estimates of plant vigor, average height and crown diameter, form class, and age class are utilized to characterize shrub populations.

In order to assess and interpret the landscape in a more effective way, trend assessments are no longer formally addressed within the report and have been replaced by the Desirable Components Index (DCI), Woodland Succession Phase models, and State-and-Transition Models that are associated with their Ecological Site as described by the National Resources Conservation Service (NRCS). Using these three methods in conjunction will give land managers a more complete assessment of the area of interest, and what measures, if any, need to be taken in order to improve the ecology of a site.

Desirable Components Index: Range Trend Program personnel created the desirable components index (DCI) as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, not a replacement for, the site-specific range trend assessments that are found in the annual Utah Big Game Range Trend Studies report. This index was designed to score mule deer winter range based upon several important vegetation components (i.e. preferred browse cover, shrub decadence, shrub young recruitment, cover of perennial grasses, cover of perennial forbs, cover of annual grasses, and presence of noxious weeds). Although the index may be useful for assessing habitat for other species (i.e. sage-grouse and elk), the rating system was devised to specifically address mule deer winter range requirements.

This index is used primarily to determine if a particular site has the vegetation components necessary to be good winter range for mule deer. It can also be used to identify areas where habitat restoration projects may be needed and assist land managers in determining possible rehabilitation options. Because it does not take into account factors such as soil stability, hydrologic function, and other environmental factors, it should not be used to assess a sites function and/or condition as typically used by the Federal land management agencies.

Desirable mule deer winter range provides 12-20% of preferred browse cover, 20% or less shrub decadency, and 10% or more of the shrub population is young. The herbaceous understory contains 8-15% perennial grass cover, 5% perennial forb cover, and less than 5% annual grass cover. Based on these criteria, communities are scored in a 100-point scale using the following system:

Preferred Browse (60 points)

(Preferred Browse species are favorable or crucial to deer and are broken into three categories; Highly Preferred, Preferred and Key).

Preferred Browse Cover (30 pts. possible)

- Highly Preferred species = 1.5 points for each 1% of cover, Preferred species = 1.25 points for each 1% of cover and Key species = 1 point for each 1% of cover (maximum 30 points)

Percent Decadence (15 points possible)

- 0.3 points for each 1% under 50% decadence and -0.3 points for each 1% over 50% decadence (maximum 15 points or minimum -15 points)

Percent Young (15 points possible)

- 0.5 points for each 1% of young

Herbaceous Understory (40 points)

Perennial Grass Cover (30 points possible)

- 2 points for each 1% cover

Perennial Forb Cover (10 points possible)

- 2 points for each 1% cover

Annual Grass Cover (-20 points possible)

- -0.75 points for each 1% cover

Noxious Weeds (State List)

- -2 points for each species present

The Desirable Components Index ratings are divided into four categories because each community has a different ecological potential. These categories include very low potential (Desert Ecological Site), low potential (Semidesert Ecological Site), mid-level potential (Upland Ecological Site) and high potential (Mountain and High Mountain Ecological Sites) categories. The four categories are scored based on the above criteria as follows:

Very Low potential scale (Desert Ecological Site)

> 50	Excellent
50-40	Good
40-25	Fair
25-10	Poor
< 10	Very Poor

Low potential scale (Semidesert Ecological Site)

> 65	Excellent
45-64	Good
25-44	Fair
10-24	Poor
< 10	Very Poor

Mid-level potential scale (Upland Ecological Site)

> 80	Excellent
79-65	Good
64-50	Fair
49-35	Poor
< 35	Very Poor

High potential scale (Mountain and High Mountain Ecological Site)

> 90	Excellent
89-70	Good
69-55	Fair
54-40	Poor
< 39	Very Poor

Once a DCI score has been determined for a particular site, the score can be compared to previous sample years in order to determine a quality trend and better assess conditions that may need to be addressed within the community for mule deer habitat (i.e. .increasing preferred browse cover, decreasing the decadence to young ratio, increasing perennial herbaceous cover, or control/removal of noxious weeds et cetera).

Woodland Succession: Although pinyon-juniper woodlands are an important community within their own ecotype, sagebrush steppe, mixed shrub, and grassland communities have experienced significant encroachment of pinyon-juniper woodlands. As active encroachment within these communities continues, abiotic and biotic structures and functions are interrupted, which leads to the reduction of wildlife habitat, forage production, and biodiversity. Moreover, encroachment increases fuel load and fire frequency jeopardizing remnant shrub and grass communities to future loss. In an attempt to describe the succession or maturation of pinyon-juniper, phases of succession are presented within the report to aid managers in identifying the progress of infilling on a particular site and what type of input may be necessary for site rehabilitation (Tausch, Miller, Roundy, & Chambers, 2009).

- Phase I: is described as having an open canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with low seed production, and an intact shrub understory (Tausch, Miller, Roundy, & Chambers, 2009).
- Phase II: is described by the expansion of the pinyon-juniper canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with moderate to high seed production, and a shrub understory that ranges from nearly intact to one that is significantly thinning (Tausch, Miller, Roundy, & Chambers, 2009).
- Phase III: is described by the stabilization of the pinyon-juniper canopy where crown lift is present and lower limbs are dying, recruitment of young trees is limited with low to moderate seed production, and the shrub understory exhibits 75% or greater dead plants throughout the respective population (Tausch, Miller, Roundy, & Chambers, 2009).

State-and-Transition: Ecological sites are individual land types that have the ability to support specific plant species or communities based on the characteristic for their respective land type. Each ecological site therefore has its own potential and responds according to that potential when a site is influenced by natural or anthropomorphic inputs. State-and-Transition modeling attempts to describe an individual ecological site's response to these inputs by dividing the plant communities into states that are comprised of one to multiple community phases and to potentially predict the direction of a community transitioning from one state to another. State-and-Transitions are not trends per se, but rather an illustration of a community's current state in which it has the potential to respond positively or negatively to triggers and thresholds specific to that ecological site. As a tool, State-and-Transition models can provide a way for land managers to interpret a landscape and provide meaningful assessment and monitoring for landscape management. This report identifies each site's potential by supplying the ecological site name and corresponding number, and where available, verifying the provided NRCS state-and-transition models with range trend's quinquennial data, and a description of the transitions between states and phases over the duration of each study. Where not available, state-and-transition models are not referenced, but an attempt is made to describe the transitional processes that have occurred over the duration of a particular study not referenced to a model.

REPORT FORMAT

The first page of the report is the map page, which has a topographic map and a diagrammatic sketch to illustrate the study location. The map page also contains three sections, *Location information*, *Transect Information* and *Directions to Site*, which contain directions, location, and transect setup descriptions. Following the map page, discussions of the study site are addressed by several topics including *Site Information*, *Wildlife Habitat and Vegetation History*, *Site Notes*, *Soils*, *Site Potential*, and “Trend Summary” tables. Site information contains geographic information such as land ownership, allotment, elevation, aspect, slope, and sample dates. *Disturbance History* contains all known disturbances that have occurred on the site. Known seed mixes are listed within the table named “SeedMix.” *Habitat and Vegetation Information* contains wildlife habitat that the site falls within for specific big game and other species of interest. *Vegetation History* follows *Wildlife Seasonal Habitat* and evaluates any major compositional transitions within the vegetation community. Site notes discuss any miscellaneous information as it relates to the site and immediate area. Site potential presents a table containing average annual precipitation, NRCS taxonomic soil classification, NRCS ecological site, and NRCS ecological site number. The table titled “Soil Analysis Data” presents texture and chemical characteristics found on the site. The *States and Transitions* portion states if the site has a defined state and transition model available and is followed by, if available, descriptions of any state or phase transitions that have occurred on the site as it relates to the State-and-Transition diagram modeled by the NRCS. Additional assessment is made by comparing photographs from year to year which can be referred on the webpage <http://wildlife.utah.gov/range-trend.html>.

The “Trend Summary” tables contain compiled vegetation data for each site. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization.

Report Description

The following tables and partial tables are examples from study sites Morris GIP (01R-14) and Scare Canyon (02-46).

Map Page

The name and directions for locating a site are given on the map page. A topographical map and diagrammatic sketch are provided to show spatial reference of site location and arrangement. A 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T). Directions to a site and baseline are provided starting from a prominent location on a mileage and turn-by-turn basis that is closely referenced to the diagrammatic sketch. Also included on this page are the identification and dimensions of the specified transect, which include the browse tag number by which the transect is identified, transect bearing and length, belt placement as it relates to the baseline, and belt marker placement as it relates to the belt itself.

Site Information

Table 1: The “Disturbance History” table summarizes what type of treatments and/or disturbances have affected the site over its history. Where available, historic treatments have been listed that have occurred on the site prior to establishment. If applicable, treatment projects that are associated with the Utah Watershed Restoration Initiative (WRI) are referenced by their project number. Finalization dates or the date in which a particular disturbance occurred are listed with reported affected acreage of the respective disturbance.

Table 01R-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Push	Morris Ranch	1503	November-December 2008	797
Seeding - Rangeland Drill	Morris Ranch	1503	November-December 2008	797

Table 2: The “Seed Mix” tables are included when a seed mix is made available and are referenced to a particular WRI project. Additionally, multiple seed mixes are often associated with one particular treatment and are combined to simplify the appearance of the report.

Table 01R-14.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Morris Ranch			Drill	Dec 2008	450
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Nordan	2.00	1.78
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.00	0.84
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	2.00	1.85
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.00	0.82
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	2.00	1.80
F	Medicago sativa	Alfalfa	Ladak	0.44	0.40
F	Medicago sativa	Alfalfa	Ranger	0.56	0.51
F	Onobrychis viciifolia	Sainfoin	Eski	1.44	1.40
F	Onobrychis viciifolia	Sainfoin	Eski	0.54	0.47
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.95
S	Atriplex canescens	Fourwing Saltbush	Central UT	1.00	0.43
S	Bassia prostrata	Forage Kochia	Humbolt/Lander NV	1.00	0.67

Habitat and Vegetation Information

Table 3: The “Wildlife Seasonal Habitat” table is a summarization of habitat for big game and other species of interest, and further categorizes the habitat into seasonal range and a value description of the habitat for the allied species.

Table 01R-14.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 4: The “Vegetation History” table summarizes what major vegetation types have occurred on the site over the duration of the study. Ranges of sample years provide the length of time that the dominant vegetation type has persisted on the site with its corresponding species listed in the adjacent cell. Most vegetation types will have one dominant species listed: this is usually a shrub species (Appendix A - Vegetation Type). For example, some sites will have a shrub canopy that dominates the site with a perennial herbaceous understory that has similar average cover as the canopy, but occurs infrequently. In this case, precedence is given to the shrub layer. Vegetation type can also be shared in the case of co-dominance. Using the example above, if the herbaceous understory had a higher cover, then the shrub layer would likely share the vegetation type with the perennial understory. The history of pinyon-juniper encroachment is characterized within the table stating the phase(s) of succession and the corresponding years of persistence. Phases of woodland succession may also influence the vegetation type. For example, pinyon-juniper encroachments in phase I are not considered co-dominant and may not be listed within the vegetation type column as they are a subordinate vegetation type. Trees in phase II are considered co-dominant with the co-dominant understory counterpart, and under these circumstances tree species are then listed with the understory counterpart within the vegetation type column.

The following “Vegetation History” table indicates that Wyoming big sagebrush was the dominant vegetation type on the site from 1982 to 2010, but the site transitioned to an annual grass-forb community in 2015. The table also indicates that woodland succession has remained in Phase I over the sample years until 2015 when the Taylor Mountain Fire removed all of the trees on the site. The transition from Wyoming big sagebrush to an annual grass-forb community that occurred between the 2010 and 2015 sample years indicates that a trigger mechanism has occurred and a threshold has been crossed that lead to the change in community composition, and in this case is related to the Taylor Mountain fire that occurred in 2014.

Table 01R-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Juniper/Black Sagebrush	Phase III
2013	Perennial Grass/Wyoming Big Sagebrush	Phase I
2017	Perennial Grass/Wyoming Big Sagebrush	Phase I
2022	Perennial Grass/Wyoming Big Sagebrush	Phase I

Site Notes

This section contains miscellaneous information pertinent to the study site.

Soils

Table 4: Chemical and textural characteristics are listed here and were determined by laboratory analysis from a composite soil sample taken near each of the five baseline starting stakes (Allison and Moode, 1965; Day, 1965; Kenney and Nelson, 1982; Normandin et. al., 1998; Olsen et. al., 1954; Rhodes, 1982; Schoenau and Karamonos, 1993; Sims and Jackson, 1934; Walkley and Black, 1971).

The descriptive terms used for ranges in pH are as follows:

Ultra Acidic	< 3.5
Extremely Acidic	3.5-4.4
Very Strong Acidic	4.5-5.0
Strongly Acidic	5.1-5.5
Moderately Acidic	5.6-6.0
Slightly Acidic	6.1-6.5
Neutral	6.6-7.3
Slightly Alkaline	7.4-7.8
Moderately Alkaline	7.9-8.4
Strongly Alkaline	8.5-9.0
Very Strongly Alkaline	> 9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 6 ppm and 60 ppm, respectively, are considered to have low availability for plant growth and development (Tiedemann and Lopez 2004).

The electrical conductivity of the soil is reported in decisiemens per meter (dS/m). Electrical conductivity is related to the amount of salts more soluble than gypsum in the soil. The following classes can be used as a reference.

Non saline	0-2
Very slightly saline	2-4
Slightly saline	4-8
Moderately saline	8-16
Strongly saline	>16

Table 02-46.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.9	38.5	46.2	15.3	13.4	35.3	361.0	0.3	08/24/2022

Site Potential

This section is prefaced by the listing of the average annual precipitation, NRCS ecological site name, and NRCS ecological site number. The ecological site name and numbers are determined by range trend personnel by digging a soil pit on site to establish the soil characteristics of the site, which is then dichotomized to establish the name of the ecological site and number.

State-and-Transitions: The state-and-transitions section is prefaced by whether or not there is a defined state-and-transitions model is available for the ecological site. When state-and-transition models are available, the state and community phase is specified for each sample year. States are identified in the diagram by whole numbers. For example, the reference state is referred to by 1, the current potential state by 2, and subsequent states are labeled 3, 4 and etc. While community phases are nested within a state and are identified by rational numbers. For example, community phases in state 1 would be identified by 1.1, 1.2, 1.3 etc. Transitions are labeled alpha-numerically and are preceded by the letter “T”. It is important to note that this section of the report does not stand alone and care must be taken by the reader to reference the provided state-and-transition model in order to understand the driving factors within the community. The paragraph describes the community dynamics and changes that occur over the duration of the study

Trend Summary Tables

Table 6: The “Shrub/Tree Summary” table summarizes percent average quadrat cover and percent average line intercept cover for all shrub and tree species occurring on the site. Average quadrat cover is determined using cover classes in conjunction

with the 1/4m² quadrat to estimate percent quadrat cover. To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100-foot belt.

Table 01R-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2008	2.5	0.2	7.9	3.1	0.3	38.6
2013	6.0	0.0	0.1	9.5	0.1	-
2017	9.8	0.1	-	11.4	0.4	0.1
2022	10.4	0.7	-	12.0	0.3	0.2

Table 7: The “Herbaceous Summary” table summarizes the total average cover for all grass and forb species and summarizes the nested frequency by life form.

Table 01R-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2008	76	230	34	108	0.2	2.7	0.1	0.9
2013	339	284	65	103	1.7	11.8	0.2	1.7
2017	292	322	72	32	3.3	17.1	0.1	0.8
2022	225	320	124	30	1.0	13.9	0.4	0.1

Table 8: The “Basic Ground Cover” table summarizes average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Vegetation crown cover estimates are projected vertically while the remaining cover types’ cover estimates are a planar projection and when combined will usually exceed 100%. Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

Table 01R-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2008	13.4	0.4	53.8	26.7	3.6	14.9
2013	20.7	-	32.4	16.4	8.3	27.7
2017	27.8	0.0	24.7	28.2	5.4	33.6
2022	33.6	0.5	21.3	29.8	6.3	24.4

Table 9: The “Pellet Group Data” table summarizes the frequency of animal pellets sampled within the 100 quadrats placed along the sampling belts as well as data from a pellet group transect read parallel to the study site baseline. Quadrat frequency of rabbit or big game pellets indicates a relative amount of presence by a particular animal. This data can help characterize changes in wildlife occupancy patterns on a site.

The data presented in the “Days Use per Acre” section of the table is reported from the pellet group transect in conjunction with the vegetation transects. Animals that do not have a defined defecation rate are recorded as pellets per acre (ha) and are indicated by (*). Rabbit pellet groups were recorded in a few of the years close to the year 2000, but have not been sample within the transect since that time; these are also recorded as pellets per acre (ha).

Table 01R-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2008	1	3	-	72
2013	2	-	-	5
2017	2	2	-	30
2022	4	5	-	6
Year	Days Use Per Acre (ha)			
2008	2.2 (5.4)	2.7 (6.6)	-	-
2013	20.3 (50.2)	4.0 (9.9)	-	-
2017	1.5 (3.6)	6.0 (14.9)	0.7 (1.7)	-
2022	11.6 (28.7)	2.7 (6.6)	-	-

*Pellets per acre (ha)

Table 10: The “Grass Species” table summarizes the average cover and nested frequency for grass species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

Table 01R-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Agropyron fragile ⁱ (Siberian wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hordeum jubatum (foxtail barley)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency									
2008	-	-	74	28	-	29	195	9	-	2
2013	124	72	338	35	1	5	123	51	42	13
2017	209	24	282	20	-	26	148	80	38	55
2022	102	7	188	-	-	1	206	152	5	101
year	Average Cover (%)									
2008	-	-	0.2	0.2	-	0.1	2.4	0.1	-	0.0
2013	3.2	2.1	1.7	0.9	0.0	0.0	1.6	2.0	1.9	0.0
2017	8.7	0.6	3.1	0.3	-	0.8	2.4	3.4	0.9	0.2
2022	2.7	0.3	0.6	-	-	0.0	3.5	7.3	0.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 11: The “Forb Species” table summarizes the average cover and nested frequency for forb species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

Table 01R-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Eriogonum cernuum ^a (nodding buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum shockleyi (Shockley's buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Onobrychis viciifolia ⁱ (sainfoin)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
2008	-	-	3	5	3	3	-	-	-	-	12	34	-	24	-	1	77
2013	7	49	9	2	-	1	3	4	6	-	-	23	2	5	21	6	47
2017	-	65	-	2	-	2	7	5	-	3	3	14	-	-	-	-	4
2022	4	124	8	-	-	1	10	-	-	4	-	5	-	-	-	-	9
year	Average Cover (%)																
2008	-	-	0.0	0.0	0.0	0.0	-	-	-	-	0.1	0.6	-	0.0	-	0.0	0.2
2013	0.0	0.1	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.8	0.1	0.0	0.3	0.2	0.3
2017	-	0.1	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.7	-	-	-	-	0.0
2022	0.0	0.4	0.0	-	-	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 12: The “Shrub and Tree Species” table summarizes the quadrat average and line intercept cover for shrub and tree species. Species may be designated as tree species, preferred browse, and/or introduced species by the associated symbol below the graph. Preferred browse species are determined by Range Trend staff.

Table 01R-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ⁱ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)								
2008	3.1	-	-	-	-	38.6	0.2	0.1	-
2013	0.5	4.5	4.4	0.1	0.1	-	-	-	-
2017	1.9	7.8	1.5	0.4	0.2	0.1	-	-	-
2022	3.9	7.7	0.4	0.3	-	0.2	-	-	-
year	Quadrat Cover (%)								
2008	2.5	-	-	-	0.0	7.9	0.2	0.0	0.0
2013	0.5	2.7	2.8	0.0	0.0	0.1	0.0	0.0	-
2017	1.1	6.8	1.8	0.0	0.1	0.0	-	0.1	-
2022	4.5	5.5	0.2	0.7	0.2	0.0	0.0	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13: The “Shrub/Tree Characteristics” table summarizes shrub and tree species by density, age class distribution, utilization, poor vigor, and average height/crown.

Table 01R-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2008	2800	140	6	32	61	25	20	38	27/46
2013	1180	220	48	53	0	0	0	0	19/35
2017	3260	20	44	55	1	1	0	0	19/38
2022	6360	20	34	65	1	33	12	13	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2008	-	-	-	-	-	-	-	-	-/-
2013	4400	3840	80	21	0	1	1	3	32/45
2017	6700	-	47	53	0	12	7	0	29/50
2022	3900	260	13	81	6	6	5	11	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13a: The “Aspen Characteristics” table summarizes characteristics of the aspen community. Only aspen that was sampled using the size class distribution method is included in this table. Aspen sampled using the modified Cole Browse method is included in the “Browse Characteristics” table. Density is reported for the aspen population and is characterized by age class distribution, which is further subdivided into its corresponding age class demographics; this method was started in 2011. Aspen data prior to 2011 is included in Table 13.

The aspen population is then characterized by utilization, which is subcategorized by percentages of moderate and heavily hedged plants, and concluded with the percentage of plants displaying poor vigor.

Table 02-46.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2022	1520	29	21	7	43	0	0	2

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 14: The “Tree Characteristics” table tree density estimates using the point-center quarter method which better estimates density of widely distributed trees than the shrub density strips. Average basal diameter is also listed in centimeters.

Table 01R-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2008	796	10	15	25	35	15	20.4
2013	21	44	56	-	-	-	4.2
2017	13	80	20	-	-	-	2.4
2022	22	38	63	-	-	-	1.1

PRE-1992 DATA

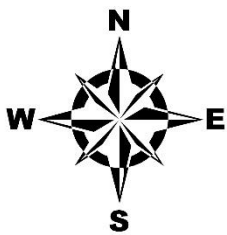
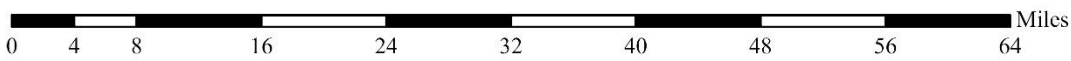
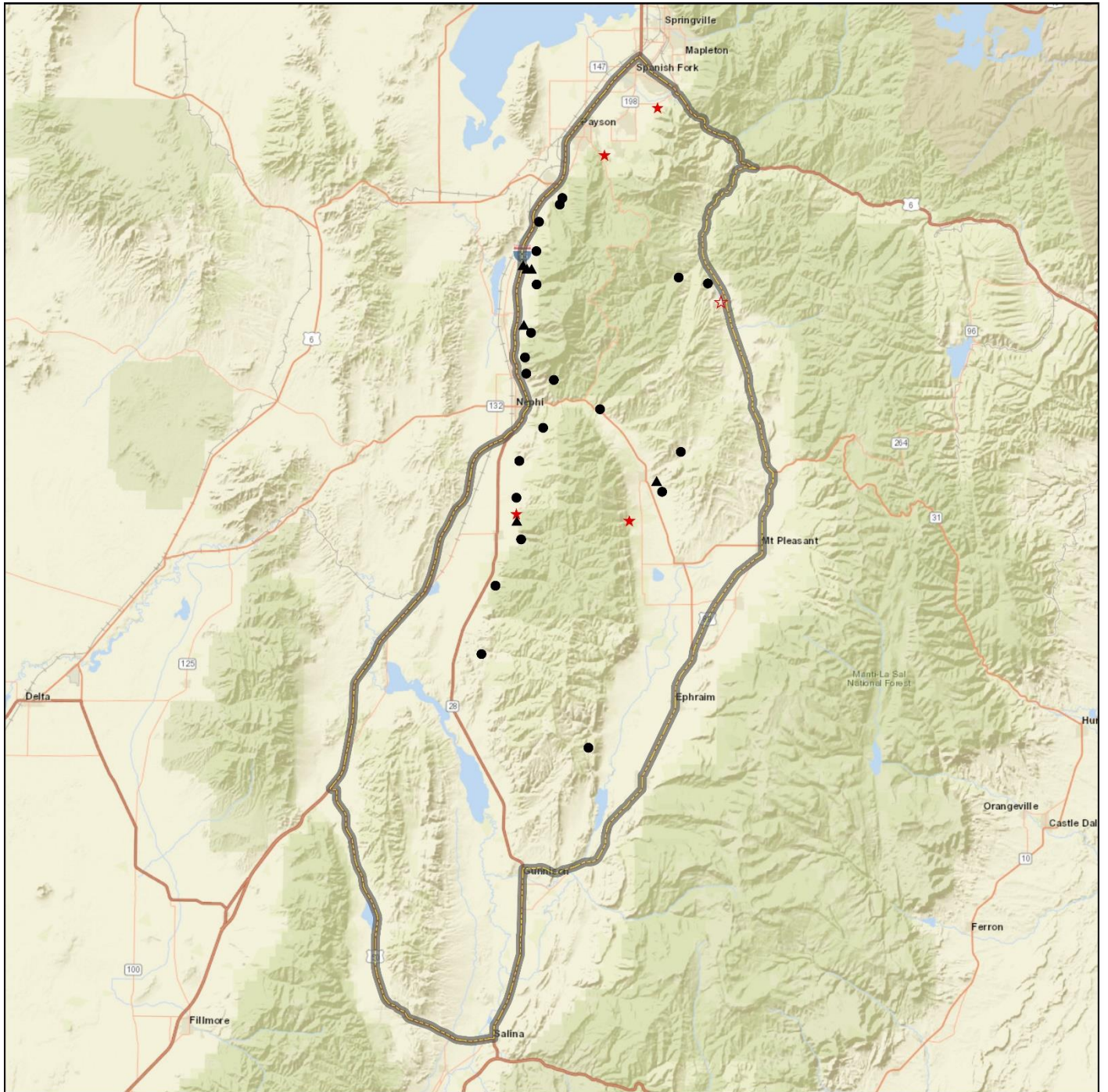
Pre-1992 Data: Data collected before July 19, 1992 has been excluded from the individual site summaries due to differences in sampling techniques and changes in sample size and area. This pre-1992 data can be found in the Utah Big Game Range Trend Studies 1982-1992 report. The following explanations address some of the major changes that occurred with data collection. Nested frequency quadrat divisions and zones were different with four divisions as compared to the five divisions and zones. In addition, nested frequency data for annual species was not collected. Shrub density was collected along a separate transect that was adjacent to the nested frequency transect within three circular plots (radius of 8.3 or 11.7 ft) centered on three permanently marked stakes. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that are characteristically clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent decadence, percent poor vigor, percent heavy hedging, young recruitment, etc., are given more weight in determining shrub population transitions when comparing survey years where sample sizes were different. For more information on earlier range trend sampling methods, see the Pre-1992 Data report methodologies (Utah Big Game Range Trend Studies 1982-1992).

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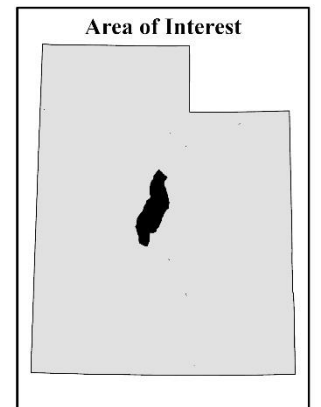
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WILDLIFE MANAGEMENT UNIT 16A – CENTRAL MOUNTAINS, NEBO

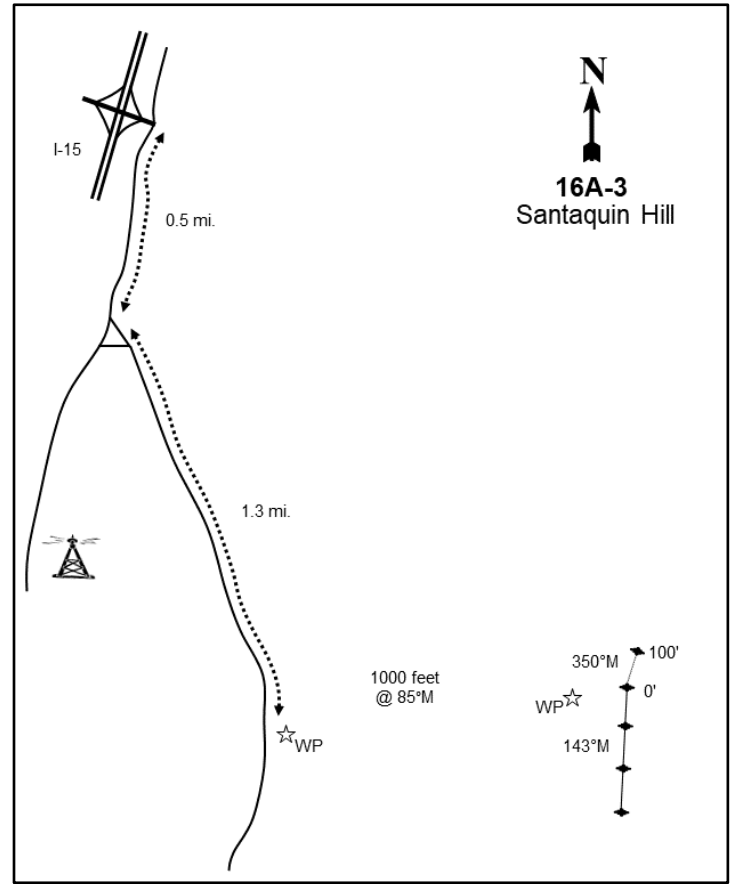
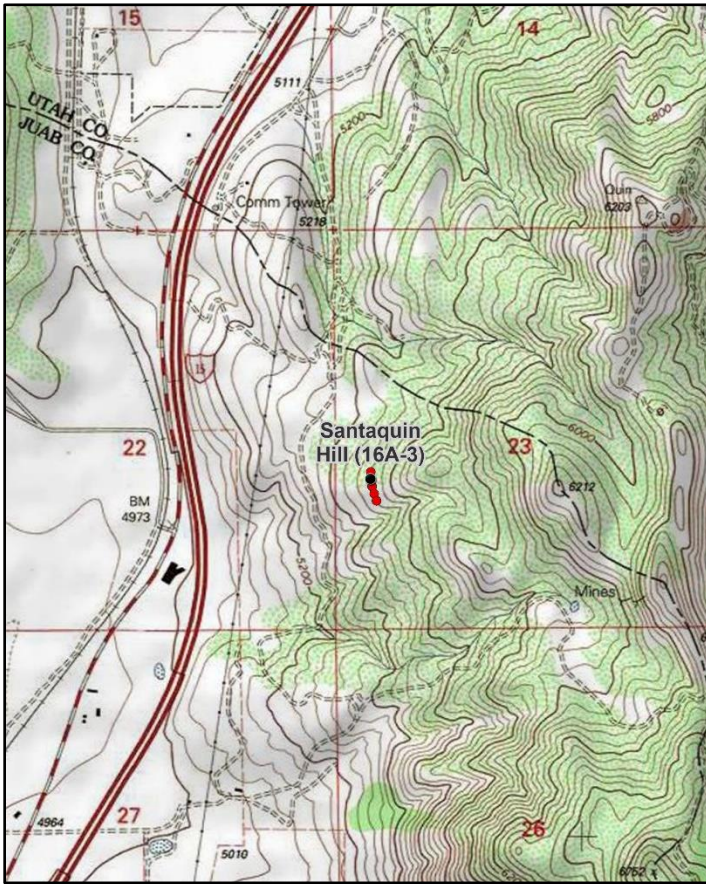


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 16A
★ RT, Suspended	
▲ WRI, Active	
☆ WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

SANTAQUIN HILL - STUDY NO. 16A-3



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Santaquin SE; Township 10S, Range 1E, Section 23
NAD 83 UTM ZONE 12, 431423 East 4420245 North

Transect Information

Browse Tag # (0' Stake)	3967
Transect Bearing	350° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the south Santaquin exit on I-15, proceed east from the overpass and then southerly onto the frontage road for 0.5 miles. The turn is just before the radio tower. Proceed south for 1.3 miles to a half-high witness post on the east side of the road. From the witness post, walk 1,000 feet at 85 degrees magnetic up the ridge to a full-high witness post; the 0-foot baseline stake is 20 feet south of the witness post. A red browse tag, #3967, is attached to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,510ft (1,679m)
Aspect	West
Slope	25%
Sample Dates	06/04/1997, 05/17/2002, 05/15/2007, 05/23/2012, 05/24/2017, 05/17/2022

Wildlife Habitat and Vegetation History**Table 16A-03.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Gambel Oak	Phase I
1989	Mountain Big Sagebrush/Gambel Oak	Phase I
1997	Mountain Big Sagebrush/Gambel Oak	Phase I
2002	Mountain Big Sagebrush/Gambel Oak	Phase I
2007	Mountain Big Sagebrush/Gambel Oak	Phase I
2012	Mountain Big Sagebrush/Gambel Oak	Phase I
2017	Mountain Big Sagebrush/Gambel Oak	Phase I
2022	Mountain Big Sagebrush/Gambel Oak	Phase I

Site Notes

No Notes

Soils**Table 16A-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	40.4	29.1	30.6	3.2	16.3	204.8	0.6	06/04/1997

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

This site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) dominated plant community since study establishment in 1983. Utah juniper (*Juniperus osteosperma*) is scattered throughout the site, placing it in Phase I of woodland succession (Photos, Table 16A-03.4, Table 16A-03.12, Table 16A-03.13, Table 16A-03.14). Perennial grasses, mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), have been the most abundant herbaceous component since 1983. The introduced annual species field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) have been sampled each year since 1997, but have contributed little cover. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2017 in low abundance (Pre-1992 Data, Table 16A-03.10). Forbs have remained diverse, with annual species being more common than perennial species (Table 16A-03.7, Table 16A-03.11). Although sagebrush density was at its highest in 2022, cover of sagebrush was at its lowest, while the percentage of decadence and poor vigor were at their highest (Table 16A-03.12, Table 16A-03.13). This change in the health of sagebrush may be indicative of a future community transition.

Trend Summary Tables

Table 16A-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	19.6	0.8	-	-	-	-
2002	14.0	0.0	-	-	-	-
2007	19.0	-	-	22.7	-	-
2012	22.3	0.0	-	32.7	0.5	-
2017	15.1	1.1	-	19.4	0.9	0.1
2022	18.7	0.3	0.5	18.3	0.1	0.3

Table 16A-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	235	312	378	66	2.7	11.4	3.2	0.5
2002	145	314	388	55	1.8	11.4	4.0	0.3
2007	219	286	440	43	5.3	9.0	10.5	0.9
2012	179	314	392	64	1.5	11.8	2.9	1.7
2017	176	335	402	75	1.8	15.5	8.7	0.3
2022	325	326	391	58	10.4	18.5	9.1	0.7

Table 16A-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.1	0.6	47.6	3.1	22.9	35.7
2002	5.8	0.3	47.3	4.2	25.5	33.0
2007	7.4	0.4	38.4	2.9	25.3	43.0
2012	8.8	0.0	41.4	4.3	26.9	40.1
2017	10.3	0.1	36.2	8.9	28.6	42.3
2022	10.7	0.2	38.8	4.4	32.6	49.6

Table 16A-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	20	2	11
2002	33	2	15
2007	52	1	21
2012	17	3	16
2017	24	2	13
2022	30	-	4
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	111.9 (276.4)	-	-
2007	138.7 (342.6)	-	-
2012	24.8 (61.2)	-	-
2017	50.2 (124.1)	0.7 (1.7)	-
2022	64.3 (158.9)	-	-

Table 16A-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Bromus arvensis ^{ai} (field brome)	152	128	-	-	-	110	267
Bromus tectorum ^{ai} (cheatgrass)	-	145	-	-	3	93	287
Poa bulbosa ⁱ (bulbous bluegrass)	7	219	-	-	-	111	263
Poa fendleriana (muttongrass)	130	80	-	-	-	121	284
Poa pratensis ⁱ (Kentucky bluegrass)	74	125	13	-	2	69	323
Poa secunda (Sandberg bluegrass)	278	237	33	11	-	108	284
Pseudoroegneria spicata (bluebunch wheatgrass)							
year	Average Cover (%)						
1997	1.9	0.8	-	-	-	0.9	10.5
2002	-	1.8	-	-	0.0	0.5	10.9
2007	0.0	5.2	-	-	-	0.9	8.2
2012	1.2	0.2	-	-	-	1.2	10.6
2017	0.6	1.2	0.5	-	0.0	0.6	14.4
2022	7.2	3.3	0.8	0.2	-	1.1	16.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum alyssoides ^{ai} (pale madwort)	-	352	1	7	-	2	11	-	12	0	58	8	-	-	22	-	-
Alyssum desertorum ^{ai} (desert madwort)	-	371	2	-	-	1	-	2	18	1	75	-	-	0	17	4	-
Antennaria (pussytoes)	-	433	-	-	-	10	-	0	13	-	65	-	-	5	54	-	1
Arabis (rockcress)	-	387	-	-	-	15	-	14	2	12	18	-	-	9	10	-	-
Artemisia ludoviciana (white sagebrush)	-	380	-	-	-	8	-	1	56	4	54	-	1	0	84	2	-
Astragalus beckwithii (Beckwith's milkvetch)	68	269	-	-	3	5	-	2	41	2	147	-	-	3	182	-	-
Astragalus cibaricus (browse milkvetch)																	
Astragalus eurekaensis (Eureka milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curveseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Chaetopappa ericoides (rose heath)																	
Cirsium undulatum ^a (wavy/leaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Convolvulus arvensis ⁿⁱ (field bindweed)																	
year	Average Cover (%)																
1997	-	2.4	0.0	0.0	-	0.1	0.2	-	0.0	0.0	0.1	0.0	-	-	0.1	-	-
2002	-	3.4	0.0	-	-	0.0	-	0.0	0.1	0.0	0.3	-	-	0.0	0.1	0.0	-
2007	-	9.6	-	-	-	0.7	-	0.0	0.0	-	0.1	-	-	0.1	0.2	-	0.0
2012	-	2.4	-	-	-	0.7	-	0.6	0.0	0.1	0.0	-	-	0.2	0.0	-	-
2017	-	6.2	-	-	-	0.1	-	0.0	0.2	0.0	0.3	-	0.0	0.0	0.4	0.0	-
2022	0.9	3.5	-	-	0.0	0.1	-	0.0	0.1	0.1	0.8	-	-	0.0	1.6	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																
year	Average Cover (%)																
Crepis acuminata (tapertip hawkbeard)	5	3	38	1	-	46	3	-	10	30	-	1	29	5	-	2	
Draba ^a (draba)	2	-	22	-	-	43	-	-	1	29	-	3	25	8	1	5	
Epilobium brachycarpum ^a (tall annual willowherb)	-	-	-	-	5	76	-	-	8	62	-	0	22	-	-	2	
Eriogon pumilus (shaggy fleabane)	2	-	34	-	-	24	-	-	5	10	2	5	19	8	-	3	
Erodium cicutarium ^{ai} (redstem stork's bill)	-	-	23	-	36	71	-	-	13	8	-	-	6	4	-	2	
Galium aparine ^a (stickywilly)	-	6	5	-	29	74	-	4	7	21	-	3	3	-	-	4	
Helianthus annuus ^{ai} (common sunflower)	0.0	0.0	0.1	0.0	-	0.5	0.0	-	0.0	0.1	-	0.0	0.1	0.0	-	0.0	
Holosteum umbellatum ^{ai} (jagged chickweed)	0.0	-	0.1	-	-	0.1	-	-	0.0	0.1	-	0.2	0.1	0.0	0.0	0.0	
Lactuca serriola ^{ai} (prickly lettuce)	-	-	-	-	0.0	0.3	-	-	0.0	0.1	-	0.2	0.1	-	-	0.0	
Microsteris gracilis ^a (slender phlox)	0.0	-	0.1	-	-	0.1	-	-	0.0	0.0	0.0	0.1	0.1	0.0	-	0.0	
Oenothera (evening primrose)	-	-	0.1	-	1.1	0.6	-	-	0.0	0.0	-	-	0.0	0.0	-	0.0	
Petradoria pumila (rock goldenrod)	-	0.0	0.0	-	0.3	1.2	-	0.0	0.6	0.0	-	0.4	0.0	-	-	0.0	
Phlox longifolia (longleaf phlox)	0.0	-	0.1	-	-	0.1	-	-	0.0	0.0	0.0	0.1	0.1	0.0	-	0.0	
Silene antirrhina ^a (sleepy silene)	-	-	0.1	-	-	0.1	-	-	0.0	0.0	-	-	0.0	0.0	-	0.0	
Taraxacum officinale (common dandelion)	-	0.0	0.0	-	0.3	1.2	-	0.0	0.6	0.0	-	0.4	0.0	-	-	0.0	
Tragopogon dubius ^{ai} (yellow salsify)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	-	-	-	-
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	-	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	13	1.2	-	-	8.5
Juniperus osteosperma ⁱ (Utah juniper)	16.5	0.9	0.5	-	15.3
Quercus gambelii ^p (Gambel oak)	9.4	0.6	0.9	0.1	9.4
year	8.9	-	0.1	0.3	9.4
SHRUB SPECIES	Quadrat Cover (%)				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	10.3	0.7	0.8	-	8.6
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	8.9	0.2	0.0	-	4.9
Gutierrezia sarothrae (broom snakeweed)	11.6	0.8	-	-	6.6
Juniperus osteosperma ⁱ (Utah juniper)	12.4	0.2	0.0	-	9.7
Quercus gambelii ^p (Gambel oak)	7.2	0.0	1.1	0.0	7.9
year	10.9	-	0.3	0.5	7.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2780	100	19	54	27	43	12	19	43/63
2002	2940	20	5	55	40	38	28	26	52/81
2007	2820	20	4	53	43	29	45	27	67/89
2012	2420	100	7	72	22	33	13	13	61/95
2017	2940	80	24	48	28	40	19	20	55/86
2022	3060	60	17	39	44	39	54	44	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	140	-	0	100	0	14	14	0	68/90
2002	80	-	0	75	25	0	0	25	75/120
2007	80	-	0	0	100	0	25	75	75/107
2012	60	-	0	67	33	0	0	33	75/116
2017	40	-	0	100	0	0	0	0	64/101
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	740	20	8	89	3	0	0	0	24/22
2002	260	-	8	77	15	0	0	31	16/21
2007	160	20	38	63	0	0	0	13	24/31
2012	560	60	0	100	0	0	0	0	20/27
2017	1580	40	24	75	1	0	0	1	22/27
2022	660	100	49	36	15	0	3	12	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	3140	100	27	71	3	26	43	1	76/74
2002	6860	-	2	98	0	1	16	9	74/48
2007	5020	100	44	51	6	7	0	2	85/69
2012	5220	380	17	83	0	8	0	0	81/77
2017	3100	420	10	88	2	5	7	9	85/81
2022	6240	80	50	30	20	27	55	22	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

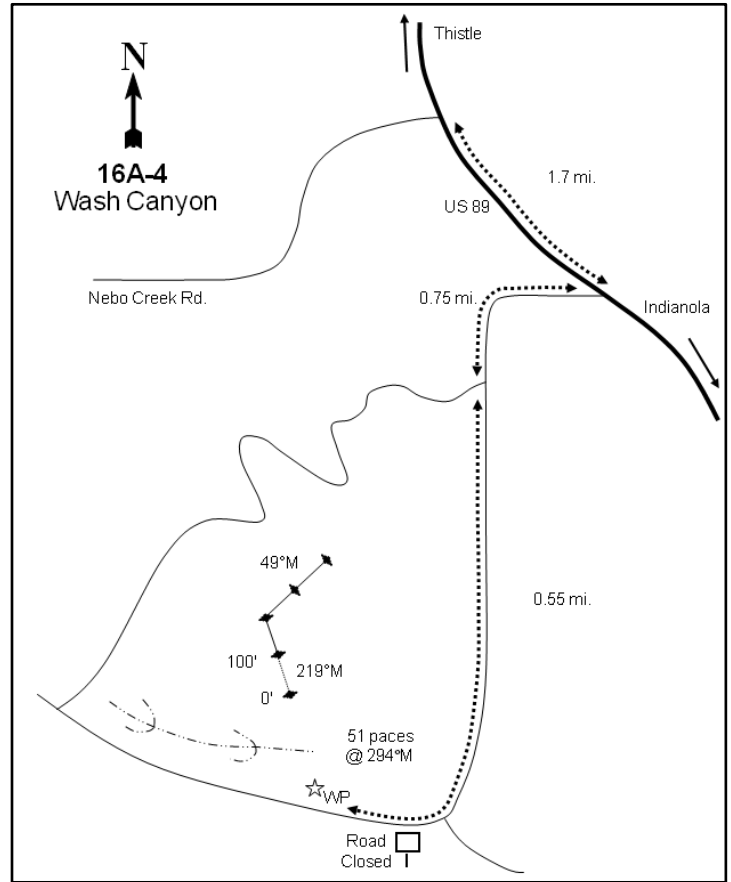
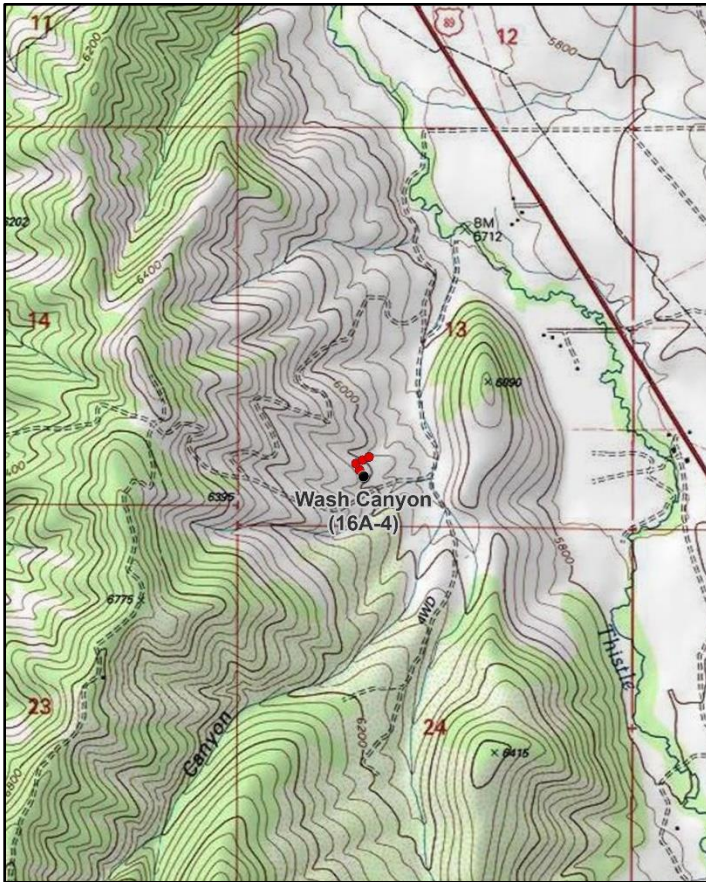
Table 16A-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	22	10	-	30	20	40	14.5
2022	25	-	10	30	10	50	19.3

Table 16A-03.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	22.4	10.4	10.8	22.8	-2.0	0.9	0.0	65.3	Fair
2002	16.2	7.4	2.1	22.8	-1.4	0.7	0.0	47.8	Poor
2007	26.3	5.5	9.4	18.1	-4.0	1.9	-2.0	55.1	Poor-Fair
2012	30.0	11.5	5.7	23.7	-1.1	3.3	0.0	73.0	Good
2017	21.9	10.7	8.1	30.0	-1.4	0.7	0.0	70.0	Fair-Good
2022	20.5	5.4	15.0	30.0	-7.8	1.3	0.0	64.4	Fair

WASH CANYON - STUDY NO. 16A-4



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Spencer Canyon NE; Township 11S, Range 3E, Section 13
NAD 83 UTM ZONE 12, 453705 East 4412098 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
315° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: 2ft

Directions to Site

From the intersection of Nebo Creek Road and US-89, proceed south on US-89 for 1.7 miles (0.6 miles south of mile marker 302) to a road to the west. Turn right (west) and proceed westerly for 0.75 miles, crossing a stream at 0.25 miles and an old railroad bed at 0.30 miles en route to a faint fork in the road. Take the left fork and proceed for 0.5 miles to the end of the road. Walk up the old road for 0.05 miles to a half-high witness post on the north side of the road. From the witness post, walk 51 paces at an azimuth of 295 degrees magnetic to the 0-foot baseline stake (the baseline stake is 17 paces away from a lone juniper at an azimuth of 56 degrees). The 0-foot baseline stake is a green post located just north of a clump of oak.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,040ft (1,841m)
Aspect	northeast
Slope	15-20%
Sample Dates	08/22/1997, 06/18/2002, 06/20/2007, 05/29/2012, 05/30/2017, 05/23/2022

Table 16A-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Pole Creek/Bald Mountain Fire Complex	-	August-October 2018	120,854
Seeding - Aerial	Pole Creek/Bald Mountain Fire Rehabilitation	4773	November 2018	1,823
Seeding - Aerial	Pole Creek/Bald Mountain Fire Rehabilitation	4773	January 2019	1,823

Table 16A-04.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pole Creek Fire Aerial			Aerial	Nov 2018	19529
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Bromus marginatus	Mountain Brome	Garnet	0.62	0.58
G	Bromus marginatus	Mountain Brome	Garnet	0.38	0.36
G	Dactylis glomerata	Orchardgrass	Profile	0.50	0.39
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.86
G	Poa secunda	Sandberg Bluegrass	Hanford	0.24	0.21
G	Poa secunda	Nevada Bluegrass	Opportunity	0.26	0.22
G	Poa secunda	Big Bluegrass	Sherman	0.33	0.24
G	Poa secunda	Big Bluegrass	Sherman	0.17	0.12
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.26	0.23
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.19	0.17
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.31	0.27
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.50	0.47
F	Achillea millefolium	Western Yarrow	Eagle	0.04	0.04
F	Achillea millefolium	Western Yarrow	Eagle	0.01	0.01
F	Medicago sativa	Alfalfa	Ladak DL	0.21	0.20
F	Medicago sativa	Alfalfa	Ladak DL	1.79	1.73

Wildlife Habitat and Vegetation History**Table 16A-04.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long
Shiras Moose	substantial	year-long

Table 16A-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I
2022	Perennial Grass	Phase I

Site Notes

Antler drops and winter-killed deer were noted during the 1983 reading. In addition, a deer carcass was observed in the gully north of the site in 2017. Only primary seed mix was used during the WRI project #4773.

Soils**Table 16A-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	35.0	31.2	33.8	3.4	13.5	99.2	0.6	08/11/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated this study site from 1983 to 2018 when a wildfire removed much of the browse community (Table 16A-04.1). Other preferred browse species including Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) have been present as minor components (Table 16A-04.12, Table 16A-04.13). The herbaceous understory has remained abundant and very diverse, with perennial grasses as the most abundant component. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed each sample year since 2002, and has increased in cover between 2012 and 2022 (Table 16A-04.10). Perennial forbs have generally been more common than annual forbs in most sample years, with scarlet globemallow (*Sphaeralcea coccinea*) contributing the most cover of any single species in 2017 (Table 16A-04.7, Table 16A-04.11). As mentioned earlier, the Pole Canyon wildfire removed much of the preferred browse cover in 2018, and mountain big sagebrush cover decreased from 8% in 2017 to 0% in 2022 (Table 16A-04.12). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been scattered throughout the area for the study's duration, and the site has been considered to be within Phase I of encroachment (Photos, Table 16A-04.4, Table 16A-04.14).

Trend Summary Tables

Table 16A-04.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.0	11.5	-	-	-	-
2002	11.5	8.5	0.1	8.5	5.0	0.4
2007	10.2	8.0	0.1	11.4	7.4	0.4
2012	12.2	6.8	0.4	11.5	3.8	0.7
2017	9.1	8.6	1.0	8.4	6.8	0.8
2022	1.5	8.5	-	2.2	8.0	-

Table 16A-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	314	318	213	209	6.1	9.2	1.2	2.9
2002	172	281	254	133	0.7	11.5	1.4	1.7
2007	312	291	427	223	3.5	9.4	6.4	3.3
2012	96	325	317	294	0.4	14.0	2.3	7.7
2017	237	329	398	295	7.3	20.9	4.3	8.4
2022	254	343	465	297	7.1	29.0	20.7	13.8

Table 16A-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.3	0.4	40.6	9.3	5.8	43.7
2002	31.5	0.0	40.5	6.2	5.5	32.0
2007	25.7	0.0	30.7	6.3	5.5	41.0
2012	21.4	0.7	36.6	6.6	6.3	44.3
2017	30.9	0.5	28.4	8.0	6.9	49.0
2022	25.3	0.0	19.7	10.4	7.9	62.7

Table 16A-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	2	58	21	-	2
2002	1	68	12	-	14
2007	1	48	17	-	22
2012	1	14	1	-	8
2017	2	25	-	-	9
2022	1	12	1	-	3
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	0.7 (1.8)	174.9 (432.0)	10.7 (26.5)	-	-
2007	9.4 (23.3)	92.5 (228.4)	9.4 (23.2)	0.6 (1.4)	-
2012	10.2 (25.1)	36.8 (91.0)	3.4 (8.3)	-	-
2017	31.2 (77.1)	105.2 (259.9)	6.7 (16.6)	-	-
2022	15.3 (37.7)	2.7 (6.6)	2.7 (6.6)	-	-

Table 16A-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1997	93	-	-	314	1	51	27	-	-	-	5	92	54	89
2002	93	-	4	171	-	35	25	2	-	12	-	29	40	124
2007	31	-	33	303	-	49	27	-	-	53	2	-	87	169
2012	24	-	-	96	-	25	54	-	-	38	6	52	132	136
2017	31	-	109	202	-	41	47	7	-	170	4	10	126	98
2022	43	1	118	190	36	14	42	-	3	244	2	13	85	128
year	Average Cover (%)													
1997	1.8	-	-	6.1	0.0	0.6	0.6	-	-	-	0.1	3.0	0.9	2.2
2002	3.7	-	0.0	0.7	-	0.8	1.5	0.1	-	0.1	-	0.2	0.5	4.5
2007	0.5	-	0.2	3.4	-	0.6	1.0	-	-	0.9	0.0	-	1.4	5.0
2012	0.9	-	-	0.4	-	0.4	1.5	-	-	0.3	0.0	1.2	2.2	7.4
2017	1.4	-	1.8	5.4	-	1.0	2.6	0.0	-	6.4	0.0	0.2	3.7	5.7
2022	2.2	0.0	1.4	5.7	0.9	0.4	2.0	-	0.0	10.1	0.0	0.2	2.2	10.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledop false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium ^a (goosefoot)
year	Nested Frequency																
1997	-	4	13	116	1	-	-	-	9	1	-	5	-	-	-	1	3
2002	-	9	-	216	1	-	-	2	1	-	-	-	-	-	17	-	-
2007	-	17	11	368	14	-	-	12	6	2	0	-	3	3	291	2	-
2012	-	12	-	287	6	-	1	37	16	14	0	2	2	26	69	4	-
2017	-	36	99	390	2	-	-	50	17	18	1	4	3	18	81	-	-
2022	6	72	80	451	-	1	1	57	28	5	1	25	9	0	117	-	-
year	Average Cover (%)																
1997	-	0.0	0.0	0.3	0.0	-	-	-	0.1	0.0	-	0.0	-	-	-	0.0	0.0
2002	-	0.0	-	0.8	0.0	-	-	0.0	0.0	-	-	-	-	-	0.1	-	-
2007	-	0.2	0.0	2.6	0.2	-	-	0.1	0.1	0.0	0.0	-	0.0	0.1	3.1	0.0	-
2012	-	0.1	-	1.7	0.2	-	0.0	0.6	0.1	0.3	0.0	0.0	0.0	0.4	0.1	0.0	-
2017	-	0.3	0.3	3.5	0.0	-	-	0.8	0.3	0.1	0.1	0.0	0.0	0.2	0.3	-	-
2022	0.1	1.2	0.5	18.7	-	0.0	0.0	1.8	0.7	0.3	0.1	0.1	0.2	0.0	0.7	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Delphinium nuttallianum (two-lobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Erigonum racemosum (redroot buckwheat)	Erigonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)
year	Nested Frequency																
1997	18	3	9	2	3	13	-	-	41	11	1	0	2	39	-	5	87
2002	16	97	1	-	-	11	-	-	1	2	-	3	1	39	-	-	-
2007	10	131	1	5	11	10	2	-	4	2	-	12	-	13	-	22	8
2012	10	7	3	13	53	19	11	-	-	-	-	3	18	34	-	6	22
2017	14	46	-	9	15	22	10	-	17	1	3	13	2	27	-	2	12
2022	3	68	8	9	28	8	20	1	27	3	-	6	5	3	3	24	1
year	Average Cover (%)																
1997	0.2	0.0	0.0	0.0	0.0	0.1	-	-	0.1	0.1	0.0	0.0	0.0	0.4	-	0.0	0.7
2002	0.2	0.2	0.0	-	-	0.1	-	-	0.0	0.0	-	0.1	0.0	0.3	-	-	-
2007	0.2	0.3	0.0	0.1	0.0	0.1	0.0	-	0.0	0.0	-	0.1	-	0.1	-	0.2	0.1
2012	0.2	0.0	0.0	0.0	0.6	0.1	0.0	-	-	-	-	0.1	0.1	0.6	-	0.0	0.1
2017	0.1	0.2	-	0.1	0.1	0.4	0.1	-	0.1	0.0	0.0	0.2	0.0	0.4	-	0.0	0.1
2022	0.2	0.2	0.0	0.2	1.6	0.1	0.6	0.0	0.2	0.0	-	0.3	0.0	0.4	0.0	0.3	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum perenne ⁱ (blue flax)	Lithophragma (woodland-star)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Oenothera (evening primrose)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)
year	Nested Frequency																
1997	-	6	-	-	3	-	-	2	4	-	-	-	3	22	-	-	-
2002	-	-	1	-	-	-	2	-	-	-	-	-	5	1	7	-	-
2007	-	-	1	5	-	-	-	-	-	-	-	-	38	-	-	-	-
2012	-	-	5	2	-	-	-	-	-	5	0	4	40	-	4	-	4
2017	-	-	0	3	-	7	-	-	-	-	-	-	5	-	-	4	12
2022	5	-	12	-	-	8	5	3	-	-	5	-	8	-	4	18	2
year	Average Cover (%)																
1997	-	0.3	-	-	0.0	-	-	0.0	0.0	-	-	-	0.0	0.1	-	-	-
2002	-	-	0.0	-	-	-	0.0	-	-	-	-	-	0.0	0.0	0.0	-	-
2007	-	-	0.2	0.0	-	-	-	-	-	-	-	-	0.2	-	-	-	-
2012	-	-	0.2	0.0	-	-	-	-	-	0.0	0.0	0.0	0.5	-	0.0	-	0.0
2017	-	-	0.1	0.0	-	0.1	-	-	-	-	-	-	0.0	-	-	0.0	0.0
2022	0.2	-	0.4	-	-	0.1	0.0	0.0	-	-	0.0	-	0.1	-	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES									
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)									
<i>Sphaeralcea coccinea</i> (scarlet globemallow)									
<i>Streptanthus cordatus</i> (heartleaf twistflower)									
<i>Symphotrichum ascendens</i> (western aster)									
<i>Taraxacum officinale</i> (common dandelion)									
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)									
<i>Vicia americana</i> (American vetch)									
<i>Viola</i> (violet)									
<i>Zigadenus paniculatus</i> (foothill deathcamas)									
year	Nested Frequency								
1997	-	98	-	1	1	69	3	-	-
2002	-	80	-	4	-	4	8	-	-
2007	-	106	3	5	-	9	69	-	-
2012	-	86	1	2	-	20	145	-	-
2017	-	109	-	10	3	10	112	25	3
2022	2	85	-	12	-	9	110	35	-
year	Average Cover (%)								
1997	-	1.0	-	0.0	0.0	0.4	0.0	-	-
2002	-	1.0	-	0.0	-	0.0	0.0	-	-
2007	-	0.9	0.0	0.0	-	0.0	0.6	-	-
2012	-	0.7	0.0	0.0	-	0.2	2.8	-	-
2017	-	1.5	-	0.3	0.0	0.0	2.5	0.1	0.1
2022	0.0	1.6	-	0.2	-	0.1	2.5	0.4	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES										
<i>Amelanchier utahensis</i> ^p (Utah serviceberry)										
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)										
<i>Cercocarpus montanus</i> ^p (alderleaf mountain mahogany)										
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)										
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)										
<i>Gutierrezia sarothrae</i> (broom snakeweed)										
<i>Opuntia polyacantha</i> (plains pricklypear)										
<i>Pinus edulis</i> ^t (twoneedle pinyon)										
<i>Purshia tridentata</i> ^p (antelope bitterbrush)										
<i>Quercus gambelii</i> ^p (Gambel oak)										
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	0.2	7.3	-	4	0.3	0.7	0.3	0.4	0.5	0.2
2007	0.1	10	0.1	4.4	0.5	2.5	0.5	0.4	0.4	0.3
2012	0.2	9.7	0.1	3.1	0.6	0.3	0.4	0.7	0.5	0.4
2017	0.4	6	0.2	3.8	0.7	2.2	0.8	0.8	0.8	0.3
2022	0.3	-	0.6	3.8	0.7	4	0.2	-	0.6	-
year	Quadrat Cover (%)									
1997	-	7.2	0.1	8.1	-	2.7	0.7	-	0.6	-
2002	0.1	9.7	0.1	6.8	0.0	0.6	1.1	0.1	0.4	1.0
2007	0.0	8.8	0.1	4.8	0.0	2.5	0.7	0.1	0.6	0.8
2012	0.0	10.6	0.0	4.4	0.0	1.1	1.3	0.4	0.9	0.8
2017	0.0	8.3	0.2	4.9	0.0	2.5	1.1	1.0	0.2	0.4
2022	0.1	0.0	1.0	5.4	0.1	2.7	0.4	-	0.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	40	-	0	50	50	0	50	50	- / -
2002	60	-	33	0	67	0	0	0	24/42
2007	40	-	50	50	0	100	0	0	32/50
2012	40	-	0	100	0	0	100	0	37/54
2017	80	-	25	75	0	25	0	0	45/51
2022	20	-	0	100	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1800	-	20	52	28	14	0	17	71/80
2002	1980	-	4	78	18	39	35	11	64/81
2007	1760	420	17	61	22	50	8	63	69/96
2012	1960	-	19	66	14	32	25	5	54/81
2017	1880	20	18	55	27	55	17	28	51/77
2022	20	-	100	0	0	0	0	0	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	40	-	50	50	0	0	50	0	28/48
2002	20	-	0	100	0	0	100	0	45/63
2007	40	-	0	100	0	0	100	0	42/67
2012	20	-	0	100	0	100	0	0	44/73
2017	40	-	0	50	50	0	50	50	44/78
2022	60	-	33	67	0	0	33	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	7280	-	13	82	6	0	0	2	28/30
2002	7520	-	2	65	34	1	0	17	23/33
2007	6140	420	4	87	9	0	0	3	21/31
2012	5300	20	19	81	0	3	0	0	22/33
2017	4620	-	11	88	0	0	0	1	25/37
2022	4740	40	36	62	2	3	0	2	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	0	0	- /41
2002	40	-	0	100	0	100	0	0	64/64
2007	40	-	0	50	50	0	0	0	97/89
2012	40	-	0	100	0	0	0	0	85/112
2017	40	-	0	50	50	50	0	50	42/54
2022	20	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	6420	360	15	85	1	0	0	1	27/28
2002	1600	-	0	16	84	0	3	76	16/18
2007	7420	20	12	86	2	0	0	1	20/18
2012	1480	-	45	54	1	0	0	0	17/23
2017	4700	80	11	89	0	0	0	0	20/20
2022	5120	240	5	87	8	0	0	1	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	920	20	11	87	2	0	0	2	15/22
2002	1240	-	3	77	19	0	0	7	12/25
2007	780	20	5	87	8	0	0	21	15/32
2012	620	-	3	97	0	3	0	0	14/31
2017	700	-	0	100	0	0	0	3	14/32
2022	280	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pinus edulis^t -- (twoneedle pinyon)									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	100	0	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	140	-	0	100	0	71	14	0	22/41
2002	120	-	0	33	67	0	50	33	23/38
2007	140	-	14	86	0	14	71	0	21/45
2012	140	-	0	71	29	29	71	0	27/76
2017	120	-	17	83	0	0	83	0	26/77
2022	60	-	0	100	0	67	0	0	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	60	-	67	33	0	33	0	0	- / -
2002	100	-	60	20	20	20	20	80	72/143
2007	300	-	0	100	0	0	0	0	125/88
2012	40	-	0	100	0	0	0	0	- / -
2017	20	-	0	0	100	0	0	100	- / -
2022	-	-	-	-	-	-	-	-	- / -
Ribes^p -- (currant)									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	100	0	0	54/58

t - Tree Species; p - Preferred Browse; i - Introduced Species

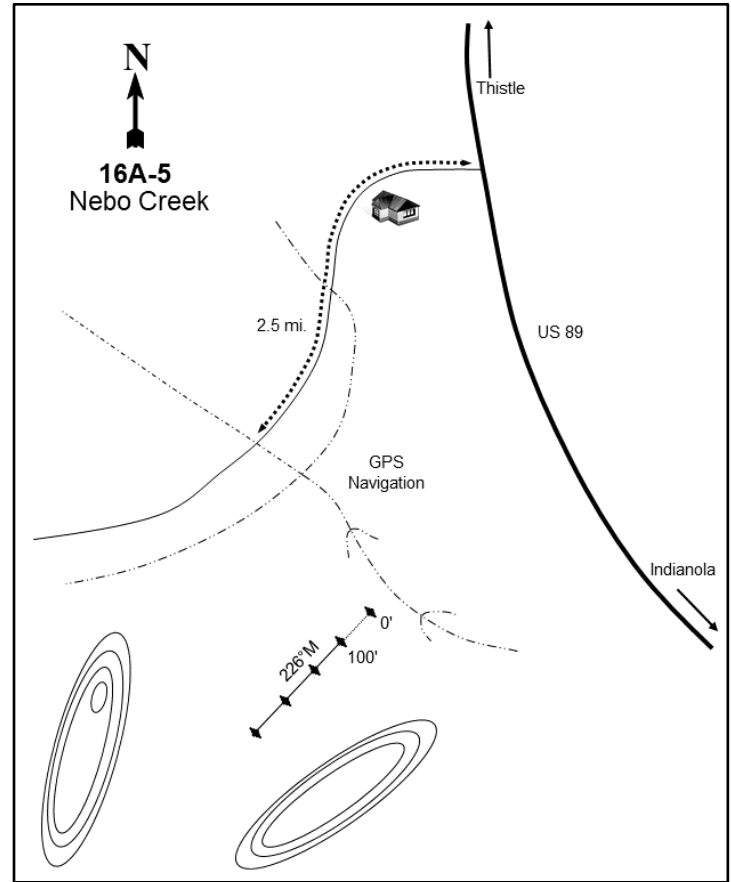
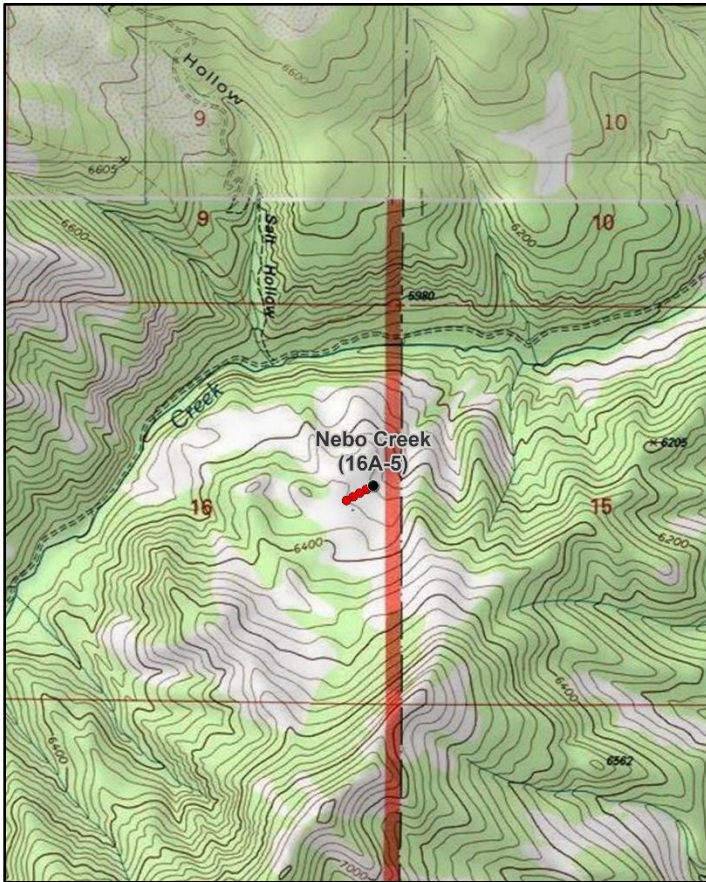
Table 16A-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	27	-	-	-	-	-	5.4
2007	15	-	25	38	25	13	13.8
2012	15	-	22	56	-	22	7.7
2017	15	-	-	44	22	33	24.4
2022	3	-	-	33	-	67	19.7
Pinus edulis (twoneedle pinyon)							
2017	11	-	20	40	20	20	9.0
2022	2	-	-	-	-	100	11.0

Table 16A-04.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.1	7.4	9.5	18.4	-4.6	5.7	0.0	46.5	Poor
2002	14.3	8.8	4.5	22.9	-0.5	3.3	0.0	53.3	Poor-Fair
2007	14.3	8.7	7.9	17.1	-2.7	6.6	0.0	52.0	Poor
2012	14.5	11.0	8.2	27.3	-0.3	10.0	0.0	70.6	Fair-Good
2017	10.8	6.6	7.9	29.1	-5.4	10.0	0.0	58.9	Fair
2022	3.1	0.0	0.0	30.0	-5.4	10.0	0.0	37.8	Very Poor

NEBO CREEK - STUDY NO. 16A-5

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Spencer Canyon NW; Township 11S, Range 3E, Section 16
NAD 83 UTM ZONE 12, 449858 East 4412881 North

Transect Information

Browse Tag # (0' Stake)	3966
Transect Bearing	226° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 3, 4: No Rebar

Directions to Site

Beginning at the intersection of Highway US-89 and Nebo Creek Road, proceed 2.5 miles westerly up Nebo Creek to the USFS boundary sign and/or the cattle guard: park here. Walk at an azimuth of 185 degrees magnetic, across Nebo Creek and uphill to the hill's crest. Trees used as landmarks have burned in a past wildfire, so from here the use a GPS is required to locate the 0-stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	PAYSON
Elevation	6,300ft (1,920m)
Aspect	Northeast
Slope	10%
Sample Dates	05/28/1997, 06/18/2002, 06/13/2007, 07/04/2012, 05/25/2017, 02/07/2022

Table 16A-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Pole Creek/Bald Mountain Fire Complex	-	August-October 2018	120854
Fire - Wildfire	Nebo Creek	-	July 2001	4378

Wildlife Habitat and Vegetation History**Table 16A-05.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	substantial	spring/fall
Shiras Moose	substantial	year-long

Table 16A-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Gambel Oak	NA
1989	Gambel Oak	NA
1997	Mountain Big Sagebrush	NA
2002	Perennial Grass	NA
2007	Annual Grass	NA
2012	Perennial Grass	NA
2017	Annual Grass	NA
2022	Perennial Grass/Annual Forb	NA

Site Notes

This study initially sampled a Gambel oak (*Quercus gambelii*) clone, but the transect was moved in 1997 to sample the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) community that was more prevalent on the slopes. As such, only data collected since 1997 is included in this discussion.

Soils**Table 16A-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.0	34.7	34.7	30.6	3.5	39.6	320.0	0.5	05/28/1997

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) in 1997, but the shrub component was mostly removed by the 2001 Nebo Creek Fire. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been the most common shrub following the 2001 and 2018 burns (Table 16A-05.1, Table 16A-05.12, Table 16A-05.13). The herbaceous understory has remained abundant and diverse. Perennial grasses -- mainly Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced species bulbous bluegrass (*Poa bulbosa*) -- and the introduced annual species cheatgrass (*Bromus tectorum*) have fluctuated in cover, but have been the dominant vegetation components in the sample years following the burn. However, bulbous bluegrass increased substantially in both cover and frequency in 2022 (Table 16A-05.7, Table 16A-05.10). Forbs have remained very diverse and fairly abundant. The introduced and noxious perennial forb whitetop (*Cardaria draba*) was sampled in 2017 and 2022, and the annual species gypsyflower (*Cynoglossum officinale*) was observed in many sample years prior to 2017. However, both species contribute or have contributed little cover (Table 16A-05.11).

Trend Summary Tables

Table 16A-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	7.6	8.9	-	-	-	-
2002	-	0.4	-	-	0.4	-
2007	0.1	8.2	-	-	12.4	-
2012	-	7.3	-	0.3	9.2	-
2017	0.1	7.9	-	0.2	13.3	-
2022	0.6	5.6	-	0.4	10.2	-

Table 16A-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	148	392	347	389	2.5	22.7	7.3	23.8
2002	35	231	174	226	0.5	10.2	1.7	6.6
2007	382	290	338	264	24.3	15.2	4.9	6.0
2012	275	362	343	293	3.5	19.3	6.4	5.8
2017	444	348	265	306	34.3	23.8	6.5	12.3
2022	226	415	392	305	8.4	34.0	28.1	18.8

Table 16A-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.3	0.5	55.0	1.7	1.9	60.8
2002	64.3	-	7.3	10.5	5.8	18.3
2007	18.8	0.0	24.7	1.5	2.1	62.3
2012	22.6	0.0	25.5	1.6	2.6	54.1
2017	8.1	-	55.9	2.2	2.4	71.8
2022	16.8	-	30.2	1.5	2.7	69.9

Table 16A-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	6	7	4	-
2002	-	3	1	-
2007	3	6	9	-
2012	4	3	4	-
2017	4	4	4	1
2022	2	6	12	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	0.7 (1.8)	6.7 (16.6)	2.7 (6.6)	-
2007	29.0 (71.7)	0.7 (1.7)	23.4 (57.9)	-
2012	8.7 (21.5)	8.7 (21.5)	6.0 (14.9)	-
2017	46.5 (114.8)	3.4 (8.3)	8.7 (21.5)	-
2022	8.0 (19.7)	1.3 (3.3)	20.8 (51.3)	-

Table 16A-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
1997	1	5	6	2	-	148	-	5	84	-	-	200	182	-	86
2002	-	5	-	-	-	35	4	2	56	-	7	25	165	7	31
2007	-	1	-	-	1	382	-	10	44	21	3	38	215	-	60
2012	-	-	-	-	5	273	4	15	20	61	5	28	299	0	108
2017	-	2	-	5	5	444	4	17	79	163	16	34	186	2	98
2022	-	-	-	-	3	223	3	15	62	296	5	14	187	7	130
year	Average Cover (%)														
1997	0.0	0.0	0.0	0.1	-	2.5	-	1.0	2.0	-	-	8.1	8.4	-	3.0
2002	-	0.0	-	-	-	0.5	0.0	0.1	1.7	-	0.0	0.3	5.6	1.4	0.9
2007	-	0.0	-	-	0.0	24.3	-	1.2	0.4	0.5	0.0	0.7	8.9	-	3.4
2012	-	-	-	-	0.0	3.5	0.0	0.9	0.1	1.3	0.1	0.1	12.6	0.0	4.1
2017	-	0.4	-	0.0	0.2	34.1	0.1	0.6	1.2	8.8	0.4	0.9	6.7	0.0	4.6
2022	-	-	-	-	0.0	8.4	0.1	2.7	2.4	15.1	0.1	0.3	6.7	0.2	6.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium campanulatum (dusky onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlepod false flax)	Capsella bursa-pastoris ^{ai} (shepherd's purse)	Cardaria draba ^{ai} (whitetop)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium album ^a (lambsquarters)
year	Nested Frequency																
1997	19	71	64	7	-	-	3	53	-	-	8	6	38	-	-	33	3
2002	2	63	10	26	4	-	-	13	-	1	12	7	-	-	-	23	-
2007	-	59	2	120	-	-	7	-	-	-	5	2	63	-	-	42	-
2012	-	70	-	195	3	3	10	6	-	-	10	-	56	-	-	51	-
2017	-	90	31	103	-	-	12	8	22	5	11	-	2	-	4	20	-
2022	-	77	13	185	-	-	11	10	34	-	6	1	-	0	13	42	-
year	Average Cover (%)																
1997	0.9	0.8	0.3	0.0	-	-	0.1	1.8	-	-	0.7	0.0	0.1	-	-	0.1	0.0
2002	0.0	0.4	0.1	0.2	0.0	-	-	0.2	-	0.0	1.2	0.0	-	-	-	0.1	-
2007	-	0.4	0.0	1.0	-	-	0.8	-	-	-	0.2	0.0	0.2	-	-	0.3	-
2012	-	0.6	-	2.0	0.0	0.0	0.3	0.2	-	-	0.6	-	0.3	-	-	0.3	-
2017	-	0.8	0.1	0.6	-	-	0.5	0.2	0.3	0.0	2.0	-	0.0	-	0.1	0.1	-
2022	-	1.3	0.1	4.3	-	-	0.5	0.3	1.3	-	1.5	0.0	-	0.0	0.9	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus longipes (longstalk springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Dracocephalum parviflorum (American dragonhead)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erigeron racemosus (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
1997	14	298	124	-	62	8	13	5	10	-	16	-	3	-	81	0	20
2002	-	134	-	-	55	-	-	1	15	-	-	-	5	-	5	6	1
2007	-	53	3	-	38	-	13	-	35	-	8	-	1	-	23	-	29
2012	11	91	9	2	49	-	5	-	35	-	12	-	9	-	83	-	62
2017	6	50	7	-	80	-	-	-	2	-	-	-	-	42	85	-	32
2022	12	155	-	1	83	6	-	-	7	22	-	3	2	60	22	-	22
year	Average Cover (%)																
1997	0.1	4.0	0.7	-	0.8	0.0	0.2	0.0	0.1	-	0.1	-	0.0	-	2.1	0.0	0.4
2002	-	0.6	-	-	1.9	-	-	0.0	0.2	-	-	-	0.0	-	0.1	0.0	0.3
2007	-	0.1	0.0	-	0.8	-	0.1	-	0.1	-	0.0	-	0.0	-	0.3	-	0.1
2012	0.1	0.9	0.2	0.0	0.4	-	0.1	-	0.2	-	0.1	-	0.0	-	1.0	-	0.4
2017	0.4	0.3	0.0	-	1.2	-	-	-	0.0	-	-	-	-	1.7	2.3	-	0.4
2022	0.6	1.4	-	0.0	2.5	0.0	-	-	0.1	0.7	-	0.0	0.0	2.7	1.1	-	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis ^a (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tetaneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency																
1997	-	198	11	4	-	-	-	18	18	39	-	-	83	49	2	16	20
2002	-	178	1	4	-	23	-	1	6	-	4	-	1	7	-	-	-
2007	66	163	1	9	-	175	1	19	1	4	-	116	76	-	-	24	-
2012	46	196	-	13	-	31	1	2	14	2	31	18	40	1	-	100	-
2017	82	12	2	7	4	7	-	6	8	1	4	84	46	24	-	45	-
2022	252	-	-	5	11	5	-	5	-	2	3	204	28	21	-	20	4
year	Average Cover (%)																
1997	-	9.1	0.5	0.1	-	-	-	0.1	0.1	1.1	-	-	1.9	0.4	0.3	0.1	0.3
2002	-	2.2	0.0	0.2	-	0.3	-	0.0	0.0	-	0.0	-	0.0	0.0	-	-	-
2007	0.3	1.6	0.0	0.2	-	1.2	0.0	0.1	0.0	0.1	-	1.0	1.6	-	-	0.3	-
2012	0.4	1.5	-	0.3	-	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.0	-	0.7	-
2017	0.4	0.0	0.0	1.0	0.1	0.0	-	0.0	0.0	0.0	0.0	1.9	1.1	0.3	-	0.6	-
2022	7.6	-	-	0.4	0.3	0.0	-	0.1	-	0.0	0.0	10.5	1.2	0.5	-	0.3	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES		
	Vicia americana (American vetch)	
		Viola (violet)
year	Nested Frequency	
1997	120	-
2002	6	-
2007	3	-
2012	-	-
2017	151	-
2022	205	2
year	Average Cover (%)	
1997	3.7	-
2002	0.2	-
2007	0.1	-
2012	-	-
2017	2.3	-
2022	6.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Amelanchier utahensis ^p (Utah serviceberry)							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)							
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)							
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Opuntia polyacantha (plains pricklypear)							
Quercus gambelii ^p (Gambel oak)							
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	-	0.4	-	-	-	-
2007	-	-	12.4	0	-	-	-
2012	-	-	9.2	-	-	-	0.3
2017	-	-	12.9	-	0.4	0	0.2
2022	-	-	9.6	-	0.6	-	0.4
year	Quadrat Cover (%)						
1997	0.0	6.9	8.7	0.1	0.0	0.1	0.6
2002	-	-	0.4	0.0	-	-	-
2007	-	-	8.1	0.1	-	-	0.1
2012	-	-	7.3	0.0	-	-	0.0
2017	-	-	7.5	-	0.3	0.0	0.1
2022	-	-	5.3	-	0.3	-	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	20	-	0	100	0	0	100	0	74/110
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1480	20	19	78	3	1	0	0	89/115
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	41/47
2012	-	-	-	-	-	-	-	-	63/93
2017	-	-	-	-	-	-	-	-	59/82
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	3540	-	1	98	2	0	0	2	43/59
2002	720	-	61	39	0	0	0	3	15/19
2007	2800	-	1	98	1	1	0	0	41/61
2012	2560	20	9	86	6	1	0	48	44/76
2017	2700	40	18	80	2	0	0	0	42/70
2022	2240	-	12	87	2	9	0	2	-/-
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	0	0	95/103
2002	20	-	0	100	0	0	0	0	22/21
2007	20	-	0	100	0	100	0	0	78/140
2012	40	-	100	0	0	0	0	50	80/145
2017	20	-	100	0	0	0	0	0	62/64
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	180	-	44	56	0	0	0	0	28/49
2022	760	140	79	21	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	80	-	0	100	0	0	0	0	12/31
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	13/20
2012	-	-	-	-	-	-	-	-	21/37
2017	20	-	0	100	0	0	0	0	19/78
2022	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^P -- (Gambel oak)									
1997	60	-	0	100	0	0	0	0	53/31
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	70/43
2012	20	-	0	100	0	0	0	0	117/104
2017	40	-	0	100	0	0	0	0	131/78
2022	60	-	0	100	0	0	0	0	-/-

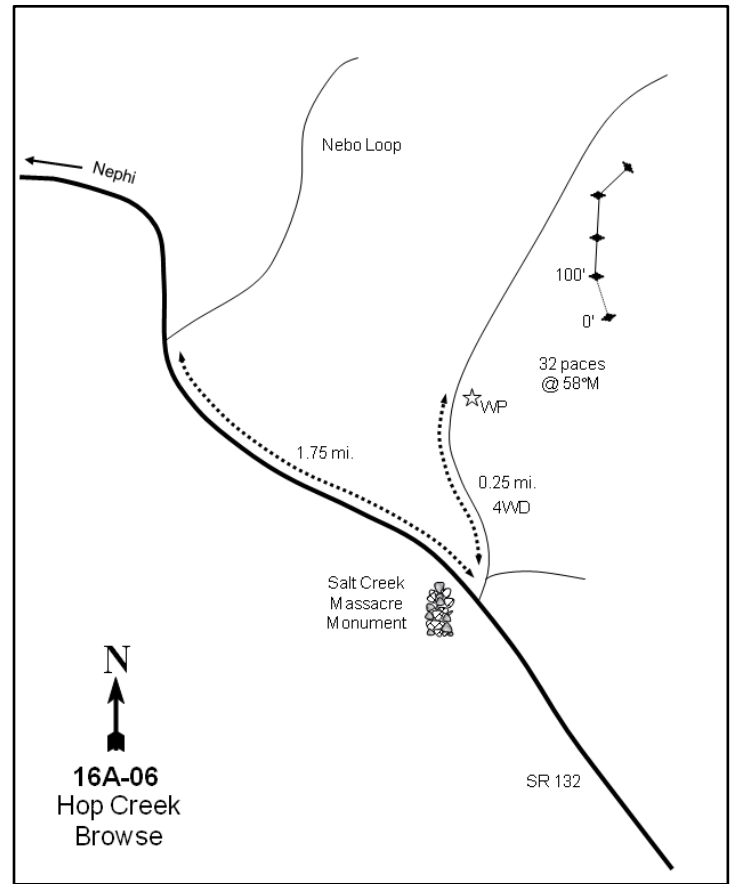
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	54/104

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-05.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	9.3	14.2	8.6	30.0	-1.9	10.0	-2.0	68.2	Fair-Good
2002	0.0	0.0	0.0	20.4	-0.4	10.0	0.0	29.9	Very Poor
2007	0.0	0.0	0.0	29.4	-18.2	10.0	-2.0	19.1	Very Poor
2012	0.3	0.0	0.0	30.0	-2.6	10.0	-2.0	35.7	Very Poor
2017	0.2	0.0	0.0	30.0	-20.0	10.0	-2.0	18.2	Very Poor
2022	0.4	0.0	0.0	30.0	-6.3	10.0	-2.0	32.1	Very Poor

HOP CREEK BROWSE - STUDY NO. 16A-6



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Fountain Green North; Township 13S, Range 2E, Section 09
NAD 83 UTM ZONE 12, 439487 East 4395491 North

Transect Information

Browse Tag # (0' Stake)	3959
Transect Bearing	163° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Highway 132 and Nebo Loop Road, proceed south on Highway 132 for 1.75 miles. Just past the Salt Creek Massacre Monument, stop at a turnoff on the north side of the road. Drive up the left fork of a four-wheel drive road (four low may be useful) for 0.25 miles to a witness post on the right (east) side of the road. From the witness post, walk 32 paces at 58 degrees magnetic to the 0-foot stake.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	South
Slope	5%
Sample Dates	05/28/1997, 10/25/2002, 05/24/2007, 05/16/2012, 05/18/2017, 05/10/2022

Table 16A-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	Salt Creek Wildfire Rehabilitation	970	December 2007	302
Fire - Wildfire	Salt Creek	-	July-August 2007	25913
Chaining - One-Way Smooth	Salt Creek Wildfire Rehabilitation	970	December 2007	302
Seeding - Aerial Before	Salt Creek Wildfire Rehabilitation	970	November 2007	1197

Table 16A-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Aerial			Aerial	Nov 2007	1150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.00	0.91
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.00	0.76
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Nordan	1.00	0.86
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	1.00	0.84
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.50	0.47
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.61	0.54
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.39	0.34
G	<i>Thinopyrum intermedium</i>	Intermediate Wheatgrass	Oahe	1.00	0.92
G	<i>Thinopyrum intermedium</i>	Pubescent Wheatgrass		2.00	1.82
F	<i>Achillea millefolium</i>	Western Yarrow		0.10	0.10
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.00	0.99
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.00	0.93
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.25	0.20
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.00	1.84
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.00	0.94
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.25	0.09
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.25	0.08

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Dribbler			Dribbler	Dec 2007	335
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.45	0.42
S	<i>Purshia tridentata</i>	Bitterbrush	Millard UT	0.45	0.39

Wildlife Habitat and Vegetation History**Table 16A-06.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Perennial Grass	No Encroachment
2017	Perennial-Annual Grass	No Encroachment
2022	Perennial Grass	No Encroachment

Site Notes

Due to the phenotype of *Poa secunda*, it may be difficult to distinguish between *P. secunda* and *P. pratensis*.

Soils**Table 16A-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.9	42.4	27.1	30.6	3.2	9.6	67.2	0.6	05/29/1997

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2007 sample year, this study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with other preferred browse such as Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) present to a lesser extent (Photos, Table 16A-06.12, Table 16A-06.13). Soon after the 2007 sampling a fire removed most of the shrubs (Table 16A-06.1), and the site transitioned into one dominated by perennial grasses including bluebunch wheatgrass (*Pseudoroegneria spicata*) and western wheatgrass (*Pascopyrum smithii*). The introduced perennial species bulbous bluegrass (*Poa bulbosa*) has been observed in increasing amounts since 2007. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been sampled since 1997, and was a co-dominant site component in 2017, but decreased in abundance in 2022 (Table 16A-06.10). Forbs have remained diverse and were abundant in 2022. Most of the overall forb cover was provided by annual species in the most recent sampling, but the native perennial species tapertip hawkbeard (*Crepis acuminata*) contributed the most cover of any single species (Table 16A-06.7, Table 16A-06.11).

Trend Summary Tables

Table 16A-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	12.2	0.3	0.8	-	-	-
2002	12.7	2.1	0.8	-	-	-
2007	11.6	0.3	0.8	16.1	1.0	3.9
2012	0.0	0.5	-	0.3	1.5	-
2017	0.2	1.0	-	0.9	1.6	-
2022	1.0	2.6	-	1.8	1.5	-

Table 16A-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	71	441	310	252	0.7	19.6	2.9	5.2
2002	93	379	313	207	0.8	16.7	4.4	4.1
2007	256	394	397	258	6.5	25.7	8.0	6.6
2012	98	404	274	258	1.0	23.5	1.8	6.7
2017	296	420	458	236	12.6	23.5	22.1	6.5
2022	311	414	419	291	4.0	38.2	10.9	10.1

Table 16A-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.6	4.6	51.0	1.9	0.2	43.6
2002	17.7	2.6	51.5	1.2	0.1	43.2
2007	14.5	3.0	41.3	1.3	0.1	57.4
2012	18.0	0.0	56.5	1.4	0.2	39.0
2017	11.4	0.5	51.4	3.6	0.2	61.1
2022	19.4	0.3	40.5	1.3	0.8	57.4

Table 16A-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	34	24	-	4
2002	1	43	17	-	18
2007	-	64	19	-	44
2012	1	2	4	-	1
2017	1	11	12	-	8
2022	-	23	16	-	11
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	2.2 (5.4)	146.1 (360.9)	22.8 (56.3)	-	-
2007	8.7 (21.5)	147.4 (364.2)	23.4 (57.9)	-	-
2012	-	2.0 (5.0)	4.7 (11.6)	0.6 (1.4)	-
2017	-	5.3 (13.2)	14.7 (36.4)	-	-
2022	-	31.5 (77.8)	36.8 (91.0)	0.6 (1.4)	-

Table 16A-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex obtusata (obtuse sedge)	Dactylis glomerata ⁱ (orchardgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency															
1997	-	-	-	71	-	-	1	41	10	138	-	78	207	95	195	-
2002	3	-	-	93	-	-	3	44	37	140	-	30	91	130	191	-
2007	2	-	-	256	-	-	-	20	3	157	3	38	68	205	184	-
2012	2	28	-	98	-	1	-	22	-	237	1	29	52	133	168	33
2017	6	53	-	296	-	-	-	37	3	304	33	34	15	142	50	73
2022	21	142	4	311	2	-	-	18	-	234	44	24	-	208	55	81
year	Average Cover (%)															
1997	-	-	-	0.7	-	-	0.0	1.0	0.2	1.6	-	1.6	7.6	2.5	5.0	-
2002	0.1	-	-	0.8	-	-	0.0	1.2	1.2	3.1	-	0.9	2.2	2.8	5.0	-
2007	0.1	-	-	6.5	-	-	-	0.3	0.1	2.4	0.0	0.6	2.2	7.7	12.2	-
2012	0.0	0.7	-	1.0	-	0.0	-	0.4	-	3.8	0.0	0.7	0.9	2.8	13.1	1.0
2017	0.4	1.9	-	12.6	-	-	-	1.6	0.0	10.5	0.9	0.4	0.2	2.8	2.9	1.9
2022	1.3	9.8	0.4	4.0	0.0	-	-	1.1	-	4.4	1.8	1.0	-	9.8	4.1	4.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus cibarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album ^a (lambsquarters)	Chorispora tenella ^{ai} (crossflower)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)
year	Nested Frequency																
1997	23	0	-	138	5	1	1	9	10	8	33	84	2	-	-	19	195
2002	36	1	-	187	7	-	2	8	38	-	8	54	-	3	2	16	216
2007	36	-	-	359	7	-	-	36	16	7	9	103	-	-	-	14	131
2012	54	-	-	194	-	3	1	6	3	-	-	21	-	-	8	32	19
2017	120	-	-	455	-	-	1	18	17	4	-	-	-	-	-	8	5
2022	75	-	186	317	-	-	-	12	96	-	-	41	-	-	-	3	42
year	Average Cover (%)																
1997	0.1	0.0	-	0.5	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.5	0.0	-	-	0.2	1.3
2002	0.4	0.0	-	0.8	0.0	-	0.0	0.0	0.1	-	0.1	0.5	-	0.0	0.1	0.3	2.2
2007	0.2	-	-	4.5	0.2	-	-	0.5	0.0	0.0	0.1	0.9	-	-	-	0.3	0.4
2012	0.5	-	-	1.1	-	0.0	0.0	0.0	0.0	-	-	0.1	-	-	0.2	0.2	0.0
2017	1.6	-	-	18.9	-	-	0.0	0.3	0.1	0.6	-	-	-	-	-	0.3	0.0
2022	0.6	-	3.1	5.5	-	-	-	0.1	0.3	-	-	0.3	-	-	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Erysimum (wallflower)	Galium ⁿ (bedstraw)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
1997	47	94	45	-	53	3	3	40	1	3	-	1	-	3	-	98	2
2002	27	32	69	-	44	6	-	25	5	3	-	-	1	-	2	23	1
2007	7	89	111	-	48	6	82	28	1	3	-	-	-	5	-	65	2
2012	5	29	197	1	46	11	1	12	2	-	-	-	-	5	9	1	8
2017	-	14	117	-	31	-	-	-	3	-	13	-	-	31	-	14	3
2022	-	24	207	-	35	-	-	-	4	-	38	-	-	-	-	17	-
year	Average Cover (%)																
1997	0.1	0.9	0.5	-	0.4	0.0	0.0	0.1	0.0	0.1	-	0.0	-	0.0	-	0.6	0.4
2002	0.1	0.2	1.3	-	0.5	0.0	-	0.1	0.1	0.0	-	-	0.0	-	0.0	0.1	0.0
2007	0.0	0.7	1.6	-	0.5	0.0	1.4	0.1	0.0	0.1	-	-	-	0.0	-	0.7	0.1
2012	0.0	0.2	4.3	0.0	0.5	0.0	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	0.0
2017	-	0.1	1.9	-	0.2	-	-	-	0.0	-	0.3	-	-	0.2	-	0.1	0.0
2022	-	0.1	6.6	-	0.8	-	-	-	0.0	-	0.8	-	-	-	-	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1997	-	9	41	3	-	3	29	17	24
2002	1	42	28	4	-	1	31	15	35
2007	-	45	51	4	-	-	39	13	35
2012	-	1	27	27	1	10	26	16	34
2017	-	-	-	-	21	4	27	53	32
2022	-	-	3	-	-	5	12	55	50
year	Average Cover (%)								
1997	-	0.0	0.1	0.0	-	0.0	1.2	0.1	0.2
2002	0.0	0.1	0.2	0.0	-	0.0	0.9	0.1	0.3
2007	-	0.1	0.3	0.0	-	-	1.1	0.3	0.3
2012	-	0.0	0.2	0.1	0.0	0.0	0.3	0.0	0.4
2017	-	-	-	-	0.9	0.0	0.3	0.8	1.9
2022	-	-	0.0	-	-	0.0	0.5	0.9	0.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2007	0.2	13.6	0.6	0.3	3.9	2.3	0.1
2012	-	-	-	-	-	0.3	1.5
2017	-	0.3	0.2	0.2	-	0.6	1.2
2022	-	0.8	0.1	0.3	-	1	1.1
year	Quadrat Cover (%)						
1997	0.2	9.1	0.2	0.1	0.8	3.0	0.0
2002	0.4	9.9	0.3	1.2	0.8	2.5	0.5
2007	0.5	9.1	0.1	0.1	0.8	2.0	0.2
2012	0.0	-	0.2	-	-	0.0	0.3
2017	0.0	0.0	0.1	0.3	-	0.2	0.6
2022	0.0	0.6	0.7	0.9	-	0.3	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	100	-	20	60	20	80	0	20	72/74
2002	60	-	0	100	0	33	33	0	82/81
2007	60	-	33	67	0	0	67	0	105/103
2012	20	-	100	0	0	0	100	100	39/50
2017	20	-	0	100	0	0	100	0	32/28
2022	40	-	50	50	0	0	0	50	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2300	40	33	55	12	29	4	9	83/114
2002	3120	20	33	36	31	27	5	15	77/100
2007	2260	200	3	64	34	27	9	22	77/95
2012	20	-	100	0	0	0	100	0	36/39
2017	20	-	0	100	0	100	0	0	41/57
2022	20	-	0	100	0	0	100	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	300	-	0	100	0	0	0	0	34/57
2002	740	-	14	76	11	0	3	8	29/44
2007	640	-	25	66	9	13	9	6	34/48
2012	280	-	7	93	0	7	0	7	33/50
2017	380	20	11	90	0	0	0	0	35/70
2022	400	-	20	55	25	15	0	25	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	32/45
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	840	20	36	60	5	0	0	5	15/16
2002	1780	-	6	81	14	0	0	6	15/36
2007	480	-	13	79	8	4	0	33	21/26
2012	40	-	0	100	0	0	0	0	15/25
2017	120	-	0	100	0	0	0	0	16/32
2022	1640	140	39	60	1	0	0	2	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
1997	540	40	4	89	7	15	70	11	98/141
2002	480	-	8	63	29	4	63	4	104/121
2007	520	20	8	50	42	15	85	23	115/129
2012	40	20	0	100	0	50	50	0	36/91
2017	60	-	0	100	0	0	100	0	38/109
2022	60	-	0	100	0	0	100	33	-/-
Quercus gambelii^P -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	100/168
2017	-	-	-	-	-	-	-	-	60/45
2022	-	-	-	-	-	-	-	-	-/-
Rosa woodsii^P -- (Woods' rose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	38/15
2017	-	-	-	-	-	-	-	-	33/31
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^P -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	40/60
2012	-	-	-	-	-	-	-	-	19/15
2017	-	-	-	-	-	-	-	-	29/39
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1997	80	-	0	100	0	0	0	0	35/29
2002	260	-	15	85	0	0	8	8	28/41
2007	220	-	0	91	9	27	9	9	27/42
2012	400	60	5	95	0	0	0	0	26/40
2017	280	-	0	100	0	0	0	0	32/68
2022	280	-	0	100	0	14	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

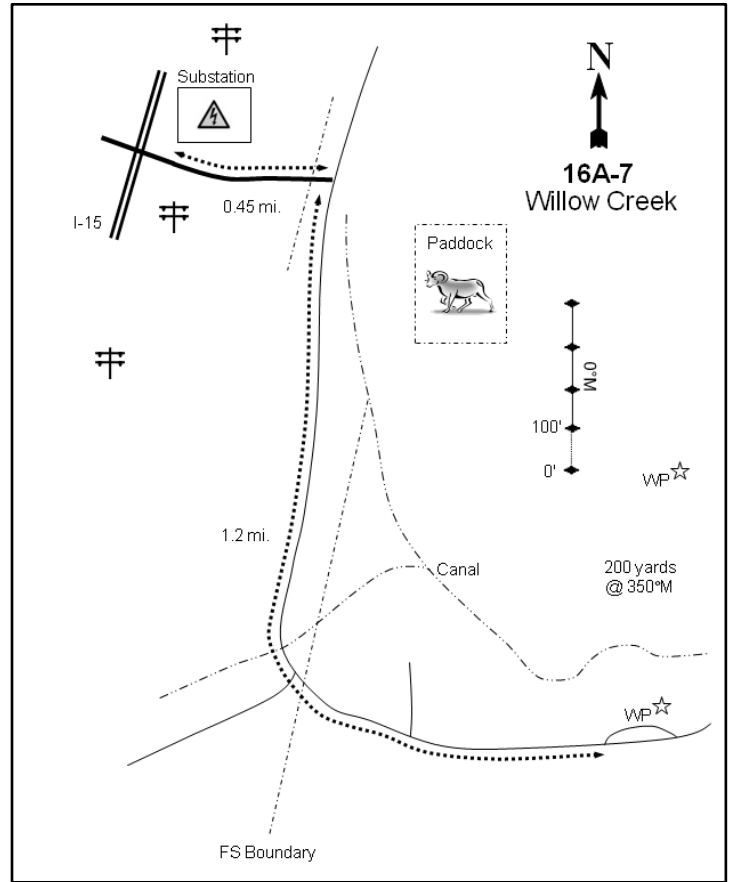
Table 16A-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	22	-	-	-	-	-	25.2
2007	57	-	11	11	-	78	19.8

Table 16A-06.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	16.0	11.7	12.9	30.0	-0.5	10.0	0.0	80.0	Good
2002	16.6	6.0	13.5	30.0	-0.6	8.2	0.0	73.7	Good
2007	20.8	4.7	1.9	30.0	-4.9	10.0	0.0	62.4	Fair
2012	0.5	0.0	0.0	30.0	-0.7	10.0	0.0	39.7	Very Poor-Poor
2017	1.3	0.0	0.0	30.0	-9.4	10.0	0.0	31.9	Very Poor
2022	2.5	0.0	0.0	30.0	-3.0	10.0	0.0	39.5	Very Poor-Poor

WILLOW CREEK - STUDY NO. 16A-7



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mona SW; Township 12S, Range 1E, Section 37
NAD 83 UTM ZONE 12, 430381 East 4405594 North

Transect Information

Browse Tag # (0' Stake)	3958
Transect Bearing	0° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

Beginning at the east side of the underpass where Cemetery Road passes over I-15 southeast of Mona, proceed east for 0.45 miles to an intersection. Take the right fork and proceed for 1.2 miles on the main road to a pullout. From this point, walk 200 yards at 350 degrees magnetic to the witness post (you will need to cross the irrigation canal). The 0-foot baseline stake is 3 paces west of the witness post: it is a green fencepost with a red browse tag #3958 attached. The baseline runs at an azimuth of 0 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,850ft (1,783m)
Aspect	South
Slope	40%
Sample Dates	05/19/1997, 05/20/2002, 05/16/2007, 05/22/2012, 05/23/2017, 05/24/2022

Wildlife Habitat and Vegetation History**Table 16A-07.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long
Mountain Goat	unknown	unknown

Table 16A-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Cliffrose	No Encroachment
1989	Cliffrose	No Encroachment
1997	Cliffrose/Annual Grass	No Encroachment
2002	Cliffrose/Annual Grass	No Encroachment
2007	Cliffrose/Annual Grass	No Encroachment
2012	Cliffrose/Annual Grass	No Encroachment
2017	Cliffrose/Annual Grass	No Encroachment
2022	Cliffrose/Annual Grass	No Encroachment

Site Notes

No Notes

Soils**Table 16A-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.0	58.3	25.1	16.6	1.8	6.4	38.4	0.6	05/19/1997

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983, with other preferred species including (but not limited to) mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and fourwing saltbush (*Atriplex canescens*) present as minor components (Photos, Table 16A-07.12, Table 16A-07.13). The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed each sample year since 1997 in the herbaceous understory as a co-dominant site component (Table 16A-07.7, Table 16A-07.10). Forbs are diverse, but were relatively rare every sample year except 2017, in which the introduced and weedy annual species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) provided the most forb cover (Table 16A-07.11). Unless a major disturbance occurs, this site is expected to remain in a similar state in future sample years.

Trend Summary Tables

Table 16A-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	15.8	0.4	-	-	-	-
2002	16.3	1.2	-	-	-	-
2007	11.2	0.2	-	25.3	0.1	-
2012	14.4	0.9	-	22.0	2.3	-
2017	10.7	0.1	-	12.5	0.3	-
2022	8.6	0.5	-	18.0	0.5	-

Table 16A-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	438	180	361	72	17.3	5.5	3.3	1.7
2002	421	193	262	57	14.8	7.2	2.5	1.2
2007	406	227	287	48	15.6	11.7	5.3	1.0
2012	395	203	272	60	18.3	11.5	1.3	1.5
2017	364	233	393	80	18.4	12.3	10.7	2.0
2022	408	213	276	41	18.5	13.2	5.9	1.0

Table 16A-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	12.0	0.1	40.0	15.5	7.4	40.3
2002	17.9	-	36.6	16.6	7.7	39.9
2007	11.7	0.1	34.8	17.1	9.3	40.9
2012	7.0	0.1	47.1	14.1	4.8	48.3
2017	18.5	0.0	32.1	26.0	8.0	45.5
2022	13.6	1.1	33.3	24.5	12.0	43.1

Table 16A-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	11	32	-
2002	30	19	-
2007	35	6	2
2012	27	3	5
2017	17	5	6
2022	27	2	13
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	87.8 (216.8)	39.6 (97.7)	-
2007	122.0 (301.3)	13.4 (33.1)	-
2012	67.0 (165.5)	2.0 (5.0)	-
2017	83.1 (205.3)	16.8 (41.4)	-
2022	81.7 (201.9)	4.0 (9.9)	-

Table 16A-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Aristida purpurea (purple threeawn)	-	-	435	36	30	147	7
Bromus arvensis ^{ai} (field brome)	-	20	412	68	17	131	-
Bromus tectorum ^{ai} (cheatgrass)	-	-	404	100	17	152	5
Poa bulbosa ⁱ (bulbous bluegrass)	-	-	395	55	34	157	5
Poa secunda (Sandberg bluegrass)	-	-	364	152	11	128	-
Pseudoroegneria spicata (bluebunch wheatgrass)	1	8	408	101	20	130	1
Vulpia myuros ^{ai} (annual fescue)							
year	Average Cover (%)						
1997	-	-	17.3	1.2	0.1	4.2	0.0
2002	-	0.4	14.4	1.5	0.1	5.5	-
2007	-	-	15.6	4.3	0.3	7.2	0.0
2012	-	-	18.2	1.3	0.6	9.6	0.0
2017	-	-	18.4	5.5	0.1	6.8	-
2022	0.0	0.2	18.3	5.3	0.3	7.5	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	352	6	-	-	11	3	14	-	8	-	8	-	36	9	-	7
Alyssum desertorum ^{ai} (desert madwort)	1	244	3	6	-	0	-	19	-	2	-	-	-	101	-	-	-
Artemisia ludoviciana (white sagebrush)	-	249	-	-	3	2	-	20	-	8	5	-	1	157	1	-	-
Asclepias (milkweed)	3	255	-	-	-	2	1	15	-	-	-	-	-	26	9	-	-
Astragalus cibirius (browse milkvetch)	-	333	11	-	1	4	3	1	0	32	3	1	-	206	32	2	-
Astragalus utahensis (Utah milkvetch)	-	82	-	6	-	-	-	16	-	20	20	-	-	229	5	1	-
Camelina microcarpa ^{ai} (littledrop false flax)																	
Chaetopappa ericoides (rose heath)																	
Cryptantha (cryptantha)																	
Descurainia incana ^a (mountain tansymustard)																	
Draba ^a (draba)																	
Eriogonum brevicaulle (shortstem buckwheat)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Galium aparine ^a (stickywilly)																	
Gilia inconspicua ^a (shy gilia)																	
Hackelia patens (spotted stickseed)																	
year	Average Cover (%)																
1997	-	3.1	0.1	-	-	0.2	0.0	0.3	-	0.0	-	0.1	-	0.2	0.0	-	0.0
2002	0.0	0.8	0.0	0.2	-	0.0	-	0.2	-	0.0	-	-	-	1.7	-	-	-
2007	-	2.5	-	-	0.0	0.0	-	0.4	-	0.1	0.0	-	0.0	2.7	0.0	-	-
2012	0.0	1.0	-	-	-	0.0	0.0	0.3	-	-	-	-	-	0.2	0.0	-	-
2017	-	4.0	0.1	-	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	-	4.9	1.1	0.0	-
2022	-	0.5	-	0.1	-	-	-	0.3	-	0.1	0.1	-	-	4.5	0.2	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lygodesmia grandiflora (largeflower skeletonplant)	Oenothera (evening primrose)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency											
1997	-	1	-	-	1	-	3	-	28	-	4	-
2002	3	2	1	-	-	1	3	-	34	-	-	-
2007	5	8	17	5	-	-	1	-	25	0	-	3
2012	5	3	11	-	-	-	3	-	47	-	-	4
2017	3	1	21	3	-	2	7	9	50	-	-	-
2022	11	-	33	-	-	-	-	3	27	-	-	1
year	Average Cover (%)											
1997	-	0.0	-	-	0.0	-	0.0	-	1.0	-	0.0	-
2002	0.0	0.0	0.0	-	-	0.0	0.1	-	0.6	-	-	-
2007	0.0	0.0	0.1	0.1	-	-	0.0	-	0.4	0.0	-	0.0
2012	0.0	0.0	0.0	-	-	-	0.0	-	1.2	-	-	0.0
2017	0.1	0.0	0.1	0.0	-	0.0	0.1	0.2	1.6	-	-	-
2022	0.0	-	0.5	-	-	-	-	0.0	0.7	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia stansburiana ^p (Stansbury cliffrose)	Rhus trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	0.9	1.4	0.1	23	-
2012	0.2	-	2.3	21.8	-
2017	0.1	-	0.3	12.4	-
2022	-	-	0.5	17.8	0.2
year	Quadrat Cover (%)				
1997	0.5	1.0	0.4	14.2	-
2002	0.9	0.5	1.2	14.9	-
2007	0.4	0.3	0.2	10.5	-
2012	0.2	-	0.9	14.2	-
2017	0.0	-	0.1	10.7	-
2022	-	-	0.5	8.6	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	40	-	0	100	0	50	0	0	70/127
2002	40	-	0	50	50	0	50	0	81/138
2007	40	-	0	50	50	0	50	50	79/140
2012	40	-	0	50	50	50	0	0	66/85
2017	60	-	0	67	33	33	33	33	63/93
2022	20	-	0	0	100	0	100	100	- / -
Atriplex canescens^P -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	150/118
2002	20	-	0	100	0	0	100	0	123/174
2007	-	-	-	-	-	-	-	-	197/166
2012	20	-	0	100	0	0	0	0	115/178
2017	20	-	0	100	0	100	0	0	138/142
2022	-	-	-	-	-	-	-	-	- / -
Brickellia californica -- (California brickellbush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	151/285
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Celtis laevigata var. reticulata -- (netleaf hackberry)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	195/300
2017	-	-	-	-	-	-	-	-	455/508
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	320	-	13	88	0	31	44	0	73/123
2002	60	-	0	0	100	67	0	33	61/95
2007	60	-	0	33	67	0	0	0	92/118
2012	-	-	-	-	-	-	-	-	79/121
2017	-	-	-	-	-	-	-	-	62/101
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1780	20	49	49	1	0	0	0	28/27
2002	520	-	4	50	46	0	0	39	18/27
2007	680	-	38	62	0	0	0	0	25/37
2012	700	120	17	83	0	0	0	0	34/60
2017	440	20	36	64	0	0	0	0	18/27
2022	200	20	0	90	10	0	0	10	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	580	20	0	97	3	7	93	0	143/174
2002	900	-	4	73	22	0	93	20	163/170
2007	600	-	10	70	20	7	90	10	172/179
2012	760	20	5	82	13	37	16	3	165/177
2017	840	260	2	50	48	29	57	41	156/176
2022	800	-	3	75	23	48	48	23	- / -

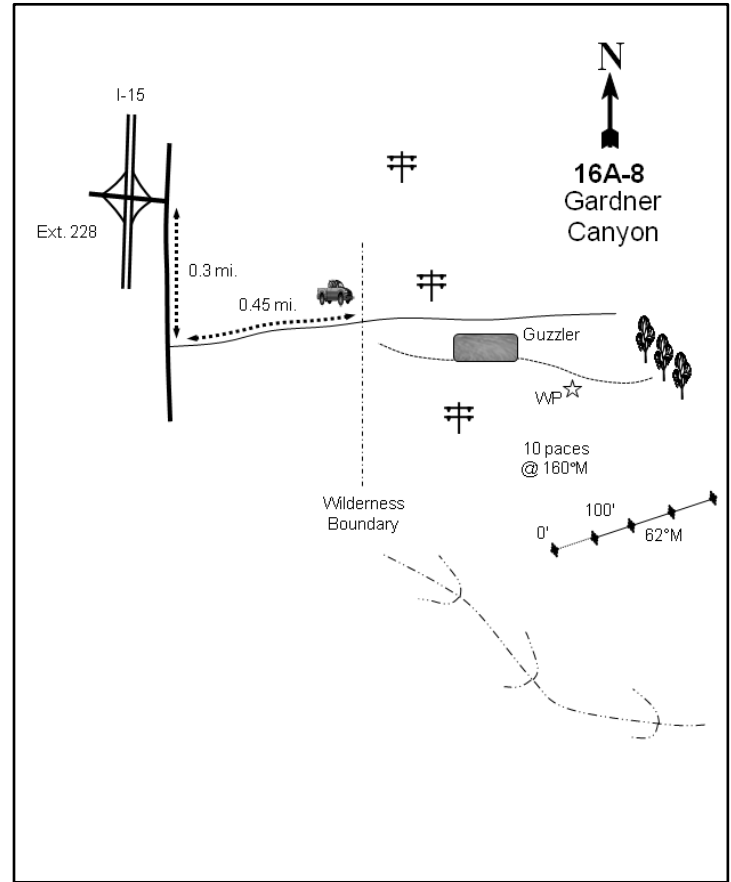
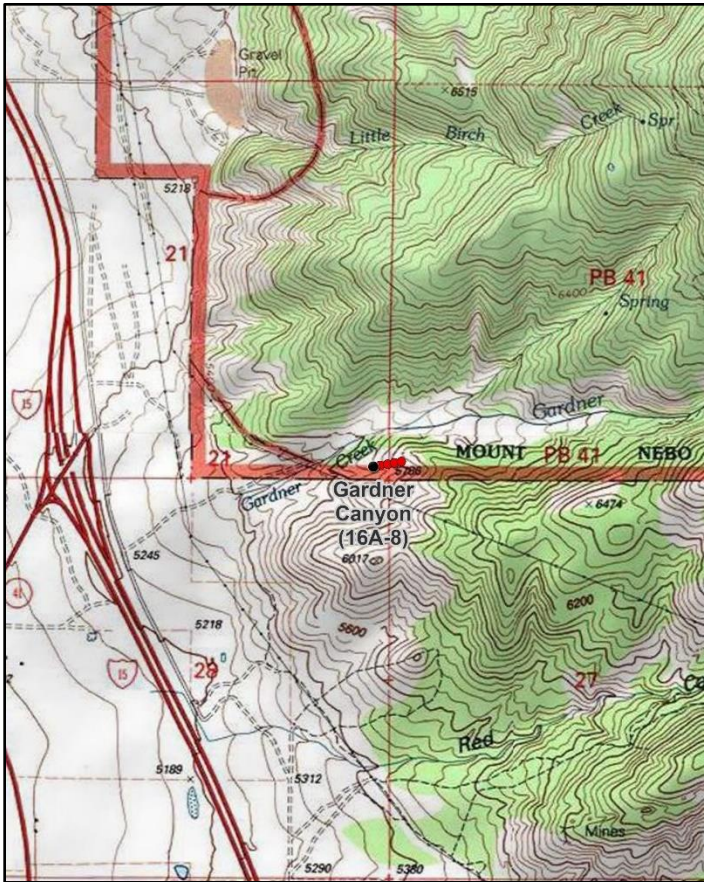
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	73/114
2002	-	-	-	-	-	-	-	-	182/146
2007	-	-	-	-	-	-	-	-	194/136
2012	-	-	-	-	-	-	-	-	248/313
2017	-	-	-	-	-	-	-	-	237/225
2022	-	-	-	-	-	-	-	-	-/-
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	136/291
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	283/543
2017	-	-	-	-	-	-	-	-	314/527
2022	-	-	-	-	-	-	-	-	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 01-02.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	23.3	14.1	0.4	8.6	-13.0	3.3	0.0	36.7	Very Poor-Poor
2002	24.1	7.1	2.0	11.3	-11.1	2.4	0.0	35.8	Very Poor-Poor
2007	30.0	7.9	4.5	14.9	-11.7	2.1	0.0	47.7	Poor
2012	30.0	10.9	2.6	20.3	-13.7	2.9	0.0	53.2	Fair
2017	18.7	0.8	1.2	13.6	-13.8	4.1	0.0	24.6	Very Poor
2022	26.9	8.2	1.2	15.8	-13.8	2.0	0.0	40.2	Poor

GARDNER CANYON - STUDY NO. 16A-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Nephi NW; Township 12S, Range 1E, Section 21
NAD 83 UTM ZONE 12, 429755 East 4400200 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3964
62° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From exit #228 on I-15, turn south on the frontage road on the east side of the freeway and drive 0.3 miles to an intersection with a gate. Turn left (west) at the intersection and drive 0.45 miles to the wilderness boundary fence. Walk up the old road under some powerlines. Perpendicular to the road and to the south is a steep slope with a Gambel oak and cliffrose community. Walk up the slope to a guzzler on the ridgetop. The witness post lies 75 yards up the ridge from the guzzler. From the witness post, the 0-foot stake is 10 paces at an azimuth of 160 degrees magnetic and has a red browse tag #3964 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	South
Slope	45%
Sample Dates	05/19/1997, 10/25/2002, 05/21/2007, 05/17/2012, 05/23/2017, 05/24/2022

Wildlife Habitat and Vegetation History**Table 16A-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush/Annual Grass	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush/Annual Grass	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment
2022	Mixed Mountain Brush/Annual Grass	No Encroachment

Site Notes

These foothills are heavily used by deer and elk, and carcasses were found in the area during the 1989, 2007, and 2012 readings.

Soils**Table 16A-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.0	38.7	40.7	20.6	1.6	4.4	57.6	0.5	05/19/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Mixed mountain brush species such as Stansbury cliffrose (*Purshia stansburiana*) and alderleaf mountain mahogany (*Cercocarpus montanus*) have dominated this site since the study began in 1983; density of cliffrose has decreased over time, while decadence has increased (Table 16A-08.12, Table 16A-08.13). The herbaceous understory has remained moderately diverse and abundant (Table 16A-08.7). Perennial grasses, particularly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced annual grass cheatgrass (*Bromus tectorum*) have been the most common herbaceous species throughout the duration of the study. Annual grasses were a co-dominant site component in 1997, 2007, and 2022 (Table 16A-08.10). Forbs have remained rare in comparison: the 2017 sample year is an exception to this, with just over 12% cover being contributed by the introduced annual species desert madwort (*Alyssum desertorum*) (Table 16A-08.11).

Trend Summary Tables

Table 16A-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	7.8	0.7	-	-	-	-
2002	9.6	2.5	-	-	-	-
2007	8.6	2.1	-	12.8	2.6	-
2012	8.1	3.6	-	13.5	4.9	-
2017	5.3	1.7	-	8.8	3.2	-
2022	6.3	1.2	-	10.1	1.9	-

Table 16A-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	425	258	438	116	11.3	7.6	5.6	0.9
2002	361	205	362	106	9.5	8.5	3.3	2.2
2007	390	206	387	141	11.9	9.3	5.9	1.5
2012	353	233	364	142	8.2	10.3	1.4	1.8
2017	242	243	444	148	6.2	9.3	15.0	2.4
2022	421	192	269	108	20.7	11.2	5.4	2.9

Table 16A-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.7	1.0	30.7	7.8	18.2	33.3
2002	26.2	0.8	30.4	5.3	17.9	33.1
2007	17.1	0.7	37.8	4.1	18.4	37.8
2012	19.4	0.1	40.0	4.3	16.3	34.5
2017	23.4	0.3	27.1	14.6	20.6	39.0
2022	21.2	0.1	32.8	12.0	22.7	44.3

Table 16A-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	21	20	5
2002	-	26	20	2
2007	-	51	15	11
2012	-	21	8	2
2017	-	19	17	17
2022	-	33	4	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	69.7 (172.1)	24.1 (59.6)	-
2007	-	101.2 (249.9)	19.4 (48.0)	-
2012	-	34.9 (86.1)	7.4 (18.2)	-
2017	-	42.9 (105.9)	18.1 (44.7)	-
2022	26.8 (66.3)	89.8 (221.8)	30.8 (76.1)	-

Table 16A-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency					
1997	-	424	1	-	258	4
2002	-	361	6	6	200	6
2007	3	390	16	0	195	9
2012	16	350	17	5	224	-
2017	-	242	30	17	219	-
2022	37	412	22	10	172	-
year	Average Cover (%)					
1997	-	11.3	0.0	-	7.6	0.0
2002	-	9.3	0.6	0.0	7.8	0.2
2007	0.0	11.8	0.5	0.0	8.8	0.1
2012	0.1	8.2	0.4	0.1	9.8	-
2017	-	6.2	0.6	0.1	8.6	-
2022	0.7	20.1	1.2	0.1	9.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Asclepias subverticillata (horsetail milkweed)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium undulatum ^a (wavyleaf thistle)	Descurainia incana ^a (mountain tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lygodesmia grandiflora (largeflower skeletonplant)	Malcolmia africana ^{ai} (African mustard)
year	Nested Frequency																
1997	438	-	7	-	17	-	6	-	13	2	-	5	-	-	-	5	-
2002	351	0	-	-	9	-	-	-	93	-	-	-	3	-	19	16	-
2007	378	-	3	-	20	2	-	1	128	-	-	-	-	-	44	11	-
2012	362	-	-	-	17	2	-	-	24	-	-	-	-	-	13	9	-
2017	440	3	7	12	16	3	10	-	108	5	4	5	-	3	40	11	-
2022	228	-	-	8	9	12	-	1	67	1	-	3	2	-	52	9	2
year	Average Cover (%)																
1997	5.5	-	0.0	-	0.3	-	0.0	-	0.1	0.0	-	0.0	-	-	-	0.0	-
2002	1.8	0.0	-	-	0.2	-	-	-	1.3	-	-	-	0.0	-	0.2	0.1	-
2007	3.9	-	0.0	-	0.1	0.0	-	0.0	1.6	-	-	-	-	-	0.5	0.1	-
2012	1.2	-	-	-	0.3	0.0	-	-	0.1	-	-	-	-	-	0.0	0.1	-
2017	12.1	0.1	0.0	0.1	0.2	0.0	0.1	-	2.4	0.0	0.0	0.0	-	0.0	0.2	0.1	-
2022	2.5	-	-	0.0	0.1	0.6	-	0.0	1.4	0.0	-	0.0	0.0	-	0.4	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Silene antirrhina ^a (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)
year	Nested Frequency					
1997	-	-	87	7	4	1
2002	-	-	87	-	-	-
2007	1	6	117	-	-	-
2012	6	6	118	-	4	-
2017	-	17	122	-	-	-
2022	1	9	93	-	-	-
year	Average Cover (%)					
1997	-	-	0.5	0.0	0.0	0.0
2002	-	-	1.8	-	-	-
2007	0.0	0.0	1.3	-	-	-
2012	0.0	0.0	1.4	-	0.0	-
2017	-	0.1	1.9	-	-	-
2022	0.0	0.3	2.8	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Peraphyllum ramosissimum ^p (wild crab apple)	Purshia stansburiana ^p (Stansbury cliffrose)	Rhus trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	-	7.4	0.9	-	1.7	-	5.4	-
2012	-	7	3.2	-	1.7	-	6.5	-
2017	-	5.8	1.9	-	1.3	-	3	-
2022	-	6.7	1.9	-	-	-	3.4	-
year	Quadrat Cover (%)							
1997	-	2.8	0.2	0.4	0.5	-	4.6	-
2002	-	3.3	0.5	0.3	2.1	-	5.3	0.8
2007	0.0	4.4	0.8	0.1	1.3	-	3.9	0.2
2012	-	4.9	2.0	0.1	1.6	-	3.0	0.0
2017	-	2.8	0.4	0.0	1.3	0.0	2.5	-
2022	0.1	3.7	1.0	-	0.2	-	2.5	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	53/93
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	135/198
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	40	-	0	0	100	100	0	100	62/97
2002	-	-	-	-	-	-	-	-	54/89
2007	-	20	0	0	0	0	0	0	58/68
2012	-	-	-	-	-	-	-	-	56/78
2017	-	-	-	-	-	-	-	-	58/72
2022	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	240	-	8	83	8	25	75	0	158/199
2002	300	-	0	67	33	27	67	27	167/187
2007	200	-	0	70	30	10	70	20	163/201
2012	300	-	7	53	40	40	20	7	143/184
2017	300	40	0	93	7	93	0	7	141/177
2022	340	60	6	77	18	35	53	12	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	440	-	0	91	9	0	0	5	35/62
2002	360	-	0	78	22	6	0	0	34/65
2007	420	-	0	100	0	29	0	0	36/72
2012	660	20	0	100	0	0	0	0	35/73
2017	120	-	0	100	0	0	0	0	42/88
2022	460	-	17	83	0	0	0	0	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	37/75
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	20	-	0	100	0	100	0	0	73/169
2002	20	-	0	0	100	0	0	100	63/129
2007	-	-	-	-	-	-	-	-	52/114
2012	-	-	-	-	-	-	-	-	56/119
2017	60	-	0	100	0	0	0	0	42/89
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1280	60	45	52	3	0	0	2	18/22
2002	2280	-	1	84	15	0	0	5	19/32
2007	2060	160	52	44	4	0	1	3	21/31
2012	600	-	0	100	0	3	0	0	27/37
2017	980	-	8	92	0	0	0	0	22/32
2022	300	20	27	73	0	0	0	0	- / -

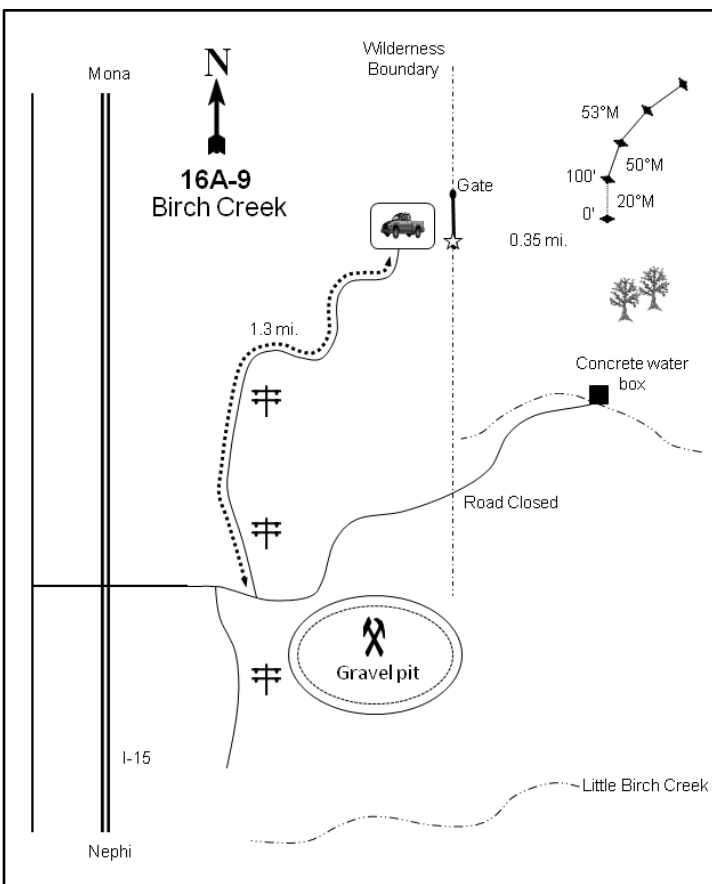
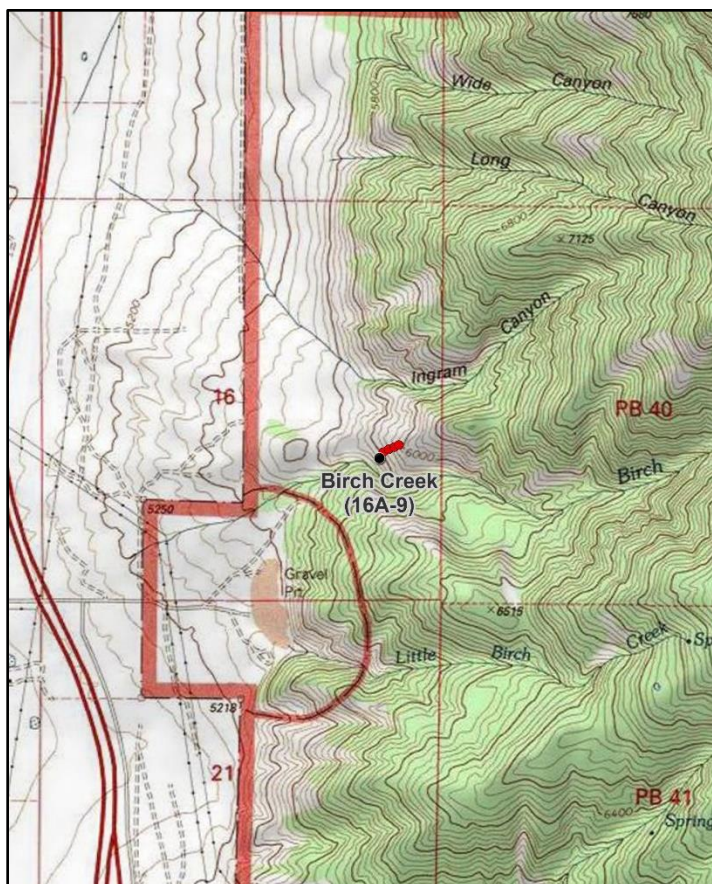
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Peraphyllum ramosissimum^p -- (wild crab apple)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	110/146
2017	-	-	-	-	-	-	-	-	134/141
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	600	-	10	67	23	3	80	7	118/125
2002	500	-	4	76	20	0	80	8	100/112
2007	440	-	0	68	32	0	96	23	125/126
2012	380	20	5	63	32	26	68	26	123/130
2017	320	-	0	63	38	6	94	38	137/120
2022	300	-	7	87	7	67	33	13	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	197/207
2002	-	-	-	-	-	-	-	-	78/60
2007	-	-	-	-	-	-	-	-	147/109
2012	-	-	-	-	-	-	-	-	180/149
2017	-	-	-	-	-	-	-	-	111/77
2022	-	-	-	-	-	-	-	-	-/-
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	146/477
2007	-	-	-	-	-	-	-	-	159/272
2012	-	-	-	-	-	-	-	-	191/403

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-08.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	11.5	9.9	4.4	15.3	-8.5	1.8	0.0	34.4	Very Poor-Poor
2002	14.0	6.2	1.1	15.7	-7.1	4.3	0.0	34.2	Very Poor-Poor
2007	19.2	5.8	0.0	17.5	-8.9	3.0	0.0	36.5	Very Poor-Poor
2012	20.3	4.2	3.0	19.8	-6.2	3.5	0.0	44.6	Poor
2017	13.2	9.8	0.0	17.3	-4.6	4.8	0.0	40.5	Poor
2022	15.2	10.8	3.1	19.9	-15.5	5.8	0.0	39.2	Poor

BIRCH CREEK - STUDY No. 16A-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mona SW; Township 12S, Range 1E, Section 16
NAD 83 UTM ZONE 12, 429593 East 4402339 North

Transect Information

Browse Tag # (0' Stake)	197
Transect Bearing	20° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

Beginning at the overpass where the road to Little Birch Canyon passes over I-15 (north of the northernmost Nephi exit), take the first left (north) just before the powerlines cross the road. Proceed about 1.3 miles east-northeast to a parking lot. From the wilderness boundary, walk east for about 0.35 miles to the 0-foot stake. The 0-foot baseline stake is near a small trail running parallel along the bench and is marked by browse tag #197.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,730ft (1,747m)
Aspect	Southwest
Slope	55%
Sample Dates	05/20/1997, 05/22/2002, 05/29/2007, 05/21/2012, 05/22/2017, 05/23/2022

Table 16A-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Birch	-	September 2001	2681

Wildlife Habitat and Vegetation History**Table 16A-09.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
1997	Mixed Mountain Brush	Phase I
2002	Annual Grass	No Encroachment
2007	Annual Grass/Mixed Mountain Brush	No Encroachment
2012	Annual Grass/Mixed Mountain Brush	No Encroachment
2017	Annual Grass/Mixed Mountain Brush	No Encroachment
2022	Annual Grass/Mixed Mountain Brush	No Encroachment

Site Notes

Water is available in Birch Creek approximately 150 yards (137m) downslope from the baseline.

Soils**Table 16A-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.1	54.4	30.0	15.6	3.1	9.7	80.0	0.7	05/20/1997

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This site was dominated by a diverse number of mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) from study establishment in 1983 through the 1997 sample year. A wildfire in 2001 removed much of the browse on this site, with the remaining shrubs being situated toward the end of the transect (Photos, Table 16A-09.1, Table 16A-09.12, Table 16A-09.13). The herbaceous understory has remained abundant and diverse, with the introduced annual grass species cheatgrass (*Bromus tectorum*) as a (co-)dominant site component since 2002. Perennial grass cover has been largely contributed by the native species bluebunch wheatgrass (*Pseudoroegneria spicata*); the introduced species bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2017, albeit in low amounts (Table 16A-09.7, Table 16A-09.10). In general, forbs have remained relatively rare (Table 16A-09.11).

Trend Summary Tables

Table 16A-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	6.8	0.9	2.9	-	-	-
2002	2.3	0.0	-	-	-	-
2007	6.4	0.4	-	8.1	1.5	-
2012	4.1	0.9	-	5.5	1.9	-
2017	3.4	0.6	-	6.8	0.8	-
2022	4.1	0.8	-	7.9	1.9	-

Table 16A-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	352	247	325	55	6.1	7.1	3.7	1.8
2002	325	176	284	26	9.8	5.5	3.7	0.8
2007	379	194	299	35	17.2	11.5	5.8	1.1
2012	336	227	320	40	12.6	11.0	3.9	1.0
2017	366	206	338	23	20.5	9.5	8.3	1.1
2022	369	199	302	25	20.4	11.1	11.1	1.9

Table 16A-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.5	0.9	26.2	9.2	47.8	26.5
2002	13.1	0.0	19.0	9.4	50.7	21.9
2007	5.5	0.0	21.8	6.9	37.3	43.2
2012	4.6	0.0	33.2	5.3	36.1	34.7
2017	9.3	0.2	21.9	15.2	47.8	41.0
2022	5.0	0.0	21.6	10.4	44.6	40.4

Table 16A-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	15	30	-
2002	25	12	-
2007	14	8	1
2012	10	12	2
2017	15	11	5
2022	14	8	-
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	44.2 (109.2)	20.1 (49.7)	-
2007	38.9 (96.0)	38.9 (96.0)	-
2012	18.7 (46.3)	8.7 (21.5)	-
2017	12.8 (31.5)	28.1 (69.5)	-
2022	10.7 (26.5)	11.4 (28.1)	-

Table 16A-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{aii} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency							
1997	-	-	352	-	23	243	-	-
2002	-	46	325	-	61	151	-	-
2007	-	3	379	-	26	188	-	9
2012	5	4	336	-	31	213	6	-
2017	-	-	365	3	29	197	-	5
2022	-	5	367	10	14	193	8	-
year	Average Cover (%)							
1997	-	-	6.1	-	0.1	7.0	-	-
2002	-	0.2	9.7	-	0.6	4.9	-	-
2007	-	0.0	17.0	-	0.5	10.9	-	0.2
2012	0.4	0.0	12.5	-	0.2	10.4	0.0	-
2017	-	-	20.3	0.0	0.3	9.2	-	0.2
2022	-	0.1	20.3	0.2	0.2	10.7	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (tittlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)
year	Nested Frequency																
1997	-	291	1	4	2	-	3	-	7	-	-	9	-	-	8	26	61
2002	3	217	-	3	1	3	-	6	-	3	-	20	-	1	11	46	60
2007	-	218	-	3	-	11	-	-	-	5	-	27	-	-	6	100	34
2012	-	230	-	3	-	25	-	-	1	2	-	3	-	-	16	68	36
2017	-	207	-	5	-	15	-	6	3	4	-	-	-	1	1	170	65
2022	-	69	-	5	1	3	-	2	1	4	2	2	3	-	1	214	64
year	Average Cover (%)																
1997	-	2.7	0.0	0.0	0.0	-	0.0	-	0.0	-	-	0.0	-	-	0.7	0.1	0.8
2002	0.0	1.2	-	0.0	0.0	0.0	-	0.0	-	0.0	-	0.1	-	0.0	0.5	1.4	0.2
2007	-	1.3	-	0.0	-	0.0	-	-	-	0.0	-	0.5	-	-	0.4	2.6	0.4
2012	-	1.1	-	0.0	-	0.1	-	-	0.0	0.0	-	0.0	-	-	0.1	0.8	0.5
2017	-	2.2	-	0.1	-	0.1	-	0.0	0.0	0.0	-	-	-	0.0	0.2	3.9	1.4
2022	-	0.8	-	0.1	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	7.0	1.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency															
year	Average Cover (%)															
Gilia inconspicua ^a (shy gilia)	9	-	22	-	-	-	6	-	10	-	-	2	-	5	1	33
Hackelia patens (spotted stickseed)	20	-	2	-	11	2	7	-	-	-	75	5	-	1	-	-
Hedysamum boreale (Utah sweetvetch)	0	-	9	-	59	46	6	-	5	-	8	10	4	4	8	-
Helianthus annuus ^{ai} (common sunflower)	-	1	9	-	87	81	6	4	-	-	2	6	12	1	17	-
Holosteum umbellatum ^{ai} (jagged chickweed)	-	-	3	-	-	53	15	2	9	-	29	3	11	-	2	-
Lactuca serriola ^{ai} (prickly lettuce)	-	-	15	2	97	14	12	-	1	1	34	-	12	-	5	-
Lappula occidentalis ^a (flatspine stickseed)	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-	0.0	-	0.2	0.0	0.1
Lygodesmia grandiflora (largeflower skeletonplant)	0.1	-	0.2	-	0.0	0.0	0.0	-	-	-	0.5	0.1	-	0.0	-	-
Machaeranthera canescens (hoary tansyaster)	0.0	-	0.6	-	0.2	0.3	0.0	-	0.1	-	0.0	0.0	0.2	0.0	0.1	-
Oenothera caespitosa (tufted evening primrose)	-	0.0	0.8	-	0.5	0.5	0.0	0.0	-	-	0.0	0.0	0.3	0.0	0.1	-
Phacelia linearis ^a (threadleaf phacelia)	-	-	0.4	-	-	0.4	0.2	0.1	0.3	-	0.2	0.0	0.0	-	0.0	-
Phlox longifolia (longleaf phlox)	-	-	1.4	0.0	0.5	0.1	0.2	-	0.2	0.1	0.3	-	0.3	-	0.2	-
Sisymbrium altissimum ^{ai} (tall tumbled mustard)	0.0	-	0.2	-	-	-	0.0	-	0.0	-	-	0.0	-	0.0	0.0	-
Streptanthus cordatus (heartleaf twistflower)	0.1	-	0.2	-	0.0	0.0	0.0	-	-	-	0.5	0.1	-	0.0	-	-
Tragopogon dubius ^{ai} (yellow salsify)	0.0	-	0.1	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	-
unknown annual forb ^a (unknown forb)	0.0	-	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
year	Quadrat Cover (%)											
Amelanchier utahensis ^p (Utah serviceberry)	-	-	-	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	-	-	-	-	-	-	-	-	-	-	-
Atriplex canescens ^p (fourwing saltbush)	2.9	-	-	0.2	1.4	1.2	-	0.1	-	1.8	-	2
Brickellia californica (California brickellbush)	2.6	-	-	0.2	1.1	1.4	-	0.3	-	0.4	-	1.4
Cercocarpus montanus ^p (alderleaf mountain mahogany)	3.8	-	0.5	0.1	0.9	0.7	0.6	-	-	0.7	-	0.3
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	3.4	-	0	-	2.9	-	-	1.9	-	0.8	0.7	0.1
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	1.9	0.9	-	0.8	1.0	0.0	-	-	2.9	3.0	-	-
Gutierrezia sarothrae (broom snakeweed)	1.1	0.0	-	-	0.1	0.0	-	-	-	1.1	-	-
Juniperus osteosperma ⁱ (Utah juniper)	1.6	-	-	0.0	1.0	0.2	-	0.2	-	2.1	-	1.6
Purshia stansburiana ^p (Stansbury cliffrose)	2.1	-	-	0.0	1.5	0.0	-	0.8	-	0.2	-	0.3
Quercus gambelii ^p (Gambel oak)	1.9	-	0.4	0.0	0.4	0.6	0.0	0.0	-	0.6	-	0.1
Rhus glabra ^p (smooth sumac)	1.9	-	0.1	-	1.1	-	-	0.8	-	0.8	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	640	160	41	56	3	50	34	0	104/132
2002	1300	-	95	3	2	0	5	0	100/120
2007	920	100	59	35	7	17	20	4	62/88
2012	620	40	29	68	3	61	3	0	52/72
2017	620	-	23	77	0	45	48	0	66/82
2022	420	-	0	100	0	24	29	5	- / -
Artemisia nova^P -- (black sagebrush)									
1997	120	-	0	83	17	50	17	17	38/68
2002	-	-	-	-	-	-	-	-	16/70
2007	80	-	0	25	75	25	0	75	24/51
2012	-	-	-	-	-	-	-	-	50/61
2017	-	-	-	-	-	-	-	-	22/44
2022	20	-	0	100	0	0	100	0	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	360	-	17	83	0	50	33	0	69/103
2002	80	-	0	25	75	0	50	50	47/77
2007	-	-	-	-	-	-	-	-	47/76
2012	60	-	0	100	0	33	0	0	52/67
2017	40	-	0	100	0	100	0	0	48/64
2022	20	-	0	100	0	100	0	0	- / -
Atriplex canescens^P -- (fourwing saltbush)									
1997	20	-	0	100	0	0	100	0	56/93
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	106/151
2012	-	-	-	-	-	-	-	-	88/124
2017	20	-	0	100	0	0	0	0	108/152
2022	20	-	0	100	0	0	100	0	- / -
Brickellia californica -- (California brickellbush)									
1997	100	-	0	100	0	0	0	0	54/70
2002	-	-	-	-	-	-	-	-	- / -
2007	40	-	0	100	0	0	0	0	42/79
2012	40	-	0	100	0	0	0	0	31/67
2017	40	-	0	100	0	0	0	0	30/51
2022	40	-	0	100	0	0	0	0	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	40	-	0	100	0	0	100	0	139/126
2002	20	20	0	100	0	0	100	0	180/144
2007	40	-	0	100	0	100	0	0	147/146
2012	40	-	0	100	0	100	0	0	184/145
2017	40	-	0	100	0	0	0	0	150/146
2022	80	-	0	75	25	50	50	25	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	60	20	0	100	0	0	0	0	43/86
2002	60	-	33	33	33	0	0	0	28/46
2007	80	-	0	75	25	0	0	0	34/65
2012	40	-	0	100	0	0	0	0	46/68
2017	40	-	0	100	0	0	0	0	43/83
2022	20	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	152/240
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	90/139
2012	-	-	-	-	-	-	-	-	94/217
2017	40	-	0	100	0	50	0	0	86/133
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	160	20	38	63	0	0	0	0	21/31
2002	60	-	0	67	33	0	0	33	15/24
2007	140	20	43	57	0	0	0	0	19/30
2012	160	-	0	100	0	0	0	0	28/48
2017	100	-	0	100	0	0	0	0	23/27
2022	80	-	0	100	0	0	0	0	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1997	40	-	0	100	0	0	0	0	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	22/29
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	180	-	0	78	22	44	44	11	149/184
2002	60	-	0	67	33	0	100	0	123/188
2007	40	-	50	50	0	50	50	0	147/143
2012	40	-	50	50	0	50	50	0	118/139
2017	20	-	0	0	100	0	100	0	109/117
2022	160	-	75	25	0	0	75	0	-/-
Quercus gambelii^P -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	116/143
2017	-	-	-	-	-	-	-	-	28/49
2022	120	-	0	100	0	83	0	0	-/-
Rhus glabra^P -- (smooth sumac)									
1997	-	-	-	-	-	-	-	-	84/48
2002	40	-	100	0	0	0	0	0	-/-
2007	60	20	0	100	0	0	0	0	109/133
2012	100	-	0	100	0	100	0	0	117/109
2017	320	-	31	63	6	0	38	75	95/81
2022	160	-	13	75	13	63	25	13	-/-

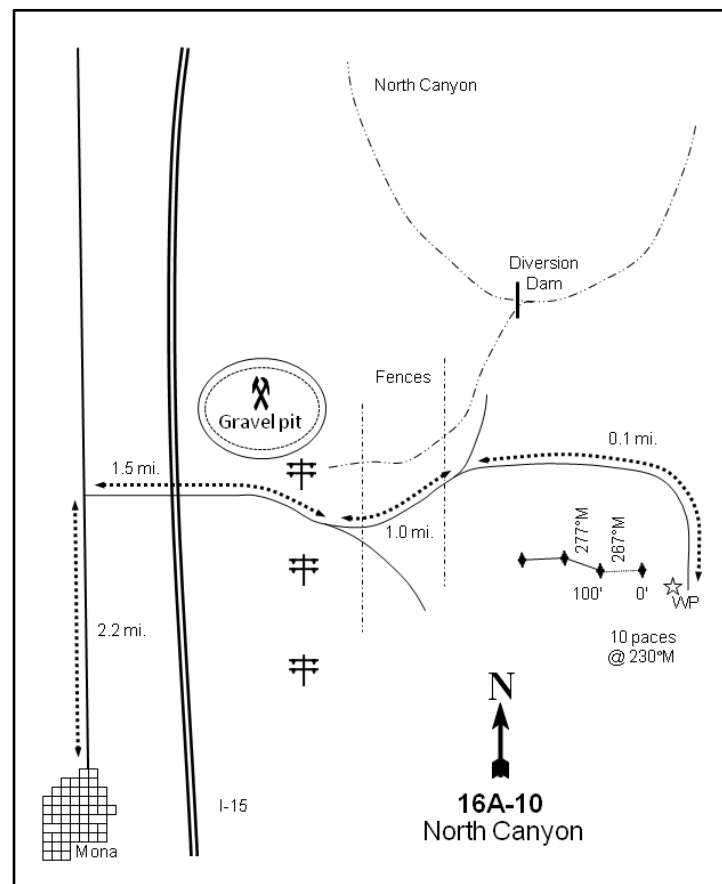
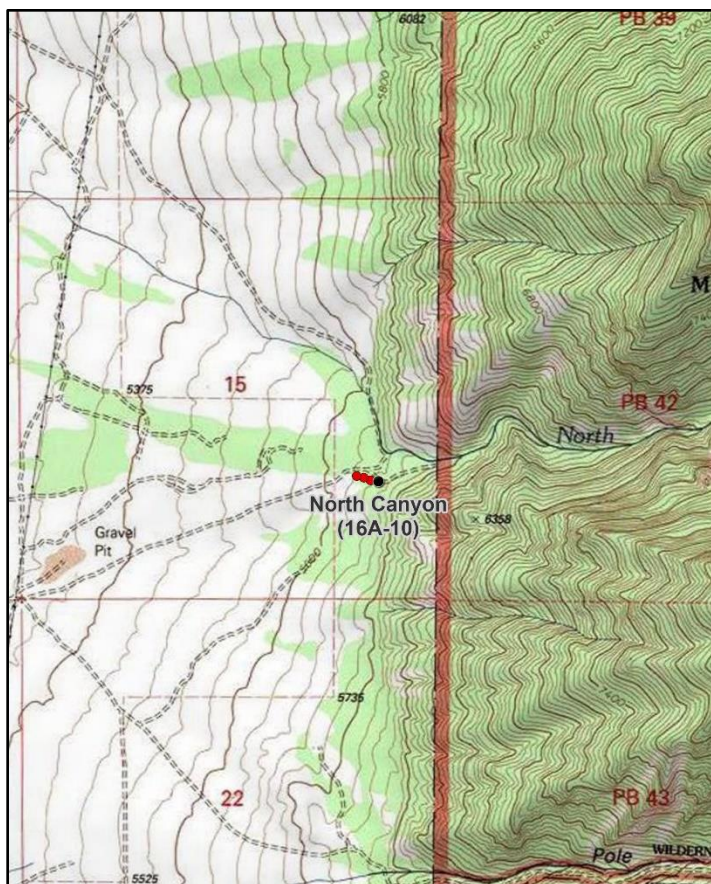
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata ^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	189/390
2012	-	-	-	-	-	-	-	-	160/555
2017	-	-	-	-	-	-	-	-	175/529

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-09.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.0	11.8	6.8	14.3	-4.6	3.5	0.0	41.7	Poor
2002	3.4	0.0	0.0	11.0	-7.4	1.6	0.0	8.6	Very Poor
2007	11.2	14.3	15.0	22.9	-12.9	2.3	0.0	52.8	Fair
2012	7.6	14.5	8.7	21.9	-9.4	2.1	0.0	45.3	Poor
2017	9.8	11.8	7.0	19.0	-15.3	2.3	0.0	34.6	Very Poor-Poor
2022	11.5	12.2	3.9	21.7	-15.3	3.9	0.0	37.8	Poor

NORTH CANYON - STUDY NO. 16A-10

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mona NE; Township 11S, Range 1E, Section 15
NAD 83 UTM ZONE 12, 431119 East 4411974 North

Transect Information

Browse Tag # (0' Stake)	3957
Transect Bearing	267° magnetic (Line 2: 285° magnetic, Line 3: 267° magnetic)
Length	300ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (Belt 3 on 41ft), Line 3 (34ft centered on 40ft & 95ft)
Belt Marker Placement	Belt 2: 1ft, Belt 4: 2ft

Directions to Site

Beginning at the intersection of 200 North and Main Street in Mona, drive north on Main Street for 2.2 miles to an improved gravel road on the east side. Take this road east for 1.5 miles (passing beneath the freeway) to where the road forks after crossing an irrigation ditch. Stay left (north) at this fork and continue another mile to where the road faintly forks again. Proceed for 0.1 miles on the right (south) side of the fork; the witness post is located 15 feet off of the right (south) side of the road. The 0-foot stake is 10 paces away at 270 degrees magnetic, with a red browse tag #3957 attached.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,670ft (1,728m)
Aspect	West
Slope	10-16%
Sample Dates	05/20/1997, 05/20/2002, 05/21/2007, 05/21/2012, 05/22/2017, 05/18/2022

Wildlife Habitat and Vegetation History**Table 16A-10.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1997	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush/Bulbous Bluegrass	No Encroachment
2022	Mountain Big Sagebrush/Bulbous Bluegrass	No Encroachment

Site Notes

There is a creek approximately 650 feet (200m) north of the study.

Soils**Table 16A-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.1	56.4	28.1	15.6	3.2	8.2	51.2	0.8	05/20/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with Gambel oak (*Quercus gambelii*) scattered throughout (Photos, Table 16A-10.12, Table 16A-10.13). The herbaceous understory has remained abundant with perennial grasses contributing a majority of the cover since 1997; the introduced species bulbous bluegrass (*Poa bulbosa*) was a co-dominant site component in 2017 and 2022 with just over 11% cover. In addition, the introduced annual species cheatgrass (*Bromus tectorum*) has been observed since 1997 in fluctuating amounts. Finally, the noxious weeds jointed goatgrass (*Aegilops cylindrica*) and gypsoflower (*Cynoglossum officinale*) were present in previous earlier years, but were not found in the latest sample years between 2012 to 2022 (Table 16A-10.7, Table 16A-10.10, Table 16A-10.11).

Trend Summary Tables

Table 16A-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	22.3	2.5	-	-	-	-
2002	23.9	0.4	-	-	-	-
2007	19.3	1.1	-	25.8	0.6	-
2012	20.6	1.9	-	20.9	3.3	-
2017	15.2	1.5	-	20.5	2.5	-
2022	14.8	1.0	-	19.4	2.0	-

Table 16A-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	328	245	255	130	6.0	4.0	1.1	2.7
2002	347	265	330	101	5.6	13.5	2.2	1.7
2007	336	351	332	113	6.0	20.5	6.6	1.9
2012	181	365	212	127	2.3	20.1	1.6	1.5
2017	237	383	290	115	9.1	26.3	7.3	1.9
2022	275	398	363	112	10.1	25.0	14.5	1.6

Table 16A-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.2	1.2	42.9	15.7	18.2	33.8
2002	0.9	1.2	43.6	16.1	20.8	48.4
2007	2.5	0.5	38.8	14.0	16.8	49.7
2012	1.3	0.4	56.2	10.2	15.7	47.9
2017	4.7	1.4	42.4	13.4	14.6	52.3
2022	2.4	1.5	45.9	8.9	17.9	55.1

Table 16A-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Wild Turkey
	Quadrat Frequency				
1997	-	6	-	-	-
2002	-	16	1	4	-
2007	-	26	-	3	-
2012	1	6	-	4	-
2017	1	17	-	11	-
2022	4	18	-	3	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	21.5 (53.0)	-	-	-
2007	0.7 (1.8)	53.6 (132.4)	-	-	-
2012	0.7 (1.8)	10.7 (26.5)	-	-	-
2017	-	16.8 (41.4)	0.7 (1.7)	-	-
2022	2.9 (7.2)	21.5 (53.0)	-	-	8.7 (21.5)*

*Pellets per acre (ha)

Table 16A-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica ^{ani} (jointed goatgrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency															
1997	-	7	20	-	-	323	9	7	18	-	188	-	26	28	33	-
2002	-	6	20	4	7	342	2	19	72	2	182	-	24	26	4	8
2007	1	13	23	10	-	328	3	23	188	12	197	1	31	61	85	24
2012	-	10	20	10	-	169	4	13	132	11	207	1	39	119	27	-
2017	-	-	37	-	1	237	3	23	274	3	104	4	32	137	-	-
2022	-	-	35	19	-	272	1	5	278	4	124	-	31	148	-	-
year	Average Cover (%)															
1997	-	0.0	0.8	-	-	5.7	0.0	0.5	0.2	-	1.4	-	0.4	0.6	0.3	-
2002	-	0.6	0.8	0.0	0.7	5.5	0.1	1.0	2.9	0.0	4.3	-	0.5	2.7	0.0	0.0
2007	0.0	0.3	0.8	0.0	-	5.6	0.1	1.2	7.8	0.1	4.7	0.0	1.4	4.1	0.3	0.1
2012	-	0.3	0.5	0.4	-	1.7	0.0	0.5	5.3	0.4	6.0	0.2	0.9	6.2	0.2	-
2017	-	-	1.2	-	0.0	9.1	0.0	0.7	11.3	0.2	2.2	0.0	0.9	9.7	-	-
2022	-	-	0.3	0.2	-	9.9	0.0	0.2	11.1	0.1	1.9	-	0.6	10.9	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Apocynum cannabinum (Indianhemp)	Arenaria serpyllifolia ^{ai} (thymeleaf sandwort)	Astragalus eurekensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium undulatum ⁿ (wavyleaf thistle)	Cirsium vulgare ^{ai} (bull thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cynoglossum officinale ^{ani} (gypsyflower)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
1997	8	94	-	-	-	-	28	18	-	86	6	-	7	21	4	3	-
2002	-	205	5	-	-	15	8	28	2	106	17	-	0	87	-	-	-
2007	-	147	3	-	-	9	16	13	-	44	21	-	2	146	1	-	-
2012	2	112	-	-	-	1	27	3	3	4	22	-	5	104	3	-	3
2017	2	101	-	6	-	5	16	11	-	-	27	-	-	18	4	-	-
2022	-	90	-	12	271	1	12	59	-	20	22	0	-	6	-	-	-
year	Average Cover (%)																
1997	0.0	0.3	-	-	-	-	0.3	0.0	-	0.2	0.0	-	0.0	0.1	0.0	0.0	-
2002	-	0.4	0.0	-	-	0.1	0.1	0.1	0.0	0.6	0.4	-	0.0	0.3	-	-	-
2007	-	0.6	0.0	-	-	0.0	0.3	0.1	-	0.1	0.4	-	0.0	2.9	0.0	-	-
2012	0.0	0.2	-	-	-	0.0	0.5	0.0	0.0	0.0	0.4	-	0.1	0.4	0.0	-	0.0
2017	0.0	2.3	-	0.2	-	0.0	0.1	0.1	-	-	0.5	-	-	0.3	0.0	-	-
2022	-	1.4	-	0.0	10.5	0.0	0.0	0.2	-	0.0	1.0	0.0	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Helianthus annuus ^{ai} (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum incisum (narrowleaf stoneseed)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Oenothera pallida ^a (pale evening primrose)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	-	11	9	80	-	110	-	-	33	-	-	4	10	2	-	-	3
2002	16	6	1	47	-	88	-	9	92	-	-	6	-	-	14	3	9
2007	88	1	-	63	-	107	-	-	53	7	-	3	3	-	8	3	8
2012	9	1	1	44	-	18	16	-	52	1	-	11	-	-	5	11	22
2017	-	-	-	47	15	41	-	-	169	23	-	2	19	-	-	-	4
2022	11	-	-	26	30	58	-	-	37	-	1	-	-	-	-	4	8
year	Average Cover (%)																
1997	-	0.0	0.1	2.1	-	0.4	-	-	0.1	-	-	0.0	0.0	0.0	-	-	0.0
2002	0.0	0.0	0.0	0.8	-	0.6	-	0.0	0.2	-	-	0.0	-	-	0.0	0.0	0.0
2007	0.2	0.0	-	0.7	-	2.4	-	-	0.1	0.0	-	0.0	0.2	-	0.0	0.1	0.1
2012	0.0	0.0	0.0	0.3	-	0.1	0.2	-	0.1	0.0	-	0.0	-	-	0.0	0.5	0.0
2017	-	-	-	0.4	0.1	0.7	-	-	3.7	0.1	-	0.0	0.3	-	-	-	0.0
2022	0.0	-	-	0.2	0.7	1.2	-	-	0.5	-	0.0	-	-	-	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Symphoricarichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	unknown annual forb ^a (unknown forb)	Verbascum thapsus ^{ai} (common mullein)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
1997	-	-	2	-	-	4
2002	-	1	-	-	-	2
2007	3	-	-	3	2	3
2012	-	8	-	3	-	5
2017	7	9	-	-	-	6
2022	-	-	-	-	-	5
year	Average Cover (%)					
1997	-	-	0.0	-	-	0.0
2002	-	0.0	-	-	-	0.0
2007	0.0	-	-	0.1	0.1	0.0
2012	-	0.0	-	0.2	-	0.0
2017	0.0	0.1	-	-	-	0.2
2022	-	-	-	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Quercus gambelii ^p (Gambel oak)	Rhus trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-
2007	18.1	0.1	-	2.4	0.6	-	-	4.7	0.5
2012	11.6	-	-	1.3	3.3	-	-	7.4	0.6
2017	11.7	0.1	-	0.8	2.5	-	-	7.9	-
2022	11.5	-	-	0.7	2	-	-	7.2	-
year	Quadrat Cover (%)								
1997	19.9	0.0	0.4	1.4	2.1	0.0	-	1.1	-
2002	18.0	-	-	3.1	0.4	-	0.0	2.4	0.4
2007	13.5	0.0	-	1.0	0.9	-	0.1	4.2	0.7
2012	11.8	-	-	1.5	1.9	-	-	6.3	1.0
2017	10.3	0.0	-	2.1	1.5	-	-	2.8	0.0
2022	10.8	-	-	1.4	1.0	-	-	2.7	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	3880	40	10	79	11	49	17	5	61/103
2002	3460	-	3	55	42	14	1	21	58/83
2007	2900	20	2	59	39	46	14	25	65/85
2012	1800	80	1	70	29	21	4	16	64/97
2017	1520	7440	3	63	34	28	11	17	62/101
2022	1540	20	10	52	38	43	20	40	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	0	0	100	0	100	0	7/11
2007	40	-	50	50	0	0	100	0	23/25
2012	20	-	0	100	0	0	100	0	23/33
2017	20	-	100	0	0	0	100	0	12/17
2022	-	-	-	-	-	-	-	-	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	38/52
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	0	100	0	0	0	0	87/96
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	40	-	0	100	0	50	0	0	74/115
2002	220	-	0	9	91	9	0	0	94/84
2007	100	-	0	60	40	0	0	20	85/97
2012	120	-	0	83	17	17	0	0	82/117
2017	160	-	0	75	25	13	13	13	71/78
2022	80	-	0	25	75	25	0	25	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	2020	80	28	70	2	0	0	0	15/13
2002	1700	-	5	88	7	0	0	7	14/16
2007	2660	100	60	36	4	0	0	2	26/36
2012	2680	40	8	90	2	0	1	1	22/29
2017	3700	-	16	82	3	0	0	1	19/22
2022	920	360	22	61	17	13	0	17	-/-
Opuntia -- (pricklypear)									
1997	80	-	0	100	0	0	0	0	13/18
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	5/7
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	17/17
2007	60	-	67	33	0	0	0	0	15/15
2012	20	-	0	100	0	0	0	0	17/16
2017	20	-	0	100	0	0	0	0	12/17
2022	20	-	0	100	0	0	0	0	-/-
Prunus virginiana^P -- (chokecherry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	184/361
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	248/46
2017	-	-	-	-	-	-	-	-	232/210
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	130/286
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	-/-

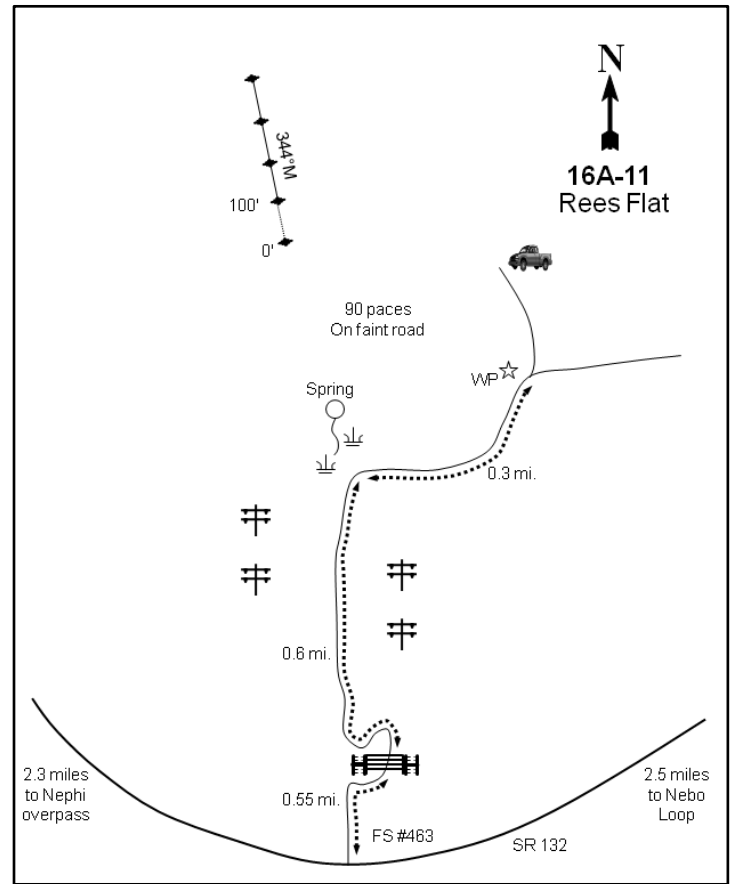
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Quercus gambelii^p -- (Gambel oak)									
1997	140	-	43	57	0	57	0	0	122/156
2002	420	-	38	62	0	0	0	38	130/86
2007	620	-	39	61	0	0	0	0	178/124
2012	480	20	21	79	0	0	0	0	- / -
2017	560	20	7	93	0	11	7	0	149/145
2022	1420	-	62	20	18	35	0	18	- / -
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	141/271
2007	20	-	100	0	0	0	0	0	198/364
2012	20	-	100	0	0	0	0	0	172/240
2017	-	-	-	-	-	-	-	-	100/133

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-10.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	27.6	12.0	5.4	7.6	-4.5	5.3	-2.0	51.4	Poor
2002	29.2	1.6	3.0	21.2	-4.2	3.3	0.0	54.2	Poor-Fair
2007	30.0	5.8	5.3	25.5	-4.5	3.8	-2.0	63.9	Fair
2012	24.1	9.9	5.4	29.8	-1.7	3.0	0.0	70.5	Fair-Good
2017	23.7	8.9	2.4	29.9	-6.8	3.8	0.0	61.8	Fair
2022	22.5	5.4	14.6	27.8	-7.6	3.3	0.0	66.0	Fair

REES FLAT - STUDY NO. 16A-11



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Nephi NE; Township 12S, Range 1E, Section 25
NAD 83 UTM ZONE 12, 433389 East 4399356 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3956
4° magnetic (Lines 2-5: 344° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt 5: 5ft

Directions to Site

Beginning at the overpass where Highway 132 crosses beneath I-15 in Nephi, take Highway 132 east for 2.3 miles. Turn north onto Forest Service Road #463 and proceed for 0.2 miles to a fork in the road. Stay left and continue for another 0.35 miles to a gate. From the gate, go 0.65 miles to another fork. Stay right on the main road for 0.6 miles, passing through a four-way intersection beneath the powerlines and reaching a spring on the left. Continue 0.3 miles farther to a 3-foot tall witness post 6 paces northwest of the road near some oak brush. Stop here and walk 90 paces west on a faint road. The 0-foot baseline stake is 9 paces north of the faint road and is a 12-inch-high red post marked by browse tag #3956.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,700ft (2,042m)
Aspect	South
Slope	15-17%
Sample Dates	05/22/1997, 10/25/2002, 05/29/2007, 05/16/2012, 05/18/2017, 05/18/2022

Table 16A-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Prior to 1983	-
Seeding - Seed Unknown	-	-	Prior to 1983	-

Wildlife Habitat and Vegetation History**Table 16A-11.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Gambel Oak	NA
1989	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
1997	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2002	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2007	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2012	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2022	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA

Site Notes

No Notes

Soils**Table 16A-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.9	40.4	33.1	26.6	2.4	29.8	179.2	0.4	05/22/1997

Site Potential

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Gravelly Loam (Oak)
NRCS Ecological Site #	R047XA410UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) have been the dominant browse species on this study site since 1983, with antelope bitterbrush (*Purshia tridentata*) also present; densities of sagebrush and bitterbrush have exhibited an overall increase over the study period (Photos, Table 16A-11.12, Table 16A-12.13). The herbaceous understory has remained abundant in all sample years since 1997, with perennial grasses contributing a majority of the cover. However, most of this cover can be attributed to the introduced species smooth brome (*Bromus inermis*) and bulbous bluegrass (*Poa bulbosa*) (Table 16A-11.10). Both annual and perennial forbs have remained rare (Table 16A-11.7, Table 16A-11.11).

Trend Summary Tables

Table 16A-11.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	10.8	0.5	-	-	-	-
2002	18.6	1.5	-	-	-	-
2007	21.2	0.2	-	28.6	0.3	-
2012	23.1	0.0	-	31.3	0.1	-
2017	21.3	0.4	-	31.5	0.3	-
2022	22.4	0.5	-	19.6	0.2	-

Table 16A-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	58	453	29	85	2.3	34.2	0.2	1.4
2002	-	473	6	47	-	41.1	0.0	0.9
2007	-	470	20	65	-	45.8	0.1	0.8
2012	3	444	5	65	0.0	43.4	0.0	1.1
2017	-	450	11	58	-	42.4	0.0	0.7
2022	6	478	12	90	0.4	57.8	0.1	1.9

Table 16A-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.5	8.6	33.7	5.2	2.8	49.7
2002	11.8	4.1	38.2	2.7	3.0	57.3
2007	10.9	1.2	33.3	4.7	2.8	62.7
2012	3.6	1.8	57.2	1.7	3.6	60.1
2017	12.7	1.6	61.6	2.0	2.7	52.1
2022	7.0	0.3	49.8	2.4	2.6	65.1

Table 16A-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	2	26	38	2
2002	4	29	13	3
2007	1	33	9	5
2012	-	17	16	3
2017	-	31	14	22
2022	-	41	11	2
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.7 (21.5)	55.6 (137.4)	26.8 (66.2)	-
2007	1.5 (3.6)	24.8 (61.2)	22.1 (54.6)	-
2012	-	14.1 (34.8)	13.4 (33.1)	-
2017	1.5 (3.6)	96.5 (238.4)	37.5 (92.7)	-
2022	8.7 (21.5)	69.7 (172.1)	31.5 (77.8)	-

Table 16A-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Agropyron cristatum ⁱ (crested wheatgrass)	104	205	58	439	-	-	27	-	
Bromus inermis ⁱ (smooth brome)	35	290	-	414	-	4	32	5	
Bromus tectorum ^{ai} (cheatgrass)	44	329	-	395	14	8	9	0	
Poa bulbosa ⁱ (bulbous bluegrass)	13	364	3	342	-	6	20	-	
Poa fendleriana (muttongrass)	7	384	-	357	4	8	-	3	
Poa pratensis ⁱ (Kentucky bluegrass)	22	394	6	415	4	1	-	5	
Poa secunda (Sandberg bluegrass)	Average Cover (%)								
Pseudoroegneria spicata (bluebunch wheatgrass)	1997	2.1	5.1	2.3	26.6	-	-	0.4	-
	2002	0.4	8.3	-	31.5	-	0.4	0.5	0.0
	2007	0.6	18.6	-	26.2	0.1	0.2	0.0	0.0
	2012	0.2	14.5	0.0	27.9	-	0.3	0.5	-
	2017	0.1	19.5	-	22.1	0.0	0.8	-	0.0
	2022	0.3	26.9	0.4	30.1	0.4	0.0	-	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	8	-	15	2	7	4	-	1	11	-	15	-	19	2	-	-	1
Alyssum desertorum ^{ai} (desert madwort)	1	-	15	-	-	5	-	-	6	-	6	-	-	-	3	-	-
Astragalus cibaricus (browse milkvetch)	-	-	21	-	2	2	3	6	9	-	7	11	-	-	-	-	1
Astragalus convallarius (lesser rushy milkvetch)	1	-	27	-	1	1	2	-	15	-	10	3	-	-	-	-	-
Calochortus nuttallii (sego lily)	1	-	11	9	6	7	1	-	6	4	3	-	-	-	-	1	3
Cirsium (thistle)	12	1	18	-	21	-	5	-	10	5	11	2	-	-	-	3	-
Collinsia parviflora ^a (maiden blue eyed Mary)	Average Cover (%)																
Collomia linearis ^a (tiny trumpet)	1997	0.2	-	0.4	0.0	0.0	0.0	-	0.0	0.5	-	0.1	-	0.0	0.1	-	0.0
Comandra umbellata (bastard toadflax)	2002	0.0	-	0.2	-	-	0.2	-	-	0.0	-	0.0	-	-	-	0.0	-
Crepis acuminata (tapertip hawksbeard)	2007	-	-	0.4	-	0.0	0.2	0.0	0.0	0.0	-	0.0	0.1	-	-	-	0.0
Cymopterus longipes (longstalk springparsley)	2012	0.0	-	0.7	-	0.0	0.0	0.0	-	0.2	-	0.1	0.0	-	-	-	-
Draba ^a (draba)	2017	0.0	-	0.3	0.2	0.0	0.0	0.0	-	0.0	0.0	-	-	-	-	-	0.0
Epilobium brachycarpum ^a (tall annual willowherb)	2022	0.5	0.0	0.8	-	0.1	-	0.0	-	0.3	0.0	0.0	0.0	-	-	-	0.0
Erigeron divergens ^a (spreading fleabane)																	
Erigonum brevicaulle (shortstem buckwheat)																	
Galium aparine ^a (stickywilly)																	
Lactuca serriola ^{ai} (prickly lettuce)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES							
<i>Machaeranthera canescens</i> (hoary tansyaster)							
<i>Microseris nutans</i> (nodding microseris)							
<i>Phlox longifolia</i> (longleaf phlox)							
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)							
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)							
unknown annual forb ^a (unknown forb)							
<i>Zizadenus paniculatus</i> (foothill deathcamas)							
year	Nested Frequency						
1997	2	-	29	-	6	2	3
2002	-	-	12	3	3	-	1
2007	-	-	32	-	-	-	4
2012	-	-	16	-	-	-	7
2017	-	-	9	6	2	-	7
2022	-	4	18	-	1	-	7
year	Average Cover (%)						
1997	0.0	-	0.1	-	0.0	0.0	0.0
2002	-	-	0.4	0.0	0.0	-	0.0
2007	-	-	0.1	-	-	-	0.0
2012	-	-	0.0	-	-	-	0.1
2017	-	-	0.0	0.0	0.0	-	0.1
2022	-	0.0	0.1	-	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)						
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)						
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)						
<i>Gutierrezia sarothrae</i> (broom snakeweed)						
<i>Purshia tridentata</i> ^p (antelope bitterbrush)						
<i>Quercus gambelii</i> ^p (Gambel oak)						
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	16.4	-	0.1	0.3	5.6	6.5
2012	17.4	-	-	0.1	9.6	4.3
2017	15.6	-	-	0.3	9.6	6.3
2022	10.7	0	-	0.2	7.5	1.4
year	Quadrat Cover (%)					
1997	4.9	-	0.1	0.5	1.5	4.3
2002	9.8	-	0.0	1.5	4.2	4.5
2007	12.7	-	0.0	0.2	5.2	3.3
2012	13.8	0.0	-	0.0	8.4	0.9
2017	11.3	0.1	-	0.2	8.1	1.9
2022	11.6	0.0	0.0	0.5	7.7	3.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

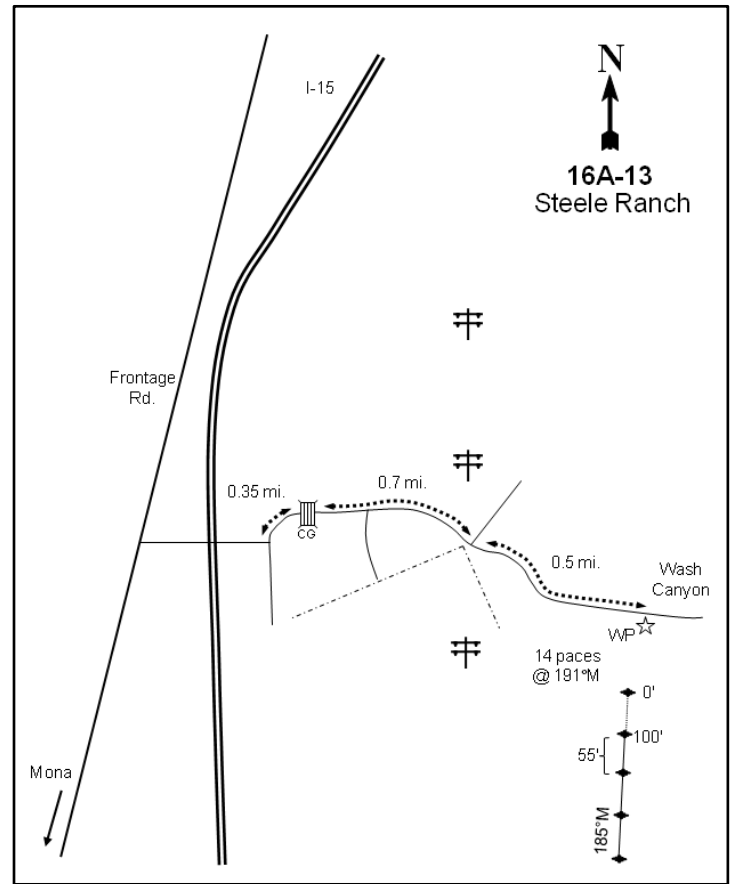
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	1900	560	72	25	3	6	4	3	62/114
2002	3460	360	48	46	6	19	5	6	47/91
2007	2900	-	7	91	2	14	1	2	57/92
2012	2440	-	2	85	13	27	4	6	56/91
2017	2080	760	5	73	22	46	14	14	56/103
2022	1620	20	4	57	40	36	0	42	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	26/70
2002	40	-	50	50	0	0	0	0	23/55
2007	-	-	-	-	-	-	-	-	17/36
2012	20	-	100	0	0	0	0	0	28/42
2017	-	-	-	-	-	-	-	-	22/26
2022	20	-	100	0	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	20	-	0	100	0	100	0	0	23/33
2002	20	-	0	0	100	100	0	100	49/95
2007	80	-	0	100	0	0	0	0	48/45
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	66/40
2022	40	-	100	0	0	100	0	0	- / -
Grayia spinosa -- (spiny hopsage)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	20	0	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	40	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1500	380	33	60	7	0	0	7	14/23
2002	2600	-	5	72	23	0	0	9	11/18
2007	2140	80	65	27	8	10	0	4	17/20
2012	740	60	19	81	0	0	0	0	14/20
2017	940	2760	38	55	6	0	0	6	16/22
2022	420	20	33	67	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	200	40	20	80	0	60	10	0	69/202
2002	420	-	14	86	0	10	81	0	68/169
2007	420	-	10	91	0	19	52	0	77/159
2012	1180	-	25	75	0	61	17	3	61/148
2017	1020	-	4	96	0	29	47	0	65/146
2022	1020	-	26	59	16	14	82	16	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	1740	40	38	62	0	1	0	0	197/136
2002	2480	-	4	90	7	0	14	31	148/91
2007	1640	20	10	79	11	0	0	99	170/121
2012	1200	-	15	85	0	0	0	2	196/156
2017	1320	-	11	89	0	77	3	0	158/104
2022	1280	-	20	70	9	11	0	70	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-11.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	12.9	14.6	15.0	15.2	-1.7	2.8	0.0	58.8	Fair
2002	23.1	13.5	14.8	19.3	0.0	1.8	0.0	72.5	Good
2007	30.0	13.9	4.0	30.0	0.0	1.5	0.0	79.5	Good
2012	30.0	12.8	5.4	30.0	0.0	2.3	0.0	80.4	Good
2017	30.0	11.7	2.8	30.0	0.0	1.5	0.0	76.0	Good
2022	26.0	6.5	6.6	30.0	-0.3	3.9	0.0	72.7	Good

STEELE RANCH - STUDY NO. 16A-13



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Santaquin SE; Township 11S, Range 1E, Section 03
NAD 83 UTM ZONE 12, 431086 East 4416364 North

Transect Information

Browse Tag # (0' Stake)	182
Transect Bearing	185° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard; Line 2: 55ft Long

Directions to Site

From 200 North Main Street in Mona, take the frontage road north towards Santaquin. Continue for 5.35 miles and turn east onto a gravel road that goes beneath the I-15 overpass. After passing beneath I-15, the road comes to a "T": turn left and proceed for 0.35 miles to a cattle guard. Continue up the road 0.7 miles to a fence corner and a fork in the road. Stay to the right (south) and drive for 0.5 miles to the witness post on the south side of the road. From the witness post, the 0-foot baseline stake is 14 paces away at 187 degrees magnetic and is marked with browse tag #182.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,650ft (1,722m)
Aspect	West
Slope	10-15%
Sample Dates	05/22/1997, 05/17/2002, 05/16/2007, 05/22/2012, 05/23/2017, 05/17/2022

Wildlife Habitat and Vegetation History

Table 16A-13.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush/Gambel Oak	NA
1997	Mountain Big Sagebrush/Gambel Oak	NA
2002	Mountain Big Sagebrush/Gambel Oak	NA
2007	Mountain Big Sagebrush/Gambel Oak	NA
2012	Mountain Big Sagebrush/Gambel Oak	NA
2017	Mountain Big Sagebrush/Gambel Oak	NA
2022	Mountain Big Sagebrush/Gambel Oak	NA

Site Notes

No Notes

Soils

Table 16A-13.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	37.1	41.1	21.8	4.0	9.1	86.4	0.7	05/22/1997

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Oak)
NRCS Ecological Site #	R047XA410UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) have dominated this study site since it was established in 1989; no other preferred browse has been observed in any sample year. There was notable increase in sagebrush quadrat cover and density in 2022 (Table 16A-13.12, Table 16A-13.13). The herbaceous understory has fluctuated throughout the duration of the study, but has largely remained diverse. Annual forbs, mainly jagged chickweed (*Holosteum umbellatum*) and stickywilly (*Galium aparine*), provided the most herbaceous cover in 2022; perennial forbs have remained rare. Perennial and annual grasses have never been particularly abundant, but annual grasses contributed nearly 10% cover in 2022 (Table 16A-13.7, Table 16A-13.10, Table 16A-13.11).

Trend Summary Tables

Table 16A-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	31.9	0.1	-	-	-	-
2002	27.4	0.2	-	-	-	-
2007	35.1	0.0	-	59.0	0.2	-
2012	33.7	0.4	-	55.5	0.6	-
2017	28.9	0.8	-	49.8	1.4	-
2022	28.4	1.0	-	35.0	0.6	-

Table 16A-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	138	276	392	126	0.4	3.4	2.2	0.9
2002	148	284	297	151	0.7	5.4	3.2	1.2
2007	166	247	414	172	1.0	6.5	8.1	1.4
2012	134	225	352	119	0.5	4.7	3.0	0.9
2017	176	190	380	145	4.5	3.7	11.6	1.7
2022	254	221	418	186	9.7	8.2	18.3	2.5

Table 16A-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.8	3.9	58.4	9.7	5.6	38.2
2002	6.1	4.7	60.3	8.8	5.3	35.8
2007	3.5	5.4	52.6	7.9	5.8	47.3
2012	5.7	5.2	65.2	6.6	4.5	44.3
2017	8.8	4.7	63.7	8.2	5.0	48.0
2022	5.0	2.1	61.4	5.0	5.4	53.2

Table 16A-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	7	-	5
2002	15	-	3
2007	19	-	8
2012	9	-	5
2017	17	-	9
2022	13	-	3
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	62.3 (153.9)	-	-
2007	90.5 (223.5)	-	-
2012	33.5 (82.8)	2.0 (5.0)	-
2017	24.8 (61.2)	-	-
2022	67.7 (167.2)	-	-

Table 16A-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency								
1997	-	112	-	-	-	17	270	-	31
2002	-	148	2	-	-	29	252	9	-
2007	-	144	-	3	-	18	234	20	53
2012	-	133	10	-	-	9	202	24	4
2017	-	176	15	-	15	11	125	42	-
2022	67	229	14	4	3	29	138	75	61
year	Average Cover (%)								
1997	-	0.3	-	-	-	0.1	3.3	-	0.1
2002	-	0.7	0.0	-	-	0.6	4.7	0.1	-
2007	-	0.9	-	0.0	-	0.3	5.6	0.5	0.1
2012	-	0.5	0.2	-	-	0.5	3.0	0.9	0.0
2017	-	4.5	0.1	-	0.2	0.3	1.6	1.5	-
2022	1.4	8.1	0.3	0.0	0.2	0.7	2.4	4.6	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Buglossoides arvensis ^{ai} (corn gromwell)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Claytonia perfoliata (miner's lettuce)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1997	8	2	-	284	-	1	12	2	-	36	9	135	-	-	6	-	-
2002	5	-	-	195	1	2	-	34	-	82	6	178	-	-	23	4	5
2007	13	-	-	311	-	6	-	15	-	69	6	134	7	7	10	13	9
2012	9	4	-	252	-	-	-	15	-	13	22	11	3	8	15	6	6
2017	8	-	-	281	3	-	-	8	4	61	-	28	4	25	-	14	7
2022	7	-	26	199	-	2	-	6	-	100	10	131	7	22	28	1	9
year	Average Cover (%)																
1997	0.0	0.0	-	0.5	-	0.0	0.1	0.0	-	0.1	0.1	0.5	-	-	0.0	-	-
2002	0.0	-	-	0.8	0.0	0.0	-	0.2	-	0.2	0.1	2.0	-	-	0.0	0.0	0.1
2007	0.1	-	-	3.7	-	0.0	-	0.0	-	0.2	0.1	0.6	0.0	0.0	0.0	0.1	0.2
2012	0.2	0.0	-	0.9	-	-	-	0.1	-	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1
2017	0.0	-	-	6.8	0.0	-	-	0.0	0.0	0.2	-	0.1	0.0	0.1	-	0.0	0.2
2022	0.0	-	0.4	2.0	-	0.0	-	0.2	-	0.5	0.1	2.1	0.2	0.1	0.4	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine ^a (stickywilly)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus ^{ai} (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Microsteris gracilis ^a (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1997	4	-	12	-	2	93	-	-	58	-	-	37	-	-	37	-	-
2002	-	1	6	0	-	63	-	-	34	3	-	23	6	1	26	-	-
2007	1	141	7	-	9	124	5	5	185	23	-	48	54	2	39	3	-
2012	-	33	131	-	9	80	-	-	92	14	1	39	7	8	16	-	-
2017	-	5	24	-	5	137	-	-	20	26	-	23	22	4	7	-	-
2022	-	127	7	-	17	155	-	-	258	-	-	28	14	-	35	-	9
year	Average Cover (%)																
1997	0.0	-	0.0	-	0.0	1.0	-	-	0.1	-	-	0.5	-	-	0.1	-	-
2002	-	0.0	0.0	0.0	-	0.2	-	-	0.1	0.0	-	0.4	0.0	0.0	0.1	-	-
2007	0.0	0.5	0.0	-	0.0	1.7	0.0	0.1	1.0	0.1	-	0.4	0.1	0.1	0.1	0.0	-
2012	-	0.1	0.3	-	0.0	0.8	-	-	0.3	0.0	0.0	0.2	0.0	0.0	0.0	-	-
2017	-	0.0	0.0	-	0.0	4.2	-	-	0.1	0.1	-	0.8	0.1	0.2	0.0	-	-
2022	-	1.8	0.0	-	0.2	2.6	-	-	8.5	-	-	0.5	0.0	-	0.4	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	unknown annual forb ^a (unknown forb)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Zigadenus pumilus (foothill deathcamas)
year	Nested Frequency				
1997	5	7	2	3	0
2002	1	-	8	5	1
2007	34	-	7	-	-
2012	74	-	-	2	6
2017	28	-	-	-	15
2022	10	-	-	1	17
year	Average Cover (%)				
1997	0.0	0.0	0.0	0.0	0.0
2002	0.0	-	0.0	0.0	0.0
2007	0.2	-	0.1	-	-
2012	0.3	-	-	0.0	0.0
2017	0.2	-	-	-	0.1
2022	0.3	-	-	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	16.3	0.2	42.7
2012	11.3	0.6	44.2
2017	10.3	1.4	39.5
2022	9.7	0.6	25.3
year	Quadrat Cover (%)		
1997	13.2	0.1	18.6
2002	13.8	0.2	13.5
2007	12.5	0.0	22.6
2012	7.2	0.4	26.5
2017	5.6	0.8	23.4
2022	11.8	1.0	16.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2480	80	1	81	19	44	22	7	66/101
2002	3340	40	7	32	61	29	37	35	64/93
2007	2680	180	5	43	53	28	17	39	58/85
2012	2220	1460	14	45	41	31	15	24	59/78
2017	2840	240	20	43	37	24	6	20	45/63
2022	3260	40	26	44	30	35	7	31	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	40	-	0	50	50	0	0	50	- / -
2017	-	-	-	-	-	-	-	-	20/16
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	80	-	0	100	0	0	0	0	15/23
2002	120	-	0	83	17	0	0	17	10/14
2007	360	1160	39	56	6	0	0	0	22/26
2012	1000	220	20	80	0	0	0	0	22/29
2017	1840	720	12	85	3	0	0	2	19/25
2022	1300	120	29	42	29	2	29	31	- / -

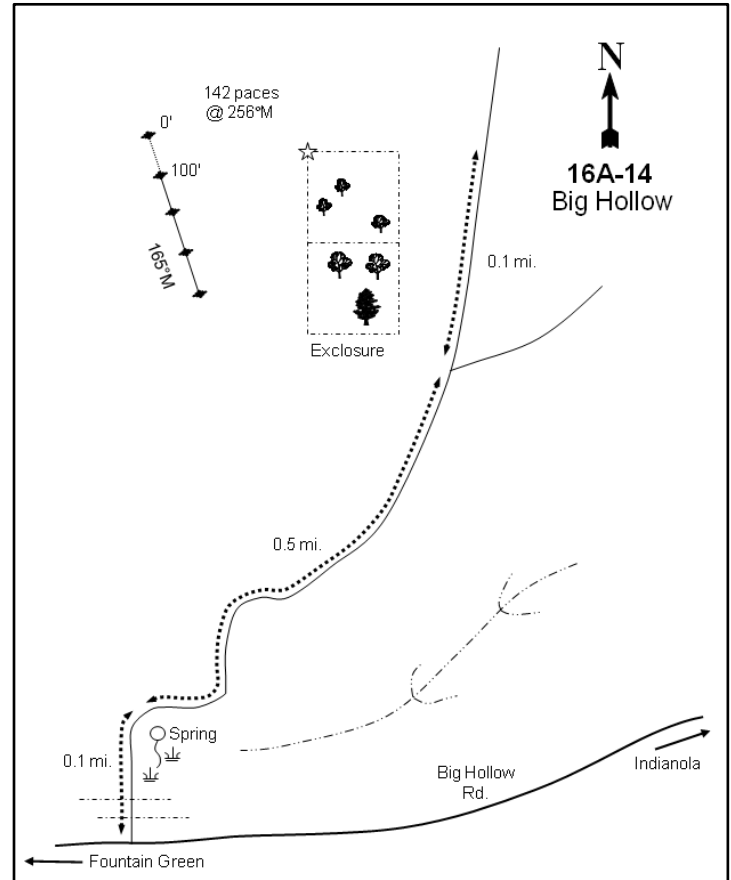
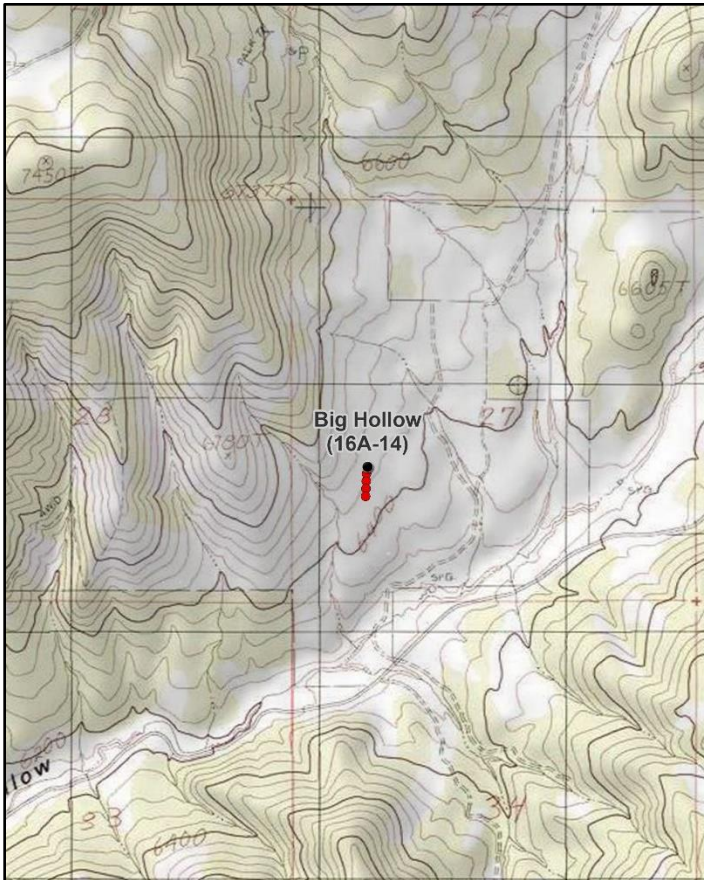
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Quercus gambelii ^p -- (Gambel oak)									
1997	10320	260	17	81	2	0	0	0	124/95
2002	15940	20	6	94	0	4	11	25	105/68
2007	10560	920	40	56	5	2	1	6	100/67
2012	12720	440	37	62	1	6	0	1	118/95
2017	13640	200	31	67	2	4	0	2	73/65
2022	10320	160	42	36	23	32	28	22	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-13.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	12.3	5.0	6.8	-0.3	1.8	0.0	55.6	Poor-Fair
2002	30.0	5.8	3.4	10.8	-0.5	2.3	0.0	51.9	Poor
2007	30.0	9.6	15.0	12.9	-0.8	2.8	0.0	69.5	Fair-Good
2012	30.0	12.3	15.0	9.3	-0.4	1.8	0.0	68.0	Fair-Good
2017	30.0	12.2	14.2	7.0	-3.4	3.4	0.0	63.6	Fair
2022	30.0	7.6	15.0	16.1	-7.2	5.0	0.0	66.4	Fair

BIG HOLLOW - STUDY NO. 16A-14

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Big Hollow SW; Township 13S, Range 3E, Section 27
NAD 83 UTM ZONE 12, 450138 East 4389859 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
185° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

At the intersection of State Street and 100 North in Fountain Green, go east on 100 North for 0.3 miles to the old dump. Continue up Big Hollow for 3.3 miles to a gate parallel to the road onto DWR land. Turn left (north) through the gates and go 0.1 miles to a spring in a wash. Continue on this road for 0.5 miles to a fork. Stay left at the fork and continue for 0.1 miles to the north end of an exclosure: park here. From the northwest corner of the exclosure, walk 142 paces at a bearing of 256 degrees magnetic to a tall fencepost: this 4-foot tall green fencepost is the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,450ft (1,966m)
Aspect	Southeast
Slope	10-15%
Sample Dates	08/22/1997, 10/25/2002, 05/24/2007, 05/15/2012, 05/16/2017, 05/10/2022

Table 16A-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1964	-
Seeding - Dribbler	Salt Creek Wildfire Rehabilitation	970	November 2007	221
Fire - Wildfire	Salt Creek	-	July 2007	25913
Chaining - One-Way Ely	Salt Creek Wildfire Rehabilitation	970	November 2007	221
Seeding - Aerial Before	Salt Creek Wildfire Rehabilitation	970	November 2007	1197
Fire - Wildfire	Wood Hollow	-	June-July 2012	47387
Seeding - Aerial	Wood Hollow Fire	2481	January 2013	301

Table 16A-14.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Aerial			Aerial	Nov 2007	1150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.00	0.91
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.00	0.76
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Nordan	1.00	0.86
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	1.00	0.84
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.50	0.47
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.61	0.54
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.39	0.34
G	<i>Thinopyrum intermedium</i>	Intermediate Wheatgrass	Oahe	1.00	0.92
G	<i>Thinopyrum intermedium</i>	Pubescent Wheatgrass		2.00	1.82
F	<i>Achillea millefolium</i>	Western Yarrow		0.10	0.10
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.00	0.99
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.00	0.93
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.25	0.20
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.00	1.84
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.00	0.94
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.25	0.09
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.25	0.08

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Dribbler			Dribbler	Nov 2007	335
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.45	0.42
S	<i>Purshia tridentata</i>	Bitterbrush	Millard UT	0.45	0.39

Mix Name			Application Type	Application Date	Acres
Wood Hollow Sage and Kochia			Aerial	Jan 2013	10486
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	0.51	0.47
S	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	Basin Big Sagebrush	Sanpete UT	0.05	0.01
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.27	0.09
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.07	0.02
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.61	0.17
S	<i>Bassia prostrata</i>	Forage Kochia	Elmore ID	0.25	0.20
S	<i>Bassia prostrata</i>	Forage Kochia	Sevier UT	0.25	0.19

Wildlife Habitat and Vegetation History**Table 16A-14.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Perennial Grass	Phase I
2017	Perennial-Annual Grass	No Encroachment
2022	Perennial Grass	No Encroachment

Site Notes

There is a perennial spring 200 yards (183m) southeast of the study. During the dry year of 1989, deer were using the area during the summer due to the availability of water. However, the majority of big game use usually occurs in winter and spring. A winter-killed fawn was found in 1989, and an antler drop was noted in 2007.

Soils**Table 16A-14.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.8	48.0	27.1	24.9	2.9	13.3	166.4	0.5	08/21/1997

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1989 through the 2007 sample year, this study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with antelope bitterbrush (*Purshia tridentata*) scattered throughout. After the 2007 sampling, a wildfire removed most of the browse component, and although some browse did remain, another fire in 2012 removed most of the extant shrubs (Table 16A-14.1, Table 16A-14.12, Table 16A-14.13). The site transitioned into one dominated by herbaceous species following the first fire in 2007. A mixture of perennial grasses including (but not limited to) the native species Indian ricegrass (*Achnatherum hymenoides*), needle and thread (*Hesperostipa comata*), and the introduced species crested wheatgrass (*Agropyron cristatum*) dominated the site from 2012 to 2022. Cover of the introduced annual species cheatgrass (*Bromus tectorum*) has fluctuated throughout the duration of the study, and it was a co-dominant site component in 2007 and 2012, but decreased substantially in 2022 (Table 16A-14.10). Forbs have remained rare in most years. However, annual forbs -- namely the introduced and weedy species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) -- contributed nearly 24% and 17% cover in 2017 and 2022, respectively (Table 16A-14.7, Table 16A-14.11).

Trend Summary Tables

Table 16A-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	17.2	5.9	-	-	-	-
2002	17.7	0.0	0.0	-	-	-
2007	11.6	7.5	0.1	15.5	7.2	0.1
2012	4.1	0.2	-	5.4	0.5	-
2017	0.0	0.7	-	-	0.8	-
2022	0.2	5.7	-	0.4	6.2	-

Table 16A-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	266	218	188	64	3.7	5.2	1.1	0.6
2002	284	248	295	56	4.9	9.2	2.5	0.7
2007	409	200	422	63	13.3	8.6	9.1	0.7
2012	268	304	368	100	5.2	17.5	4.1	1.0
2017	386	311	479	132	11.3	16.4	23.5	1.3
2022	280	305	464	122	1.3	24.3	18.0	0.8

Table 16A-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	11.1	1.6	43.9	17.5	5.1	33.6
2002	20.8	5.3	37.9	15.0	4.7	35.5
2007	13.1	4.5	35.3	13.0	4.1	48.3
2012	13.3	0.0	45.3	4.8	3.4	36.9
2017	15.6	0.0	27.0	17.9	7.5	48.0
2022	21.7	0.2	27.4	18.7	9.1	42.3

Table 16A-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	32	2	26
2002	3	14	1	73
2007	3	9	3	50
2012	4	1	4	2
2017	2	5	3	27
2022	-	5	13	3
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.0 (19.7)	62.3 (153.9)	0.7 (1.7)	-
2007	8.0 (19.7)	58.3 (144.0)	4.7 (11.6)	-
2012	3.6 (9.0)	0.7 (1.7)	3.4 (8.3)	-
2017	-	1.3 (3.3)	0.7 (1.7)	-
2022	-	1.3 (3.3)	25.5 (62.9)	-

Table 16A-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency												
1997	72	-	-	-	266	49	42	50	-	-	3	41	-
2002	50	-	22	-	284	73	88	60	5	-	-	42	-
2007	45	-	-	-	409	70	26	42	37	-	-	36	-
2012	82	60	3	-	267	86	7	37	56	-	-	65	42
2017	54	73	-	-	386	96	46	79	63	4	-	23	44
2022	39	77	-	6	280	107	-	110	44	8	-	33	77
year	Average Cover (%)												
1997	1.9	-	-	-	3.7	0.7	0.9	1.1	-	-	0.0	0.7	-
2002	1.1	-	0.1	-	4.8	2.3	2.2	1.0	0.0	-	-	2.4	-
2007	1.4	-	-	-	13.3	1.5	1.1	1.5	1.0	-	-	2.2	-
2012	3.5	2.5	0.1	-	5.1	4.6	0.2	1.3	2.2	-	-	2.3	0.9
2017	2.9	3.8	-	-	11.3	2.4	0.6	3.0	1.6	0.0	-	1.0	1.0
2022	3.8	6.6	-	0.1	1.3	1.0	-	5.6	0.9	0.1	-	2.5	3.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus newberryi (Newberry's milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (tittlepod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium ^a (goosefoot)	Chorispora tenella ^{ai} (crossflower)	Cirsium undulatum ^a (wavy/leaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha ^a (annual cryptantha)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)
year	Nested Frequency																
1997	-	-	163	-	-	2	-	-	21	2	-	18	-	-	-	-	-
2002	-	-	287	-	3	5	-	33	5	-	-	18	5	-	-	1	-
2007	-	-	415	6	-	15	-	42	6	1	-	-	11	-	3	47	4
2012	-	-	354	-	6	9	7	6	2	-	-	26	-	-	-	5	-
2017	2	-	474	-	2	16	-	2	2	-	-	9	-	-	-	-	-
2022	3	2	449	-	-	56	-	154	-	-	2	-	-	1	-	-	-
year	Average Cover (%)																
1997	-	-	1.0	-	-	0.0	-	-	0.1	0.0	-	0.0	-	-	-	-	-
2002	-	-	2.1	-	0.0	0.0	-	0.1	0.0	-	-	0.3	0.0	-	-	0.0	-
2007	-	-	8.4	0.0	-	0.0	-	0.1	0.0	0.0	-	-	0.0	-	0.0	0.3	0.0
2012	-	-	3.3	-	0.0	0.0	0.0	0.0	0.0	-	-	0.1	-	-	-	0.0	-
2017	0.0	-	17.5	-	0.0	0.1	-	0.0	0.0	-	-	0.1	-	-	-	-	-
2022	0.0	0.0	14.2	-	-	0.2	-	0.9	-	-	0.0	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Eriogonum cernuum ^a (nodding buckwheat)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Gilia inconspicua ^a (shy gilia)																		
Hackelia patens (spotted stickseed)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^a (flatspine stickseed)																		
Machaeranthera canescens (hoary tansyaster)																		
Medicago sativa ⁱ (alfalfa)																		
Microsteris gracilis ^a (slender phlox)																		
Onobrychis vicifolia ⁱ (sainfoin)																		
Orobanche fasciculata (clustered broomrape)																		
Penstemon (beardtongue)																		
Polygonum douglasii ^a (Douglas' knotweed)																		
Salsola tragus ^{ai} (prickly Russian thistle)																		
Sisymbrium altissimum ^{ai} (tall tumbleweed)																		
Sphaeralcea coccinea (scarlet globemallow)																		
Tragopogon dubius ^{ai} (yellow salsify)																		
year	Nested Frequency																	
1997	2	-	1	5	1	-	-	-	-	-	1	-	16	-	-	37	3	
2002	3	5	-	-	-	-	-	-	12	-	-	1	2	-	-	46	1	
2007	1	9	6	-	6	38	-	-	-	-	-	-	-	-	3	39	3	
2012	-	-	-	-	1	-	3	3	-	7	-	-	-	-	2	81	75	
2017	2	294	-	-	2	2	-	3	-	-	-	-	-	4	-	117	14	
2022	2	152	4	-	-	7	-	-	-	-	-	-	-	-	-	70	7	
year	Average Cover (%)																	
1997	0.0	-	0.0	0.0	0.0	-	-	-	-	-	0.0	-	0.1	-	-	0.5	0.0	
2002	0.0	0.0	-	-	-	-	-	-	0.0	-	-	0.0	0.0	-	-	0.6	0.0	
2007	0.0	0.0	0.0	-	0.0	0.1	-	-	-	-	-	-	-	-	0.0	0.6	0.0	
2012	-	-	-	-	0.0	-	0.0	0.0	-	0.1	-	-	-	-	0.0	0.8	0.6	
2017	0.0	5.8	-	-	0.0	0.0	-	0.0	-	-	-	-	-	0.1	-	1.2	0.1	
2022	0.0	2.8	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-	0.6	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)						
Bassia prostrata ^{pi} (forage kochia)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma ⁱ (Utah juniper)						
Opuntia polyacantha (plains pricklypear)						
Purshia tridentata ^p (antelope bitterbrush)						
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	13.5	-	7.1	0.1	0.1	2
2012	2	-	0.4	-	0.1	3.4
2017	-	-	0.8	-	-	-
2022	-	-	6.2	-	-	0.4
year	Quadrat Cover (%)					
1997	15.0	-	5.7	-	0.2	2.3
2002	15.4	-	0.0	0.0	-	2.4
2007	9.9	-	7.3	0.1	0.1	1.8
2012	2.0	-	0.1	-	0.0	2.0
2017	-	0.0	0.7	-	-	-
2022	-	0.1	5.7	-	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1800	80	10	63	27	3	0	9	83/97
2002	1900	180	7	58	35	18	5	19	110/128
2007	1580	20	1	53	46	22	1	29	89/112
2012	440	-	0	82	18	0	0	9	42/70
2017	-	-	-	-	-	-	-	-	33/38
2022	-	-	-	-	-	-	-	-	-/-
Bassia prostrata^{PI} -- (forage kochia)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	50	50	0	0	50	0	5/16
2022	40	-	0	100	0	0	50	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	14/23
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	22560	20	30	70	0	0	0	0	24/27
2002	160	20	100	0	0	0	0	0	-/-
2007	9400	1120	1	98	0	0	0	11	23/31
2012	840	-	14	71	14	17	0	17	14/22
2017	1280	80	14	86	0	3	0	0	16/24
2022	17120	60	3	95	2	0	0	2	-/-
Juniperus osteosperma^I -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	100	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	160	-	13	88	0	0	0	0	-/15
2002	60	-	0	67	33	67	0	0	13/26
2007	60	-	0	100	0	0	0	0	16/36
2012	40	-	0	100	0	0	0	50	10/16
2017	-	-	-	-	-	-	-	-	14/42
2022	-	-	-	-	-	-	-	-	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	7/11
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	164/238
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1997	280	-	29	50	21	36	29	21	121/172
2002	320	-	0	38	63	6	88	25	173/156
2007	260	-	0	23	77	8	69	8	152/158
2012	140	-	0	86	14	57	0	0	68/116
2017	20	-	0	100	0	100	0	0	47/107
2022	20	-	0	0	100	100	0	100	-/-
Tetradymia canescens -- (spineless horsebrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	20/36
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	20/26

t - Tree Species; p - Preferred Browse; i - Introduced Species

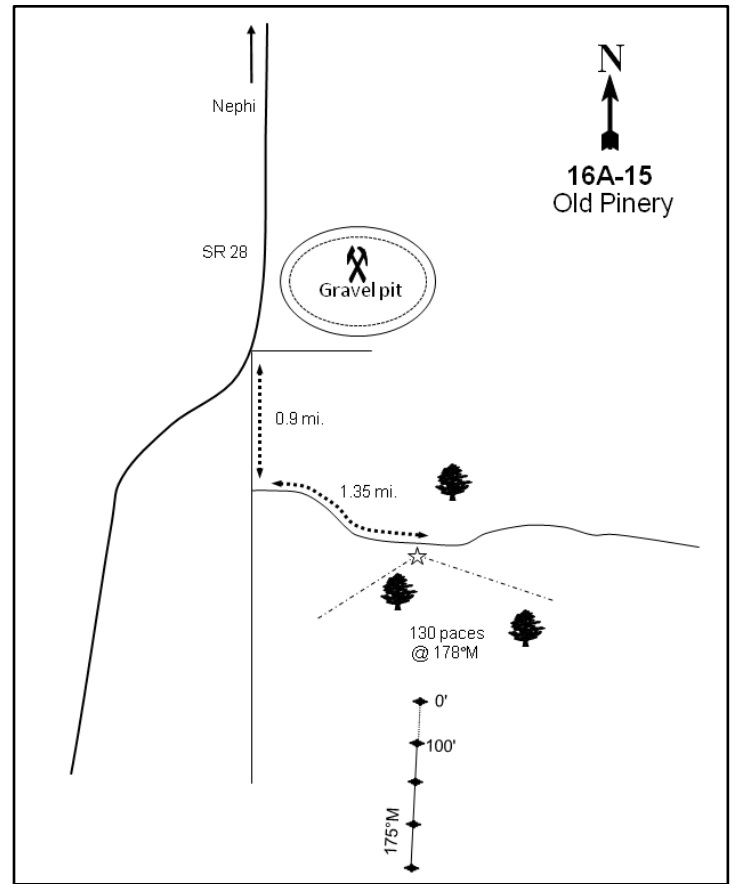
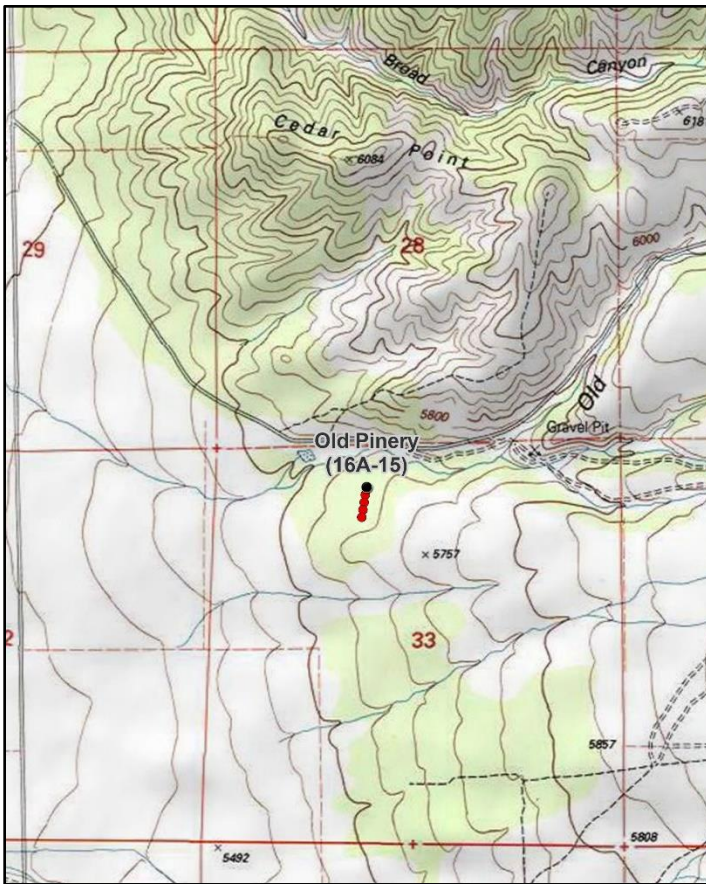
Table 16A-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	23	-	-	-	-	-	16.0
2007	30	-	10	20	20	50	16.6
2012	6	-	-	60	40	-	24.0

Table 16A-14.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	22.1	7.2	6.2	10.4	-2.8	1.3	0.0	44.5	Poor
2002	22.8	3.5	3.2	18.3	-3.7	1.4	0.0	45.4	Poor
2007	19.9	0.1	0.6	17.3	-10.0	1.4	0.0	29.3	Very Poor
2012	7.6	10.3	0.0	30.0	-3.9	2.0	0.0	45.9	Poor
2017	0.0	0.0	0.0	30.0	-8.5	2.6	0.0	24.1	Very Poor
2022	0.6	0.0	0.0	30.0	-1.0	1.5	0.0	31.1	Very Poor

OLD PINERY - STUDY NO. 16A-15



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Nephi SW; Township 13S, Range 1E, Section 33
NAD 83 UTM ZONE 12, 428825 East 4388668 North

Transect Information

Browse Tag # (0' Stake)	3960
Transect Bearing	175° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the southern exit (exit 222) of I-15 in Nephi, proceed south on U.S. 28 for about 1.0 mile to a dirt road just past a gravel pit. Turn left on the dirt road and continue south for 0.9 miles to another intersection. Turn left at the intersection and proceed southeast for 1.35 miles toward Old Pinery Canyon. Stop at the corner of the fence line. From the easternmost of the two middle fenceposts, the 0-foot marker of the baseline is located 130 paces away at an azimuth of 178 degrees magnetic and is marked by browse tag #3960.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,670ft (1,728m)
Aspect	West
Slope	5%
Sample Dates	05/27/1997, 10/25/2002, 05/31/2007, 05/24/2012, 05/17/2017, 05/11/2022

Table 16A-15.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Early 1980s	-
Seeding - Seed Unknown	-	-	Early 1980s	-

Wildlife Habitat and Vegetation History

Table 16A-15.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Annual Grass	No Encroachment
1989	Perennial Grass	Phase I
1997	Perennial Grass/Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2022	Bulbous Bluegrass	Phase I

Site Notes

A dead deer and cow were observed on site in 2007.

Soils

Table 16A-15.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.2	37.4	39.7	22.8	1.8	19.2	208.0	0.4	05/27/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

From establishment in 1983 through 1989, annual grasses and perennial grasses (respectively) were the dominant components on this study site (Photos). Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), however, has been present through the duration of the study period, and the site transitioned to one dominated by sagebrush in 1997. Sagebrush density has exhibited an overall increase from 1997 to 2012, although recruitment of young decreased. In 2022, sagebrush was observed to have a significant decrease in density and cover, while the majority of the population displayed poor vigor and decadence (Table 16A-15.12, Table 16A-15.13). Cover and abundance of the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has also increased each sample year, and it has been a co-dominant site component since 2002 (Table 16A-15.10). The sod formed by bulbous bluegrass is likely having an effect on water availability and may be contributing to the decrease in health in this community. Annual forbs have generally been more common than their perennial counterparts, and the introduced weedy species redstem stork's bill (*Erodium cicutarium*) provided nearly 16% cover in 2022 (Table 16A-15.7, Table 16A-15.11). Utah juniper (*Juniperus osteosperma*) has been observed on site since 1989, and the site has been considered to be within Phase I of woodland succession since that time (Photos, Table 16A-15.4, Table 16A-15.14).

Trend Summary Tables

Table 16A-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	5.9	0.5	0.1	-	-	-
2002	10.0	0.8	0.8	-	-	-
2007	12.6	0.1	0.8	16.3	0.1	1.6
2012	17.0	0.3	1.0	22.0	0.4	2.2
2017	9.5	0.0	2.2	14.1	-	3.3
2022	3.6	0.0	3.2	3.4	0.1	5.4

Table 16A-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	423	362	452	133	7.8	14.8	6.1	0.8
2002	305	418	281	64	3.5	31.0	2.6	0.3
2007	396	450	343	71	10.1	33.4	6.8	0.4
2012	201	464	79	69	1.9	44.2	0.4	0.4
2017	317	454	352	100	12.8	41.7	18.6	1.2
2022	309	444	356	107	6.5	42.1	17.8	1.5

Table 16A-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.3	4.0	35.8	0.7	1.0	42.7
2002	16.3	1.6	38.3	1.0	1.2	53.6
2007	11.8	3.7	35.5	1.6	1.0	61.1
2012	4.6	3.5	41.5	1.5	0.7	66.5
2017	11.5	6.9	30.9	2.5	1.4	69.3
2022	7.4	1.1	48.0	1.1	1.1	64.3

Table 16A-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	18	42	-	-	12
2002	9	58	1	-	12
2007	7	67	4	-	77
2012	4	28	1	-	13
2017	-	31	-	-	26
2022	-	37	-	-	9
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	21.8 (53.8)	95.1 (235.0)	-	1.2 (2.9)	-
2007	11.6 (28.7)	89.8 (221.8)	-	-	-
2012	1.5 (3.6)	19.4 (48.0)	-	-	-
2017	4.4 (10.8)	60.3 (149.0)	-	-	-
2022	2.9 (7.2)	22.1 (54.6)	-	-	-

Table 16A-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency											
1997	122	-	-	-	305	-	191	74	-	211	38	339
2002	116	-	20	-	298	3	170	297	5	155	67	89
2007	96	-	12	-	382	-	146	426	-	49	38	119
2012	11	-	-	-	198	4	156	393	-	162	30	4
2017	28	-	-	-	317	2	106	438	-	143	72	-
2022	35	1	-	0	307	-	109	427	-	107	63	3
year	Average Cover (%)											
1997	5.2	-	-	-	2.3	-	3.5	0.9	-	3.8	1.4	5.5
2002	6.1	-	0.0	-	3.3	0.0	3.8	14.8	0.1	2.8	3.4	0.2
2007	1.0	-	0.1	-	9.0	-	1.6	29.0	-	0.6	1.2	1.1
2012	0.3	-	-	-	1.8	0.0	2.8	34.4	-	5.3	1.5	0.0
2017	0.9	-	-	-	12.8	0.0	1.8	32.4	-	3.1	3.5	-
2022	1.3	0.0	-	0.0	6.5	-	3.8	30.4	-	1.3	5.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus cibarius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Convolvulus arvensis ⁿⁱ (field bindweed)	Crepis acuminata (tapertip hawksbeard)	Cymopterus longipes (longstalk springparsley)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
1997	8	50	337	-	9	2	13	345	10	226	2	-	18	-	80	2	6
2002	5	5	147	-	4	3	3	192	3	110	-	-	8	5	7	-	6
2007	5	-	51	-	1	3	1	35	1	118	1	-	10	147	-	-	1
2012	2	-	14	-	3	2	-	-	-	1	-	-	2	18	2	-	-
2017	17	11	57	3	2	-	17	17	0	14	-	-	14	8	-	-	-
2022	8	9	97	4	0	-	13	23	4	52	4	1	5	175	-	-	-
year	Average Cover (%)																
1997	0.0	0.1	0.9	-	0.1	0.1	0.0	2.1	0.1	0.8	0.0	-	0.2	-	0.1	0.0	0.0
2002	0.0	0.0	0.3	-	0.0	0.0	0.0	1.0	0.1	0.6	-	-	0.1	0.0	0.0	-	0.0
2007	0.0	-	0.3	-	0.0	0.0	0.0	0.1	0.0	0.6	0.0	-	0.0	0.7	-	-	0.0
2012	0.0	-	0.0	-	0.0	0.0	-	-	-	0.0	-	-	0.0	0.2	0.0	-	-
2017	0.1	0.0	0.3	0.0	0.3	-	0.1	0.1	0.0	0.0	-	-	0.1	0.0	-	-	-
2022	0.2	0.0	0.7	0.0	0.0	-	0.0	0.1	0.1	0.2	0.2	0.0	0.0	0.8	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)												
<i>Galium aparine</i> ^a (stickywilly)												
<i>Grindelia squarrosa</i> (curlycup gumweed)												
<i>Holosteum umbellatum</i> ^{ai} (jagged chickweed)												
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)												
<i>Microseris nutans</i> (nodding microseris)												
<i>Microsteris gracilis</i> ^a (slender phlox)												
<i>Phlox longifolia</i> (longleaf phlox)												
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)												
<i>Sphaeralcea coccinea</i> (scarlet globemallow)												
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)												
<i>Vicia americana</i> (American vetch)												
year	Nested Frequency											
1997	184	-	3	-	11	-	67	37	23	-	9	11
2002	34	-	-	7	-	-	5	26	1	-	-	11
2007	279	1	-	74	3	-	13	44	1	1	3	9
2012	22	-	-	42	5	-	-	55	-	-	3	9
2017	324	-	-	-	22	3	-	44	-	-	3	9
2022	283	-	-	25	-	-	-	70	-	-	3	8
year	Average Cover (%)											
1997	1.7	-	0.0	-	0.0	-	0.2	0.1	0.1	-	0.1	0.1
2002	0.6	-	-	0.0	-	-	0.0	0.1	0.0	-	-	0.1
2007	4.9	0.0	-	0.1	0.0	-	0.0	0.2	0.0	0.0	0.0	0.1
2012	0.0	-	-	0.1	0.0	-	-	0.3	-	-	0.0	0.0
2017	18.2	-	-	-	0.0	0.0	-	0.5	-	-	0.0	0.0
2022	15.8	-	-	0.0	-	-	-	0.7	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)				
<i>Gutierrezia sarothrae</i> (broom snakeweed)				
<i>Juniperus osteosperma</i> ^a (Utah juniper)				
<i>Purshia tridentata</i> ^p (antelope bitterbrush)				
year	Line Intercept Cover (%)			
1997	-	-	-	-
2002	-	-	-	-
2007	15.8	0.1	1.6	0.5
2012	20.6	0.4	2.2	1.4
2017	12.9	-	3.3	1.2
2022	2	0.1	5.4	1.4
year	Quadrat Cover (%)			
1997	5.5	0.5	0.1	0.4
2002	10.0	0.8	0.8	0.1
2007	12.5	0.1	0.8	0.1
2012	15.8	0.3	1.0	1.3
2017	8.9	0.0	2.2	0.7
2022	2.7	0.0	3.2	0.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	2040	920	69	30	1	11	10	0	57/103
2002	3340	140	35	60	5	23	8	1	47/70
2007	2700	40	4	92	4	35	17	3	61/89
2012	2220	20	6	85	9	17	5	5	63/96
2017	2460	20	0	49	51	24	2	45	55/90
2022	820	20	7	34	59	37	42	59	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	46/66
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1560	140	18	82	0	0	0	0	18/20
2002	900	-	0	76	24	0	0	4	18/21
2007	1100	60	24	73	4	0	0	0	21/19
2012	320	-	6	94	0	0	0	0	22/23
2017	120	-	50	50	0	0	0	0	19/21
2022	140	-	43	57	0	0	0	0	- / -
Juniperus osteosperma^I -- (Utah juniper)									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	342/231
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	13/55
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
1997	60	-	0	100	0	0	100	0	30/118
2002	80	-	0	100	0	0	100	0	45/140
2007	100	-	0	100	0	0	100	0	44/131
2012	60	-	0	100	0	0	100	0	43/143
2017	80	-	0	75	25	0	75	25	47/155
2022	80	-	0	75	25	25	75	25	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

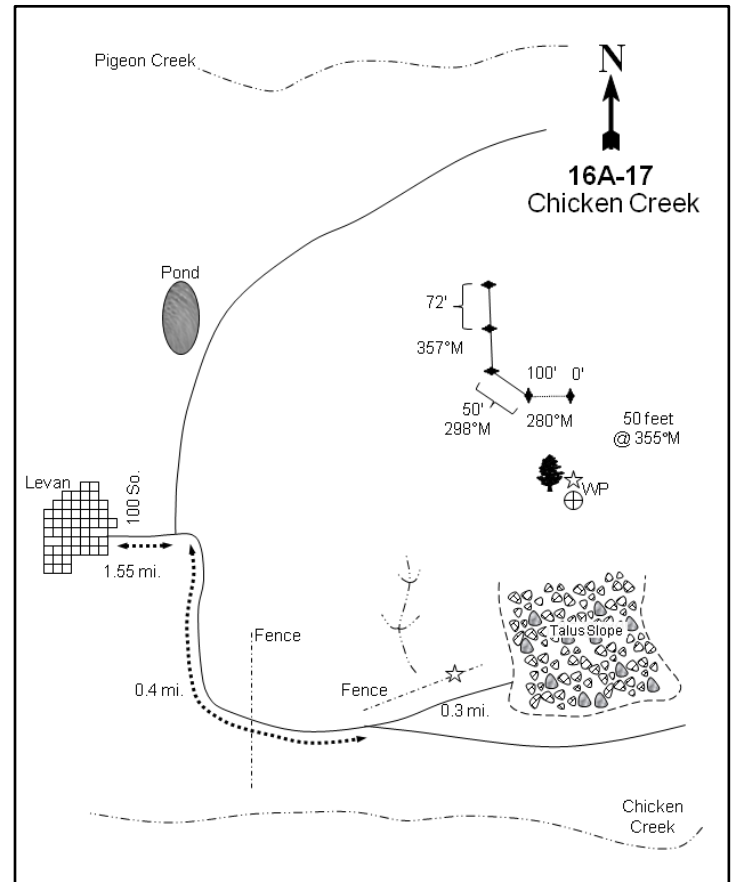
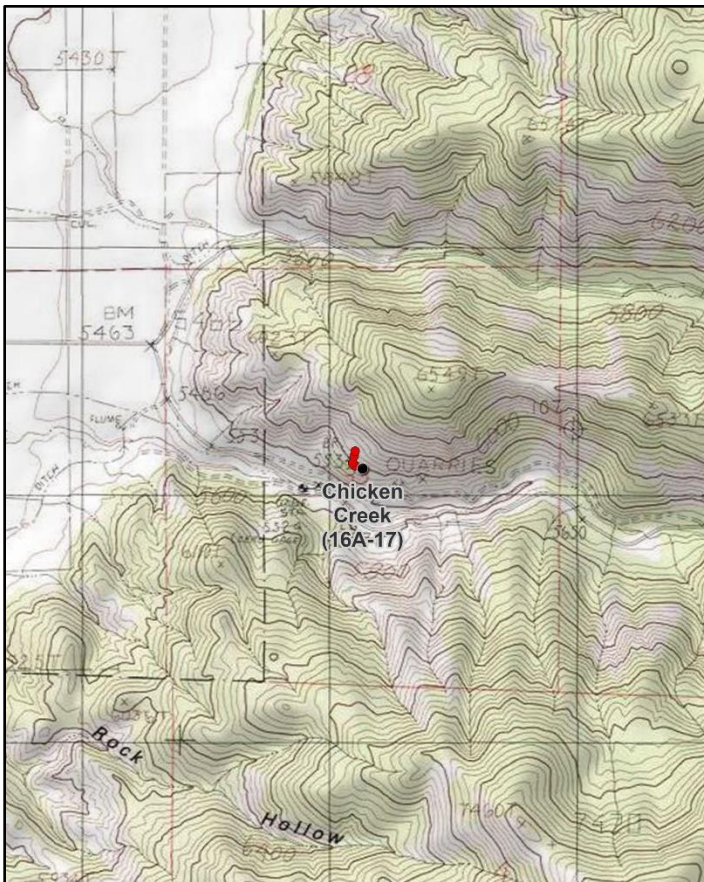
Table 16A-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	30	-	-	-	-	-	15.8
2007	10	-	-	43	14	43	25.1
2012	10	-	-	25	13	63	24.5
2017	10	-	-	-	43	57	23.7
2022	10	-	-	-	14	86	40.6

Table 16A-16.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	7.5	14.7	15.0	27.7	-5.8	1.7	-2.0	58.7	Fair
2002	12.6	13.4	15.0	30.0	-2.6	0.7	0.0	69.0	Good
2007	20.5	13.7	1.8	8.9	-7.6	0.8	-2.0	36.2	Very Poor-Poor
2012	27.9	12.5	2.9	19.6	-1.4	0.7	0.0	62.2	Fair
2017	17.9	0.3	0.0	18.5	-9.6	2.4	0.0	29.6	Very Poor
2022	4.6	0.0	0.0	23.3	-4.9	2.6	-2.0	23.6	Very Poor

CHICKEN CREEK - STUDY NO. 16A-17

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Levan SW; Township 14S, Range 1E, Section 33
NAD 83 UTM ZONE 12, 429071 East 4378303 North

Transect Information

Browse Tag # (0' Stake)	590
Transect Bearing	280° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (95ft), Line 4 (59ft)
Belt Marker Placement	No Rebar

Directions to Site

From the intersection of 100 South and Main Street in Levan, proceed east on 100 South for 1.55 miles to a fork. Turn right (south) and proceed 0.40 miles toward Chicken Creek to a road to the left. Turn left and proceed east for 0.30 miles to a green steel "T" fencepost on the north side of the road (the fencepost may no longer exist). From the fencepost, walk up-slope at an azimuth of 344 degrees true to the easternmost juniper on the ridge; there is a section marker and witness post next to the juniper. The 0-foot baseline stake is located 50 feet away at an azimuth of 355 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	CHICKEN CREEK C & H
Elevation	5,775ft (1,760m)
Aspect	South
Slope	10-60%
Sample Dates	05/29/1997, 05/22/2002, 05/30/2007, 05/24/2012, 05/25/2017, 06/01/2022

Wildlife Habitat and Vegetation History**Table 16A-17.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
1997	Mixed Mountain Brush/Annual Grass	Phase I
2002	Mixed Mountain Brush	Phase I
2007	Mixed Mountain Brush/Annual Grass	Phase I
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush/Annual Grass	Phase I

Site Notes

Three live and two dead deer were observed in 2007, and deer bones were seen in 2017.

Soils**Table 16A-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.9	39.5	30.7	29.8	2.8	11.6	192.0	1.2	05/29/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Very Steep Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Since 1983, this study site has remained dominated by a number of mixed mountain brush species, including Stansbury cliffrose (*Purshia stansburiana*) and Gambel oak (*Quercus gambelii*). Also common are alderleaf mountain mahogany (*Cercocarpus montanus*) and Utah serviceberry (*Amelanchier utahensis*). Density of oak decreased significantly in 2022, yet oak plants have been considered young in most sample years. This suggests that oak is a stable population through persistent recruitment (Photos, Table 16A-17.12, Table 16A-17.13). Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*), have provided a majority of the herbaceous cover in many sample years. However, the introduced annual grass cheatgrass (*Bromus tectorum*) has also been observed each year, and annual grasses co-dominated the site in 1997, 2007, and 2022 (Table 16A-17.10). Forbs have generally remained rare, although cover of annual forbs increased over 12% between 2012 and 2017, and then another 5% in 2022. The introduced and noxious annual forb gypsyflower (*Cynoglossum officinale*) was observed in 2012, but was not present in 2017 or 2022 (Table 16A-17.7, Table 16A-17.11). Utah juniper trees (*Juniperus osteosperma*) have been present throughout the study period, placing the site in Phase I of woodland succession (Photos, Table 16A-17.4, Table 16A-17.12, Table 16A-17.13, Table 16A-17.14).

Trend Summary Tables

Table 16A-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	5.9	0.1	-	-	-	-
2002	5.1	0.5	1.0	-	-	-
2007	3.8	1.0	2.1	12.2	1.0	4.7
2012	7.7	1.4	2.2	17.7	1.7	7.5
2017	5.3	1.0	1.8	15.9	0.7	6.0
2022	4.9	1.8	1.3	10.3	2.8	4.1

Table 16A-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	310	168	159	93	10.2	12.7	3.1	1.4
2002	301	143	142	46	8.6	11.7	2.5	0.8
2007	300	174	123	60	10.3	12.8	2.7	1.6
2012	229	178	185	83	6.8	15.8	2.8	2.1
2017	216	179	313	71	7.7	13.5	15.0	1.9
2022	304	158	369	89	7.0	9.7	20.4	2.2

Table 16A-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.9	0.3	27.7	26.3	13.5	29.6
2002	5.5	0.1	30.6	25.9	22.5	29.3
2007	3.0	0.1	32.5	22.5	20.3	31.7
2012	2.6	0.0	37.8	26.8	18.4	39.8
2017	2.1	0.3	26.9	33.8	28.0	40.8
2022	3.9	0.2	25.9	34.4	25.4	35.4

Table 16A-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	39	2	-
2002	-	36	-	2
2007	-	26	3	11
2012	-	14	-	9
2017	-	16	1	3
2022	1	27	1	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	75.1 (185.4)	2.0 (5.0)	-
2007	-	54.3 (134.1)	-	-
2012	-	26.2 (64.6)	0.7 (1.7)	-
2017	-	34.2 (84.4)	-	-
2022	-	62.3 (153.9)	-	-

Table 16A-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES					
Bromus arvensis ^{ai} (field brome)					
Bromus tectorum ^{ai} (cheatgrass)					
Poa bulbosa ⁱ (bulbous bluegrass)					
Poa secunda (Sandberg bluegrass)					
Pseudoroegneria spicata (bluebunch wheatgrass)					
year	Nested Frequency				
1997	-	310	-	20	157
2002	7	301	-	17	135
2007	-	300	-	29	161
2012	-	229	2	19	169
2017	6	211	8	7	177
2022	1	303	3	16	144
year	Average Cover (%)				
1997	-	10.2	-	0.4	12.4
2002	0.0	8.6	-	0.1	11.6
2007	-	10.3	-	0.7	12.2
2012	-	6.8	0.0	0.3	15.5
2017	0.0	7.7	0.0	0.1	13.3
2022	0.0	7.0	0.0	0.1	9.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Allium acuminatum (tapertip onion)																	
Alyssum alyssoides ^{ai} (pale madwort)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Apocynum cannabinum (Indianhemp)																	
Artemisia ludoviciana (white sagebrush)																	
Asclepias asperula (spider milkweed)																	
Brassicaceae ^a (mustard family)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa ^{ai} (littledod false flax)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Chorispora tenella ^{ai} (crossflower)																	
Cirsium undulatum ^a (wavyleaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Cryptantha gracilis ^a (narrowstem cryptantha)																	
Cryptantha humilis (roundspike cryptantha)																	
Cymopterus acaulis (plains springparsley)																	
Cynoglossum officinale ^{aim} (gypsyflower)																	
year	Nested Frequency																
1997	-	-	-	-	-	-	9	-	24	6	7	18	-	-	-	-	-
2002	1	-	-	-	-	-	-	-	12	15	14	3	2	-	2	1	-
2007	1	-	19	-	3	-	-	-	6	9	8	1	-	2	4	-	-
2012	-	-	74	-	5	-	-	-	52	7	2	2	1	9	1	11	3
2017	1	90	162	3	3	0	-	-	4	15	3	2	4	-	9	-	-
2022	4	250	102	3	3	-	-	1	-	26	10	0	-	5	-	-	-
year	Average Cover (%)																
1997	-	-	-	-	-	-	0.0	-	0.1	0.0	0.0	0.5	-	-	-	-	-
2002	0.0	-	-	-	-	-	-	-	0.1	0.1	0.1	0.5	0.0	-	0.0	0.0	-
2007	0.0	-	0.1	-	0.1	-	-	-	0.0	0.0	0.1	0.3	-	0.0	0.0	-	-
2012	-	-	0.2	-	0.0	-	-	-	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.4
2017	0.0	1.5	5.7	0.2	0.1	0.0	-	-	0.0	0.0	0.0	0.1	0.0	-	0.0	-	-
2022	0.0	10.6	2.6	0.3	0.1	-	-	0.0	-	0.2	0.3	0.0	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Descurainia pinnata ^a (western tansymustard)																		
Erigeron divergens ^a (spreading fleabane)																		
Eriogonum brevicale (shortstem buckwheat)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Galium aparine ^a (stickywilly)																		
Gilia inospicua ^a (shy gilia)																		
Hackelia patens (spotted stickseed)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^a (flatspine stickseed)																		
Lathyrus brachycalyx (Bonneville pea)																		
Lithospermum ruderale (western stone seed)																		
Machaeranthera canescens (hoary tansyaster)																		
Malcolmia africana ^{ai} (African mustard)																		
Phacelia linearis ^a (threadleaf phacelia)																		
Phlox longifolia (longleaf phlox)																		
Physalis hederifolia (ivyleaf groundcherry)																		
Silene antirrhina ^a (sleepy silene)																		
year	Nested Frequency																	
1997	21	-	11	15	70	-	20	6	8	28	-	1	-	-	23	2	-	
2002	8	-	5	30	62	6	3	7	25	7	4	-	-	9	7	-	-	
2007	8	2	6	22	48	3	14	3	16	12	-	-	-	-	10	-	10	
2012	15	11	12	19	67	3	11	30	2	19	-	-	-	-	14	-	9	
2017	13	2	1	38	101	-	21	9	25	13	-	2	-	2	14	-	4	
2022	32	4	13	59	72	10	43	0	20	14	-	-	2	11	12	-	-	
year	Average Cover (%)																	
1997	0.1	-	0.5	0.1	2.0	-	0.4	0.0	0.0	0.3	-	0.0	-	-	0.1	0.0	-	
2002	0.0	-	0.1	0.3	0.9	0.0	0.4	0.0	0.2	0.0	0.1	-	-	0.0	0.0	-	-	
2007	0.0	0.0	0.1	0.1	1.6	0.0	0.8	0.0	0.2	0.4	-	-	-	-	0.1	-	0.0	
2012	0.0	0.3	0.8	0.1	1.2	0.0	0.5	0.1	0.0	0.5	-	-	-	-	0.0	-	0.0	
2017	0.3	0.1	0.0	0.3	6.8	-	1.1	0.0	0.1	0.2	-	0.0	-	0.0	0.1	-	0.0	
2022	1.1	0.3	0.2	0.8	3.5	0.2	1.0	0.0	0.1	0.4	-	-	0.0	0.5	0.1	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
Sisymbrium altissimum ^{ai} (tall tumblemustard)					
Streptanthus cordatus (heartleaf twistflower)					
Tragopogon dubius ^{ai} (yellow salsify)					
unknown annual forb ^a (unknown forb)					
Veronica biloba ^{ai} (two-lobed speedwell)					
year	Nested Frequency				
1997	40	24	0	5	-
2002	13	19	-	-	5
2007	6	19	0	-	3
2012	4	29	7	-	-
2017	5	8	-	-	6
2022	1	4	-	-	-
year	Average Cover (%)				
1997	0.2	0.1	0.0	0.0	-
2002	0.1	0.1	-	-	0.0
2007	0.1	0.1	0.0	-	0.0
2012	0.0	0.1	0.0	-	-
2017	0.0	0.1	-	-	0.0
2022	0.0	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Purshia stansburiana ^p (Stansbury cliffrose)	Quercus gambelii ^p (Gambel oak)	Rhus glabra ^p (smooth sumac)	Rhus trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2007	0.5	-	0	1.5	0.2	4.7	0.8	-	2	8.2	-	-
2012	0.5	0.3	0.7	0.9	0.1	7.5	1.6	0.3	3.4	11	-	0.6
2017	0.5	-	1.2	0.1	-	6	0.7	-	1.7	12.4	-	-
2022	0.2	-	-	0.4	-	4.1	2.8	-	2.3	7.4	-	-
year	Quadrat Cover (%)											
1997	0.4	-	-	0.9	0.0	-	0.1	0.0	3.0	1.6	0.0	-
2002	-	-	0.4	0.7	0.1	1.0	0.3	-	3.2	0.8	-	-
2007	0.4	-	0.0	0.5	0.0	2.1	1.0	-	1.5	1.3	-	-
2012	0.4	0.0	0.4	0.5	0.1	2.2	1.3	0.0	1.9	3.7	0.0	0.8
2017	1.1	0.1	0.0	1.0	-	1.8	1.0	-	1.9	1.2	-	-
2022	0.1	-	-	0.1	-	1.3	1.8	-	2.3	2.3	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	80	-	75	25	0	75	25	0	134/178
2002	60	-	0	0	100	0	100	0	150/162
2007	80	-	50	0	50	25	50	0	98/138
2012	140	-	86	14	0	14	0	0	123/186
2017	80	-	0	100	0	0	50	0	164/180
2022	40	-	0	100	0	0	100	0	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
1997	-	-	-	-	-	-	-	-	86/76
2002	-	-	-	-	-	-	-	-	60/74
2007	-	-	-	-	-	-	-	-	76/83
2012	-	-	-	-	-	-	-	-	93/113
2017	20	40	0	0	100	0	100	100	82/89
2022	-	-	-	-	-	-	-	-	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1997	20	-	0	100	0	100	0	0	210/192
2002	20	-	0	100	0	0	100	0	182/230
2007	-	-	-	-	-	-	-	-	224/253
2012	60	-	33	67	0	33	0	0	166/222
2017	-	-	-	-	-	-	-	-	168/218
2022	20	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	120	-	17	50	33	33	0	17	68/107
2002	100	-	0	40	60	0	40	0	68/89
2007	80	-	0	25	75	25	0	50	78/111
2012	40	-	0	50	50	50	0	50	71/112
2017	100	-	0	60	40	20	0	40	82/118
2022	60	-	0	100	0	33	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	180	-	22	78	0	0	0	0	22/39
2002	140	-	0	57	43	0	0	14	12/27
2007	40	-	50	50	0	0	0	0	40/69
2012	140	-	0	100	0	0	0	0	34/47
2017	20	-	0	100	0	0	0	0	29/52
2022	60	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1997	2740	-	17	83	0	0	0	0	8/12
2002	4840	-	10	87	3	0	0	7	6/9
2007	7300	-	7	93	0	0	0	0	8/12
2012	6140	-	37	63	0	0	0	0	9/13
2017	5100	-	5	95	0	0	0	0	9/14
2022	8540	40	28	72	0	0	0	0	- / -
Prunus virginiana^P -- (chokecherry)									
1997	300	80	73	20	7	20	13	0	47/41
2002	40	-	0	50	50	50	50	50	15/20
2007	60	-	100	0	0	0	100	0	20/32
2012	320	-	0	100	0	0	0	0	24/32
2017	-	-	-	-	-	-	-	-	24/26
2022	-	-	-	-	-	-	-	-	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	240	20	0	67	33	25	50	17	132/121
2002	460	-	0	39	61	4	56	22	135/147
2007	320	-	0	50	50	6	75	38	157/167
2012	220	-	9	73	18	9	27	9	150/158
2017	260	-	0	46	54	39	46	39	124/131
2022	260	-	0	77	23	46	39	15	- / -
Quercus gambelii^P -- (Gambel oak)									
1997	2060	280	83	18	0	0	0	0	288/356
2002	2180	-	95	5	0	0	0	0	264/166
2007	2900	-	0	99	1	0	0	0	51/39
2012	2240	220	88	13	0	0	0	0	42/41
2017	2760	-	74	23	3	58	0	3	185/157
2022	1460	-	89	10	1	29	44	3	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus glabra^p -- (smooth sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	223/324
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	100	0	0	0	0	0	214/217
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	245/342
2012	-	-	-	-	-	-	-	-	192/313
2017	-	-	-	-	-	-	-	-	166/320

t - Tree Species; p - Preferred Browse; i - Introduced Species

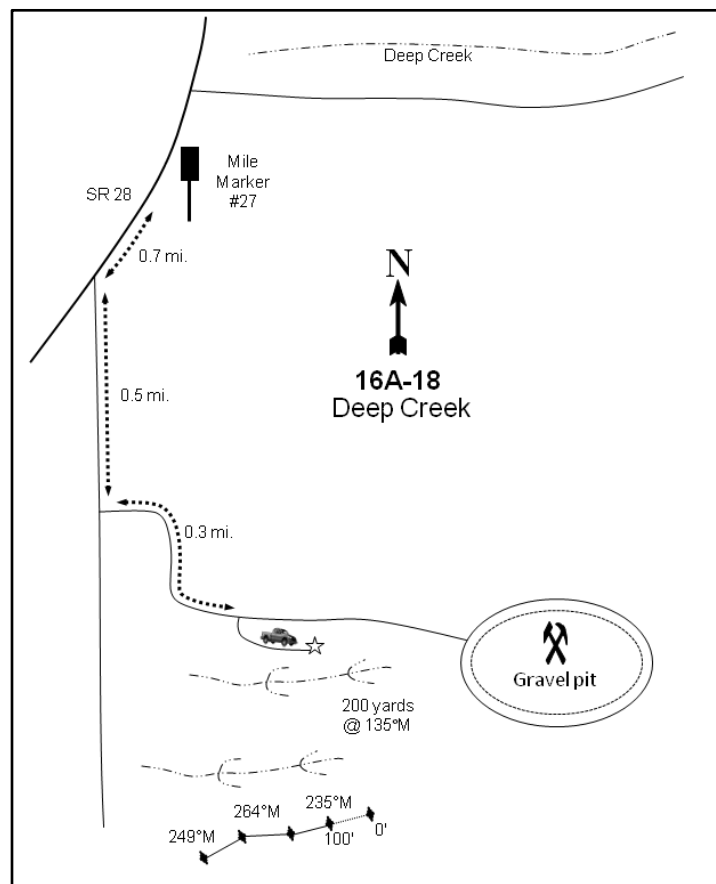
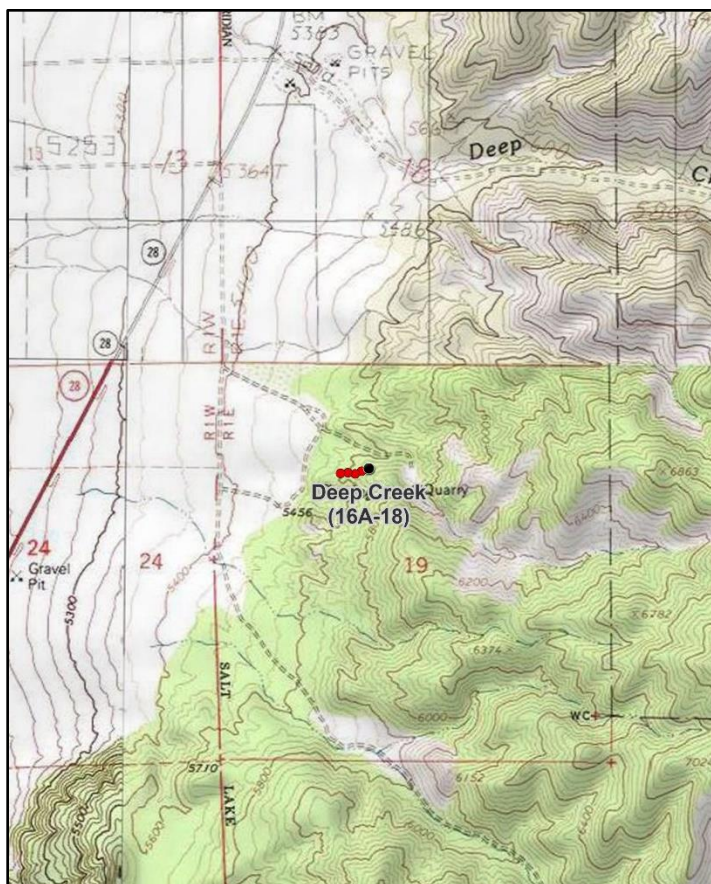
Table 16A-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	7	-	17	33	-	50	34.8
2022	7	-	-	17	-	83	44.7

Table 16A-17.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	7.8	8.3	14.9	25.5	-7.7	2.9	0.0	51.8	Poor-Fair
2002	7.1	1.1	7.7	23.5	-6.5	1.5	0.0	34.4	Very Poor-Poor
2007	13.8	8.9	1.0	25.6	-7.8	3.3	0.0	44.9	Poor
2012	20.4	12.4	15.0	30.0	-5.1	4.3	-2.0	75.0	Good
2017	17.6	11.4	15.0	26.9	-5.8	3.8	0.0	68.9	Good
2022	11.7	13.2	15.0	19.4	-5.3	4.4	0.0	58.3	Fair

DEEP CREEK - STUDY NO. 16A-18

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Chriss Canyon NW; Township 15S, Range 1E, Section 19
NAD 83 UTM ZONE 12, 425690 East 4372188 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

508
235° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From the post office in Levan (75 N. Main St.), drive south on US-28 for 3.8 miles. Turn left 0.7 miles past mile marker 27 (east then south) and go 0.5 miles to a fork in the road. Take a left (east) at the fork and continue for 0.3 miles to another fork. Take the old road to the right and park where it ends. From here, the 0-foot baseline stake is 200 yards away at an azimuth of 135 degrees magnetic. There are some large boulders around the 100-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	DEEP CANYON S & G
Elevation	5,670ft (1,728m)
Aspect	Northwest
Slope	15-25%
Sample Dates	05/29/1997, 10/25/2002, 05/30/2007, 05/30/2012, 05/25/2017, 05/19/2022

Wildlife Habitat and Vegetation History**Table 16A-18.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Alderleaf Mountain Mahogany	Phase I
1989	Alderleaf Mountain Mahogany	Phase I
1997	Alderleaf Mountain Mahogany	Phase I
2002	Alderleaf Mountain Mahogany	Phase I
2007	Alderleaf Mountain Mahogany	Phase I
2012	Alderleaf Mountain Mahogany	Phase I
2017	Alderleaf Mountain Mahogany	Phase I
2022	Alderleaf Mountain Mahogany	Phase I

Site Notes

The vegetation composition of this site is typical of the west-facing foothills from Levan south to the unit boundary. Several deer carcasses were found in 1989.

Soils**Table 16A-18.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.2	28.7	19.4	51.8	1.2	6.6	124.8	0.4	05/29/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Birchleaf Mountain Mahogany)
NRCS Ecological Site #	R047XA309UT
States and Transitions	No state and transition model is available for this ecological site.

Alderleaf mountain mahogany (*Cercocarpus montanus*) has been the dominant browse species on this site since study establishment in 1983, although other preferred browse species such as Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and mormon tea (*Ephedra viridis*) have also been present to a lesser extent. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees are scattered throughout the site, and the site has been considered to be within Phase I of woodland succession throughout the study period (Photos, Table 16A-18.4, Table 16A-18.12, Table 16A-18.13, Table 16A-18.14). Although diverse, the herbaceous understory has never been very abundant; perennial grasses -- namely bluebunch wheatgrass (*Pseudoroegneria spicata*) -- have been the most abundant herbaceous component in all sample years (Table 16A-18.7, Table 16A-18.10, Table 16A-18.11).

Trend Summary Tables

Table 16A-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.0	0.4	3.9	-	-	-
2002	10.3	0.2	3.1	-	-	-
2007	6.9	0.2	4.6	9.5	0.5	6.0
2012	12.8	0.2	7.1	13.5	0.2	12.7
2017	9.3	0.7	3.9	14.1	0.6	5.2
2022	9.1	0.2	4.9	11.3	0.1	8.8

Table 16A-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	120	167	356	204	1.0	7.6	4.0	3.2
2002	39	162	175	180	0.3	3.4	0.9	2.7
2007	193	183	275	157	3.4	7.6	3.7	2.9
2012	58	180	228	174	1.0	6.6	0.9	4.8
2017	17	172	334	190	0.0	6.3	3.5	4.9
2022	54	150	420	195	0.3	5.9	14.4	6.5

Table 16A-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.8	0.7	25.8	19.9	8.2	27.7
2002	46.8	0.9	27.6	10.1	7.3	23.4
2007	46.8	1.1	19.0	13.6	7.3	26.8
2012	39.6	1.6	27.7	6.9	8.4	32.1
2017	40.0	3.2	30.3	20.7	6.1	28.3
2022	27.4	0.9	27.1	21.9	11.1	33.3

Table 16A-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	-	16	2	9	-
2002	-	13	1	15	-
2007	-	30	-	36	-
2012	1	-	-	8	-
2017	1	4	-	5	-
2022	-	4	1	12	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	9.4 (23.2)	-	-	-
2007	-	6.7 (16.6)	-	-	47.6 (117.5)
2012	3.6 (9.0)	4.7 (11.6)	-	-	-
2017	-	2.7 (6.6)	-	-	-
2022	-	22.1 (54.6)	4.0 (9.9)	-	-

Table 16A-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1997	-	-	120	-	-	-	67	143
2002	-	-	39	-	-	-	73	131
2007	4	4	189	2	-	5	100	134
2012	2	-	58	-	-	2	98	137
2017	16	-	17	2	3	5	83	113
2022	3	8	48	-	8	-	60	112
year	Average Cover (%)							
1997	-	-	1.0	-	-	-	1.4	6.2
2002	-	-	0.3	-	-	-	0.3	3.1
2007	0.0	0.0	3.4	0.0	-	0.1	1.4	6.0
2012	0.0	-	1.0	-	-	0.0	1.9	4.7
2017	0.3	-	0.0	0.0	0.0	0.0	1.1	4.8
2022	0.0	0.1	0.3	-	0.0	-	0.9	5.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littletop false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericoides (rose heath)	Chorispora tenella ^{ai} (crossflower)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha flavoculata (roughseed cryptantha)	Cryptantha gracilis ^a (narrowstem cryptantha)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
1997	-	5	5	-	-	10	-	331	-	18	-	5	44	-	-	28	19
2002	4	-	6	1	-	8	-	160	2	12	-	1	16	-	-	12	15
2007	3	111	6	8	-	8	1	233	-	8	30	28	13	-	-	13	31
2012	9	189	4	-	-	-	-	72	-	9	-	10	28	-	-	25	-
2017	11	322	1	7	-	18	2	79	-	16	12	5	24	15	2	1	1
2022	13	413	6	0	3	68	-	194	-	13	4	14	30	32	2	3	16
year	Average Cover (%)																
1997	-	0.0	0.0	-	-	0.0	-	3.5	-	0.2	-	0.0	0.5	-	-	0.1	0.0
2002	0.0	-	0.0	0.0	-	0.0	-	0.8	0.0	0.0	-	0.0	0.1	-	-	0.0	0.0
2007	0.0	0.4	0.1	0.0	-	0.0	0.0	3.0	-	0.1	0.1	0.1	0.1	-	-	0.1	0.1
2012	0.0	0.7	0.0	-	-	-	-	0.1	-	0.3	-	0.0	0.4	-	-	0.5	-
2017	0.1	3.0	0.0	0.0	-	0.0	0.0	0.2	-	0.5	0.0	0.0	0.3	0.3	0.0	0.0	0.0
2022	0.1	11.3	0.0	0.0	0.2	0.2	-	2.5	-	0.1	0.0	0.0	0.6	0.7	0.0	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicale (shortstem buckwheat)	Erysimum repandum ^{ai} (spreading wallflower)	Galium aparine ^a (stickywilly)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physalis hederifolia (ivyleaf groundcherry)	Physaria acutifolia var. acutifolia (sharpleaf twinpod)	Stenotus acaulis (stemless mock goldenweed)
year	Nested Frequency																
1997	-	2	7	49	17	14	-	-	-	-	-	6	97	63	1	-	5
2002	-	-	7	-	6	32	10	2	-	-	-	-	111	42	-	-	-
2007	3	-	2	-	11	15	-	4	-	4	-	-	88	53	-	5	3
2012	-	-	-	-	6	-	-	1	-	-	6	-	97	71	-	2	-
2017	-	5	8	-	5	9	9	1	-	-	-	-	98	48	-	3	1
2022	5	-	3	-	7	23	-	-	1	-	-	-	79	67	-	-	4
year	Average Cover (%)																
1997	-	0.0	0.0	0.1	0.2	0.0	-	-	-	-	-	0.0	1.9	0.2	0.0	-	0.1
2002	-	-	0.0	-	0.0	0.1	0.0	0.0	-	-	-	-	2.3	0.1	-	-	-
2007	0.0	-	0.0	-	0.1	0.0	-	0.0	-	0.0	-	-	2.1	0.2	-	0.0	0.1
2012	-	-	-	-	0.0	-	-	0.0	-	-	0.2	-	3.0	0.2	-	0.0	-
2017	-	0.0	0.0	-	0.0	0.0	0.1	0.0	-	-	-	-	3.1	0.4	-	0.0	0.0
2022	0.0	-	0.1	-	0.2	0.1	-	-	0.0	-	-	-	3.2	1.3	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	unknown annual forb ^a (unknown forb)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus pumilus (foothill deathcamas)
year	Nested Frequency		
1997	8	-	1
2002	-	-	-
2007	-	19	-
2012	-	29	1
2017	-	39	5
2022	-	5	1
year	Average Cover (%)		
1997	0.1	-	0.0
2002	-	-	-
2007	-	0.1	-
2012	-	0.0	0.0
2017	-	0.1	0.0
2022	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra viridis ^p (mormon tea)	Juniperus osteosperma ⁱ (Utah juniper)	Pinus edulis ⁱ (twoneedle pinyon)	Purshia stansburiana ^p (Stansbury cliffrose)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	0.4	4	0.5	5.1	6	-	-	-
2012	0.8	10.3	0.2	2.4	12.5	0.2	-	-
2017	1.1	9.7	0.6	3.3	5	0.2	-	-
2022	0.7	8.4	0.1	2.2	8.5	0.3	-	-
year	Quadrat Cover (%)							
1997	0.7	4.7	0.4	2.6	3.9	-	-	-
2002	1.0	5.9	0.2	3.4	2.5	0.7	-	0.0
2007	1.1	3.2	0.2	2.5	4.5	0.0	-	0.0
2012	0.9	8.7	0.2	3.2	6.5	0.5	0.0	0.0
2017	0.5	5.9	0.7	2.8	3.9	0.0	-	-
2022	0.4	6.9	0.2	1.8	4.5	0.4	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
1997	300	-	7	60	33	13	0	13	67/74
2002	240	-	0	50	50	58	0	8	66/76
2007	160	-	0	75	25	38	13	13	59/82
2012	180	-	0	78	22	33	11	22	72/98
2017	160	-	0	88	13	0	0	13	74/78
2022	220	-	9	55	36	0	0	36	- / -
Bassia prostrata^{pi} -- (forage kochia)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	130/195
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1997	860	-	14	72	14	63	35	2	104/124
2002	1040	-	4	62	35	42	27	10	108/127
2007	740	80	0	32	68	14	73	60	122/158
2012	600	100	20	70	10	57	23	7	102/132
2017	780	2160	23	59	18	10	10	3	101/126
2022	600	120	7	80	13	0	0	10	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	100	-	0	80	20	0	0	0	26/40
2002	200	-	0	70	30	20	20	0	25/50
2007	140	-	0	57	43	43	57	0	24/43
2012	200	20	20	80	0	10	0	10	41/61
2017	280	20	0	93	7	0	0	7	28/36
2022	240	-	0	83	17	0	0	17	- / -
Ephedra viridis^p -- (mormon tea)									
1997	440	-	0	86	14	27	0	5	106/144
2002	700	-	6	66	29	14	0	6	108/135
2007	460	-	17	52	30	13	13	9	110/169
2012	480	20	17	67	17	4	0	17	105/133
2017	460	-	4	83	13	44	0	9	95/112
2022	600	-	10	63	27	7	0	27	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	18/26
2017	60	-	0	100	0	0	0	0	25/27
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma^t -- (Utah juniper)									
1997	60	-	0	100	0	0	0	0	- / -
2002	60	-	0	100	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	0	- / -
2012	80	-	0	100	0	0	0	0	- / -
2017	40	-	0	100	0	0	0	0	- / -
2022	60	-	0	100	0	0	0	0	- / -
Pinus edulis^t -- (twoneedle pinyon)									
1997	-	-	-	-	-	-	-	-	- / -
2002	40	-	0	100	0	0	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	45/46
2007	-	-	-	-	-	-	-	-	142/115
2012	-	20	0	0	0	0	0	0	158/172
2017	-	-	-	-	-	-	-	-	151/88
2022	-	-	-	-	-	-	-	-	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	20	0	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

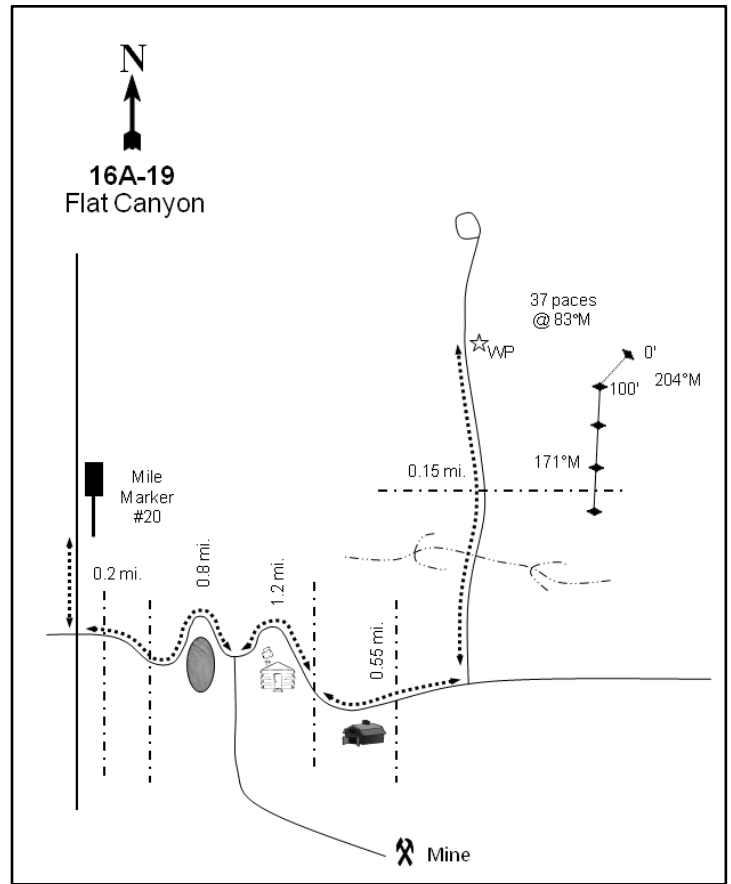
Table 16A-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	63	-	-	-	-	-	27.9
2007	53	-	18	29	35	18	33.9
2012	51	-	11	11	22	56	25.3
2017	56	-	22	22	17	39	29.0
2022	54	-	-	28	11	61	34.7
Pinus edulis (twoneedle pinyon)							
2002	2	-	-	-	-	-	11.3
2007	5	-	50	-	25	25	11.0
2012	7	-	50	-	-	50	12.5
2017	7	-	33	50	-	17	10.0
2022	8	-	29	43	14	14	9.0

Table 16A-18.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	11.2	10.4	4.4	15.2	-0.8	6.4	0.0	46.9	Poor
2002	14.3	4.7	2.0	6.9	-0.2	5.5	0.0	33.2	Very Poor-Poor
2007	12.9	1.2	4.7	15.1	-2.5	5.7	0.0	37.1	Poor
2012	19.5	11.4	9.1	13.2	-0.8	9.5	0.0	62.0	Fair
2017	20.1	10.1	8.4	12.5	0.0	9.8	0.0	60.9	Fair
2022	16.2	9.8	3.7	11.8	-0.2	10.0	0.0	51.4	Poor-Fair

FLAT CANYON - STUDY NO. 16A-19



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Skinner Peaks SE; Township 16S, Range 1W, Section 14
NAD 83 UTM ZONE 12, 423841 East 4363153 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

9084
204° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Standard

Directions to Site

From Levan, drive south on Highway 28 to 0.2 miles south of mile marker #20. Turn left (east) and go 0.8 miles to a fork. Keep left at the fork and continue for 1.2 miles to an old fence by an old cabin where the road makes a 90 degree turn to the east. Continue up the main road for 0.55 miles to a faint road, which turns off to the left and goes down into the sagebrush. Follow this road for 0.15 miles to a witness post on the right (east) side of the road. From here, walk up the hill for about 37 paces at a bearing of 83 degrees magnetic to the 0-foot baseline stake, which is marked with browse tag #9084.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT CREEK
Elevation	6,040ft (1,841m)
Aspect	Southwest
Slope	20-30%
Sample Dates	05/21/1997, 10/25/2002, 05/30/2007, 05/30/2012, 05/25/2017, 05/19/2022

Table 16A-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Chriss Creek PJ Removal Phase 2	2223	October 2012	333
Mechanical - Bullhog	Chriss Creek PJ Removal Phase 2	2223	December 2012-March 2013	333

Table 16A-19.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Chriss Creek PJ Removal - Phase II			Aerial	Oct 2012	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.94
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.95
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	1.00	0.88
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.00	0.92
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.75
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	P-7	2.00	1.79
F	Achillea millefolium	Western Yarrow	Eagle	0.05	0.04
F	Linum perenne	Blue Flax	Appar	0.15	0.13
F	Medicago sativa	Alfalfa	Ladak DL	0.85	0.79
F	Medicago sativa	Alfalfa	Ladak +	0.15	0.14
F	Onobrychis viciifolia	Sainfoin	Eski	1.00	0.78
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.89

Wildlife Habitat and Vegetation History

Table 16A-19.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16A-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I
1997	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I
2002	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I transitioning to Phase II
2007	Wyoming Big Sagebrush/Antelope Bitterbrush/Annual Grass	Phase I transitioning to Phase II
2012	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I transitioning to Phase II
2017	Wyoming Big Sagebrush/Antelope Bitterbrush/Annual Grass	Phase I
2022	Wyoming Big Sagebrush/Antelope Bitterbrush/Annual Grass	Phase I

Site Notes

Livestock use was noted in 2017.

Soils

Table 16A-19.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.2	70.4	15.8	13.8	1.6	4.4	153.6	0.5	05/21/1997

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA306UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and antelope bitterbrush (*Purshia tridentata*) have comprised a majority of the browse component since 1989. In addition, Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are scattered throughout the site. Prior to a bullhog and seeding treatment in late 2012/early 2013 (Table 16A-19.1), the site was considered to be within Phase I transitioning to Phase II of woodland succession. The treatment removed much of the tree cover, and the site is currently in Phase I of encroachment (Photos, Table 16A-19.4, Table 16A-19.12, Table 16A-19.13, Table 16A-19.14). Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced annual grass species cheatgrass (*Bromus tectorum*) have contributed a majority of the herbaceous cover in most sample years since 1997; annual grasses were a co-dominant site component in 2007, 2017, and 2022 (Table 16A-19.7, Table 16A-19.10). Although diverse, annual and perennial forbs have generally remained rare. However, there was a notable increase in the introduced annual forb species desert madwort (*Alyssum desertorum*) in 2022 (Table 16A-19.11).

Trend Summary Tables

Table 16A-19.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.8	0.5	2.9	-	-	-
2002	15.0	0.4	6.5	-	-	-
2007	11.7	0.0	6.6	10.5	0.1	16.9
2012	13.1	0.2	5.0	16.9	0.2	18.3
2017	11.4	0.2	0.4	18.0	0.2	-
2022	15.6	-	0.8	16.5	0.1	0.2

Table 16A-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	319	213	82	110	5.8	6.2	0.3	1.0
2002	244	221	62	56	1.3	10.0	0.2	0.3
2007	428	214	224	47	12.3	9.2	1.5	0.5
2012	285	247	330	44	4.1	9.5	1.8	0.4
2017	393	206	345	63	13.6	8.9	5.2	1.4
2022	388	179	409	58	13.9	9.5	13.4	1.6

Table 16A-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	28.3	0.9	32.3	15.7	7.5	26.8
2002	30.1	0.8	35.2	11.8	9.2	31.7
2007	23.3	0.3	33.1	14.0	7.9	37.2
2012	24.7	1.5	33.2	8.8	6.7	38.5
2017	23.7	0.6	50.2	10.4	5.5	35.9
2022	17.8	0.8	39.0	11.2	9.8	46.3

Table 16A-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	28	1	-	2
2002	2	29	-	1	23
2007	2	13	1	-	59
2012	-	4	-	-	16
2017	2	9	-	-	14
2022	4	17	1	-	10
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	2.2 (5.4)	44.2 (109.2)	-	-	-
2007	2.2 (5.4)	16.8 (41.4)	2.7 (6.6)	-	-
2012	-	6.0 (14.9)	-	-	-
2017	-	7.4 (18.2)	-	-	-
2022	9.4 (23.3)	20.1 (49.7)	4.7 (11.6)	-	-

Table 16A-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	11	-	319	6	28	-	-	74	138
2002	0	21	241	-	44	-	-	62	167
2007	16	-	428	12	41	-	-	80	132
2012	2	-	285	-	59	-	2	131	119
2017	12	23	370	-	29	2	-	69	157
2022	8	-	388	3	23	-	-	68	115
year	Average Cover (%)								
1997	0.1	-	5.8	0.2	1.3	-	-	1.2	3.4
2002	0.0	0.1	1.2	-	1.8	-	-	1.5	6.6
2007	0.5	-	12.3	0.1	1.8	-	-	1.3	5.5
2012	0.0	-	4.1	-	2.3	-	0.0	3.6	3.6
2017	0.5	0.8	12.8	-	0.8	0.0	-	1.1	6.4
2022	0.5	-	13.9	0.1	0.7	-	-	2.1	6.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chorispora tenella ^{ai} (crossflower)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Convolvulus arvensis ^{mi} (field bindweed)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1997	-	21	-	1	-	-	4	42	-	2	-	24	5	5	-	-	-
2002	-	13	2	29	1	6	5	18	-	-	-	2	3	-	3	-	0
2007	-	8	-	194	-	6	6	6	2	-	8	-	-	-	2	-	0
2012	-	-	-	324	-	9	6	-	-	1	3	9	-	3	1	-	4
2017	10	9	-	338	-	7	6	19	-	2	-	1	-	4	2	5	0
2022	2	8	-	401	-	3	6	17	-	2	7	-	-	1	5	1	3
year	Average Cover (%)																
1997	-	0.3	-	0.0	-	-	0.1	0.2	-	0.1	-	0.1	0.0	0.0	-	-	-
2002	-	0.1	0.0	0.0	0.0	0.0	0.0	0.1	-	-	-	0.0	0.0	-	0.0	-	0.0
2007	-	0.0	-	1.2	-	0.0	0.2	0.0	0.0	-	0.0	-	-	-	0.0	-	0.0
2012	-	-	-	1.5	-	0.0	0.1	-	-	0.0	0.0	0.0	-	0.1	0.0	-	0.0
2017	0.2	0.2	-	4.8	-	0.1	0.2	0.1	-	0.1	-	0.0	-	0.0	0.0	0.0	0.0
2022	0.0	0.2	-	11.8	-	0.0	0.2	0.1	-	0.1	0.0	-	-	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha humilis (roundspike cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Erysimum (wallflower)	Galium aparine ^a (stickywilly)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	
year	Nested Frequency																	
1997	16	-	-	-	3	-	2	-	-	54	5	-	-	0	-	7	9	
2002	-	-	8	-	7	2	4	-	1	11	-	-	-	-	3	-	7	
2007	10	-	14	1	2	-	11	-	2	19	2	13	-	-	1	3	7	
2012	4	-	-	2	3	3	8	3	-	-	3	2	-	2	2	3	1	
2017	4	3	12	-	2	-	19	-	1	18	17	1	-	2	-	2	-	
2022	5	3	3	1	-	-	25	-	7	76	3	9	4	-	-	-	7	
year	Average Cover (%)																	
1997	0.1	-	-	-	0.0	-	0.0	-	-	0.1	0.0	-	-	0.0	-	0.2	0.0	
2002	-	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	-	-	-	0.0	-	0.0	
2007	0.0	-	0.0	0.0	0.0	-	0.1	-	0.0	0.1	0.0	0.1	-	-	0.0	0.2	0.0	
2012	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0	0.2	0.0	
2017	0.2	0.0	0.0	-	0.0	-	0.3	-	0.0	0.1	0.0	0.0	-	0.0	-	0.1	-	
2022	0.6	0.0	0.0	0.0	-	-	0.7	-	0.0	0.3	0.2	0.2	0.0	-	-	-	0.2	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1997	3	-	5	9	-	-	-
2002	-	-	1	-	2	-	3
2007	-	-	2	2	2	-	-
2012	-	-	-	1	1	-	-
2017	-	1	2	2	-	-	7
2022	-	-	1	12	-	4	-
year	Average Cover (%)						
1997	0.0	-	0.0	0.1	-	-	-
2002	-	-	0.0	-	0.0	-	0.0
2007	-	-	0.0	0.1	0.0	-	-
2012	-	-	-	0.0	0.0	-	-
2017	-	0.0	0.0	0.0	-	-	0.1
2022	-	-	0.0	0.2	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis ^p (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	6.1	0.1	-	-	16.9	-	4.4	-
2012	7.7	0.2	-	-	18.3	-	9	0.2
2017	7.2	-	-	0.2	-	-	10.8	-
2022	6.4	0.1	-	-	0.2	-	10.1	-
year	Quadrat Cover (%)							
1997	8.8	0.1	-	0.3	2.9	0.0	3.0	-
2002	10.9	0.1	0.0	0.3	6.5	-	4.1	-
2007	7.2	0.0	0.0	0.0	6.6	-	4.5	0.0
2012	5.9	0.0	0.0	0.1	5.0	-	7.2	0.0
2017	3.8	0.0	0.0	0.2	0.4	-	7.2	0.4
2022	5.7	0.0	-	-	0.8	-	9.7	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	1220	120	13	72	15	10	0	2	56/89
2002	1280	-	6	72	22	33	2	11	49/75
2007	1340	-	3	55	42	31	13	21	68/86
2012	1080	20	2	69	30	2	0	11	63/87
2017	1040	280	12	73	15	10	0	12	61/90
2022	840	-	0	83	17	21	0	31	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	140	-	29	71	0	0	0	0	32/51
2002	120	-	17	50	33	0	0	0	24/34
2007	120	-	0	67	33	0	0	17	19/22
2012	120	-	50	50	0	0	0	0	33/37
2017	-	20	0	0	0	0	0	0	32/55
2022	-	-	-	-	-	-	-	-	- / -
Ephedra viridis^p -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	45/34
2002	-	-	-	-	-	-	-	-	41/32
2007	-	-	-	-	-	-	-	-	109/138
2012	60	-	0	67	33	0	67	33	91/116
2017	-	-	-	-	-	-	-	-	47/68
2022	20	-	0	100	0	0	100	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	71/84
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	59/43
2017	-	-	-	-	-	-	-	-	42/46
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1400	180	83	17	0	0	0	0	25/36
2002	400	-	0	25	75	0	0	75	11/14
2007	80	20	50	50	0	0	0	0	30/28
2012	120	-	0	100	0	0	0	0	23/37
2017	200	-	20	80	0	0	0	0	29/40
2022	20	-	100	0	0	0	0	0	-/-
Juniperus osteosperma^I -- (Utah juniper)									
1997	20	-	0	100	0	0	0	0	-/-
2002	80	-	0	100	0	0	0	0	-/-
2007	100	20	20	80	0	0	0	0	-/-
2012	100	20	0	100	0	0	0	0	-/-
2017	120	-	83	17	0	0	0	0	-/-
2022	180	20	89	11	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	80	-	0	100	0	0	0	0	7/25
2002	-	-	-	-	-	-	-	-	-/-
2007	100	-	20	80	0	0	0	0	8/18
2012	60	-	0	100	0	0	0	0	10/14
2017	20	-	0	100	0	0	0	0	6/10
2022	100	-	40	60	0	0	0	0	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
1997	600	-	17	80	3	67	27	0	63/131
2002	620	-	3	84	13	23	45	10	57/150
2007	620	-	3	77	19	23	71	13	63/154
2012	940	-	0	98	2	34	0	0	76/144
2017	1180	-	0	97	3	46	24	0	60/122
2022	900	-	16	80	4	38	51	4	-/-
Quercus gambelii^P -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	223/253
2017	40	-	0	100	0	0	0	0	42/37
2022	20	-	100	0	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

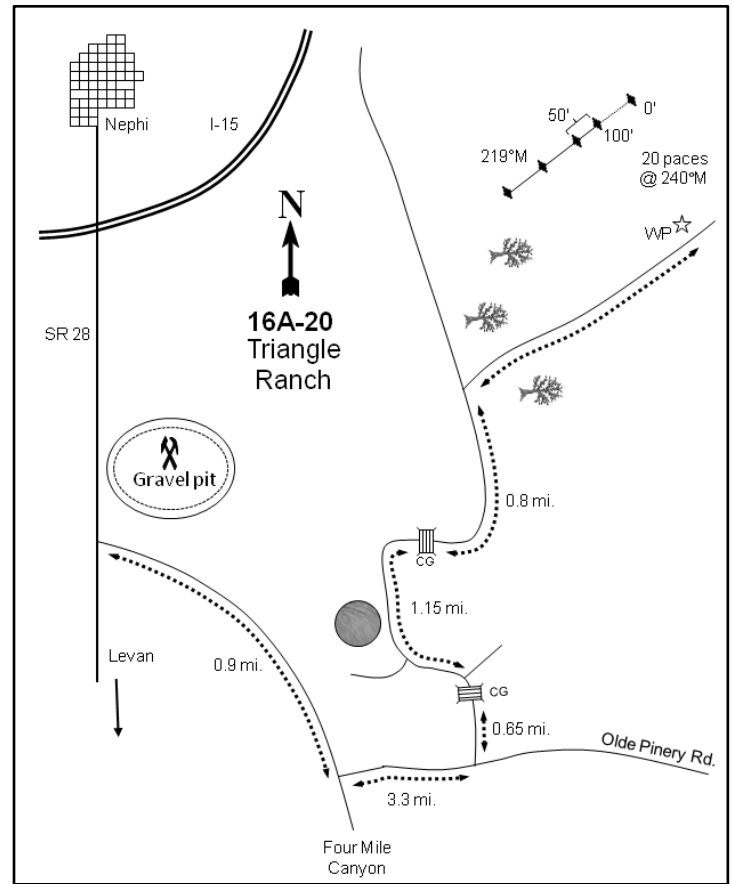
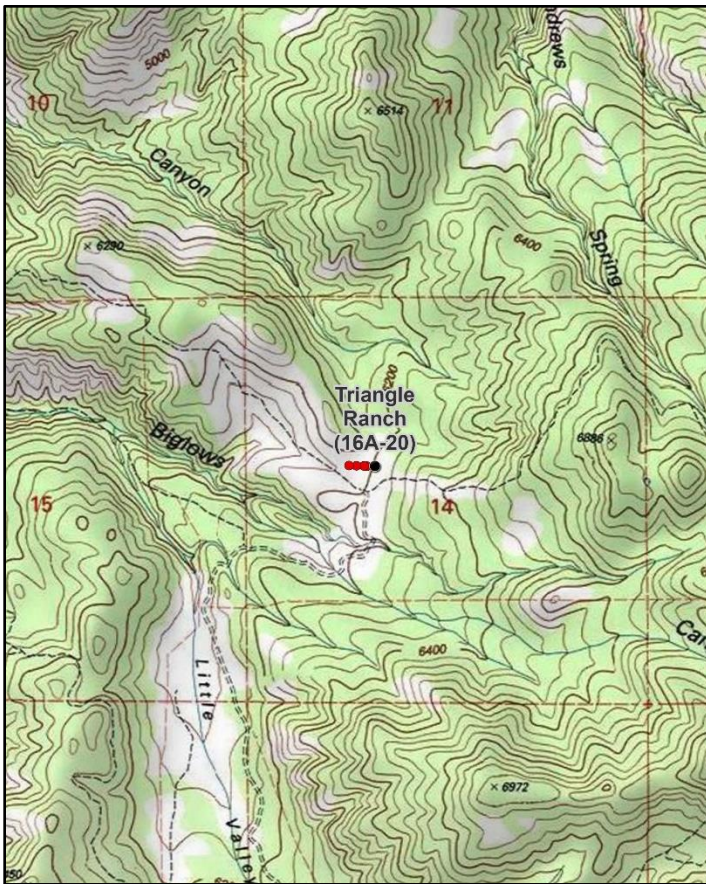
Table 16A-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	43	-	-	-	-	-	17.6
2007	35	6	6	18	41	29	22.4
2012	41	-	17	28	17	39	17.7
2017	31	7	47	27	-	20	14.1
2022	29	-	44	19	19	19	13.8
Pinus edulis (twoneedle pinyon)							
2002	14	-	-	-	-	-	13.0
2007	2	-	-	-	-	100	20.0
2022	1	50	50	-	-	-	3.0

Table 16A-19.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	15.5	11.4	7.0	12.5	-4.3	2.1	0.0	44.2	Poor
2002	19.7	9.1	2.7	20.0	-0.9	0.6	0.0	51.2	Poor-Fair
2007	14.2	5.3	1.5	18.4	-9.2	1.0	0.0	31.2	Very Poor
2012	23.3	10.6	1.0	19.1	-3.1	0.8	0.0	51.7	Poor-Fair
2017	25.2	12.5	2.3	17.8	-10.2	2.8	-2.0	48.3	Poor-Fair
2022	23.2	12.2	4.8	19.1	-10.4	3.2	-2.0	50.0	Poor-Fair

TRIANGLE RANCH - STUDY NO. 16A-20



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Nephi SE; Township 13S, Range 1E, Section 14
NAD 83 UTM ZONE 12, 431970 East 4393043 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

9085
256° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 2: No Rebar, Belt 5: 4ft; Line 2: 50ft Long

Directions to Site

Just south of Nephi on Highway 28, turn south past the gravel pit onto a graded road. Drive for 0.9 miles to a fork. Bear left on the Old Pinery Road and proceed for 3.3 miles to an intersection. Turn left here and go 0.65 miles to a cattle guard at the top of the hill, then drive through Little Valley 1.1 miles to a gate at the north end of the valley. Continue for 0.05 more miles to a cattle guard. Proceed up the jeep trail 0.8 miles to a fork in a chained area. Take the right fork and proceed for 0.05 miles to the witness post on the left (north) side of the road. From the witness post, walk for 20 paces at 341 degrees magnetic to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	West
Slope	10-15%
Sample Dates	05/27/1997, 12/13/2002, 05/31/2007, 05/29/2012, 05/18/2017, 05/18/2022

Table 16A-20.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	Triangle Ranch WMA Bullhog Project	3447	Spring 2016	302
Mechanical - Bullhog	Triangle Ranch WMA Bullhog Project	3447	July 2015-April 2016	302
Chaining - Chain Unknown	-	-	Early 1970s	-
Seeding - Seed Unknown	-	-	Early 1970s	-

Wildlife Habitat and Vegetation History

Table 16A-20.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16A-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Bulbous Bluegrass/Perennial Grass/Mountain Big Sagebrush	Phase I
2022	Bulbous Bluegrass/Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16A-20.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.2	42.0	31.4	26.6	1.9	17.6	185.6	0.4	05/27/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1989, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site. Utah juniper (*Juniperus osteosperma*) trees have also been present throughout the duration of the study, although both cover and density decreased in 2017 following a bullhog treatment (Table 16A-20.1); the study site has been considered to be in Phase I of woodland succession in all study years (Photos, Table 16A-20.4, Table 16A-20.12, Table 16A-20.13, Table 16A-20.14). The herbaceous understory has remained very abundant and diverse. Perennial grasses, including the introduced species smooth brome (*Bromus inermis*), intermediate wheatgrass (*Thinopyrum intermedium*), and orchardgrass (*Dactylis glomerata*), have been abundant in most sample years. However, the introduced species bulbous bluegrass (*Poa bulbosa*) has contributed the most cover of any one perennial grass species since 2002, and has been a co-dominant site component since that year. Forbs have remained rare in comparison (Table 16A-20.7, Table 16A-20.10, Table 16A-20.11).

Trend Summary Tables

Table 16A-20.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	12.8	0.0	1.1	-	-	-
2002	15.0	0.3	3.0	-	-	-
2007	10.2	0.5	4.7	13.0	0.1	5.5
2012	9.6	0.0	4.3	12.6	0.1	6.9
2017	7.0	0.0	-	6.0	0.1	0.2
2022	8.1	0.2	-	9.5	0.2	-

Table 16A-20.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	78	448	304	164	0.4	26.0	2.4	3.3
2002	56	422	245	157	0.1	29.7	1.2	3.7
2007	76	453	161	139	0.8	45.3	1.4	4.1
2012	8	463	62	138	0.0	42.3	0.3	3.3
2017	30	441	254	192	0.2	51.6	3.8	7.2
2022	73	468	280	216	1.2	60.3	3.4	10.7

Table 16A-20.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	12.8	0.1	50.8	1.1	0.2	47.7
2002	19.0	0.2	42.6	1.8	0.2	55.0
2007	12.4	0.2	39.8	2.4	0.1	60.1
2012	9.6	0.1	45.0	1.5	0.1	60.3
2017	9.5	0.0	58.8	1.8	0.1	63.2
2022	5.7	0.0	46.4	1.2	0.1	68.4

Table 16A-20.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1997	7	-	-	-	2
2002	5	9	-	-	8
2007	2	11	1	-	13
2012	4	2	-	-	16
2017	1	6	-	-	15
2022	6	5	1	-	1
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	4.4 (10.8)	35.5 (87.7)	-	-	-
2007	4.4 (10.8)	40.2 (99.3)	-	-	-
2012	3.6 (9.0)	4.7 (11.6)	-	8.7 (21.5)*	-
2017	8.7 (21.5)	10.0 (24.8)	-	-	-
2022	14.5 (35.9)	6.0 (14.9)	-	-	-

*Pellets per acre (ha)

Table 16A-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency														
1997	18	-	43	78	91	102	1	6	164	77	1	218	66	-	127
2002	15	-	56	56	66	95	4	-	81	223	-	133	52	-	136
2007	13	26	61	58	82	128	6	2	81	304	-	52	37	1	113
2012	16	-	85	8	94	159	12	2	81	318	8	58	34	6	110
2017	7	-	91	30	80	96	25	-	55	362	5	30	62	1	153
2022	32	38	17	45	76	84	1	5	112	384	-	8	24	9	236
year	Average Cover (%)														
1997	0.8	-	1.2	0.4	2.3	4.0	0.0	0.8	1.1	2.3	0.0	8.1	1.2	-	4.2
2002	0.4	-	2.7	0.1	3.1	6.1	0.8	-	0.8	7.9	-	3.6	0.8	-	3.5
2007	0.4	0.2	3.9	0.6	6.3	11.0	0.5	0.0	0.8	13.8	-	1.8	0.8	0.0	6.0
2012	0.5	-	3.6	0.0	4.9	8.5	1.1	0.1	1.2	14.9	0.1	0.7	0.5	0.2	5.9
2017	0.7	-	4.2	0.2	5.7	4.3	1.5	-	1.1	21.6	0.0	0.3	1.9	0.0	10.4
2022	2.6	0.4	1.1	0.8	4.9	4.5	0.1	0.4	3.0	25.1	-	0.1	0.1	0.2	18.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcross)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rusby milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)
year	Nested Frequency																
1997	98	-	41	6	10	68	7	3	10	-	-	117	0	217	7	12	-
2002	61	-	98	-	2	86	2	4	15	-	-	51	-	190	9	34	-
2007	30	-	76	-	-	72	0	-	10	2	-	30	-	70	-	31	-
2012	24	-	14	-	-	83	2	0	-	-	3	1	1	10	-	44	-
2017	51	12	150	3	-	108	8	-	11	2	-	10	3	68	11	44	-
2022	34	-	149	-	3	109	4	3	42	-	-	25	6	153	1	68	44
year	Average Cover (%)																
1997	0.8	-	0.1	0.0	0.0	1.8	0.1	0.0	0.0	-	-	0.3	0.0	0.6	0.1	0.1	-
2002	0.3	-	0.3	-	0.0	2.1	0.2	0.0	0.0	-	-	0.1	-	0.6	0.0	0.7	-
2007	0.2	-	0.2	-	-	2.4	0.0	-	0.0	0.0	-	0.1	-	0.2	-	0.8	-
2012	0.1	-	0.0	-	-	2.5	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.5	-
2017	0.3	0.0	2.1	0.0	-	4.3	0.2	-	0.1	0.0	-	0.0	0.2	0.4	0.0	1.4	-
2022	0.6	-	0.7	-	0.0	6.6	0.0	0.1	0.1	-	-	0.0	0.2	0.7	0.0	2.5	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus longipes (longstalk springparsley)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Lithospermum ruderale (western stone seed)	Medicago sativa ⁱ (alfalfa)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Orogenia linearifolia (Great Basin Indian potato)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	4	3	69	3	6	-	28	2	14	21	-	-	-	-	-	-	21
2002	8	-	21	1	6	-	-	-	-	6	-	-	-	22	-	2	21
2007	6	2	27	6	6	-	29	1	-	0	-	1	-	5	-	-	24
2012	6	-	6	2	3	-	10	3	-	7	-	-	-	-	-	-	7
2017	1	-	22	-	5	2	20	69	8	6	-	-	16	18	-	-	11
2022	7	9	1	2	-	11	18	2	-	4	0	-	14	1	7	-	11
year	Average Cover (%)																
1997	0.0	0.0	0.2	0.0	0.1	-	0.5	0.0	0.0	0.1	-	-	-	-	-	-	0.0
2002	0.0	-	0.1	0.0	0.0	-	-	-	-	0.0	-	-	-	0.0	-	0.0	0.0
2007	0.0	0.0	0.1	0.0	0.1	-	0.8	0.0	-	0.1	-	0.0	-	0.0	-	-	0.1
2012	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0
2017	0.0	-	0.1	-	0.0	0.0	0.3	0.3	0.1	0.1	-	-	0.1	0.0	-	-	0.1
2022	0.0	0.0	0.0	0.0	-	0.3	0.2	0.0	-	0.0	0.0	-	0.1	0.0	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	unknown annual forb ^a (unknown forb)	Vicia americana (American vetch)	Viola (violet)	Zigadenus paniculatus (foothill death camas)
year	Nested Frequency										
1997	8	-	-	9	-	1	60	24	-	5	6
2002	4	-	-	3	4	-	14	-	-	1	7
2007	-	-	1	5	5	-	6	-	3	0	5
2012	-	-	2	3	-	-	18	-	2	8	6
2017	-	-	-	1	-	-	24	-	9	5	6
2022	-	2	-	1	6	-	64	-	3	8	9
year	Average Cover (%)										
1997	0.0	-	-	0.0	-	0.0	0.6	0.1	-	0.0	0.0
2002	0.0	-	-	0.0	0.1	-	0.1	-	-	0.0	0.1
2007	-	-	0.0	0.0	0.2	-	0.0	-	0.1	0.0	0.1
2012	-	-	0.0	0.0	-	-	0.2	-	0.0	0.0	0.0
2017	-	-	-	0.0	-	-	0.2	-	0.5	0.0	0.1
2022	-	0.0	-	0.0	0.2	-	1.1	-	0.0	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	-	9.6	-	0.3	0.1	5.5	-	3.1
2012	-	9.5	-	-	0.1	6.9	-	3.1
2017	-	4.7	-	-	0.1	0.2	-	1.3
2022	-	5.9	-	-	0.2	-	-	3.6
year	Quadrat Cover (%)							
1997	-	12.0	-	0.1	0.0	1.1	0.1	0.6
2002	-	13.7	-	0.7	0.3	3.0	-	0.6
2007	-	9.2	-	0.2	0.5	4.7	-	0.8
2012	-	8.9	-	-	0.0	4.3	-	0.8
2017	-	6.0	-	-	0.0	0.0	-	1.0
2022	0.4	7.3	0.0	-	0.2	-	-	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	-	-	-	-	-	-	-	-	82/76
2002	-	-	-	-	-	-	-	-	98/104
2007	-	-	-	-	-	-	-	-	81/90
2012	-	-	-	-	-	-	-	-	88/74
2017	-	-	-	-	-	-	-	-	87/93
2022	40	-	0	100	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	3180	140	28	65	8	16	3	5	67/96
2002	2900	20	10	61	29	26	0	11	64/93
2007	2320	-	6	59	35	27	28	28	67/98
2012	1940	-	14	63	23	17	1	18	64/83
2017	2380	1100	48	37	15	6	0	13	51/73
2022	3860	80	55	39	5	28	9	7	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	27/38
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	49/47
2017	20	-	0	100	0	0	0	0	21/34
2022	-	20	0	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	140	-	29	57	14	0	0	14	83/72
2002	140	-	0	43	57	71	0	0	68/72
2007	80	-	0	0	100	50	25	75	76/78
2012	20	-	100	0	0	0	0	0	64/63
2017	-	-	-	-	-	-	-	-	34/40
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	240	20	42	58	0	0	0	0	11/9
2002	1320	-	21	73	6	0	0	5	11/16
2007	520	20	4	77	19	0	0	4	18/20
2012	80	-	50	50	0	0	0	0	15/18
2017	320	40	13	88	0	0	0	0	16/24
2022	220	-	9	91	0	0	0	0	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1997	40	-	100	0	0	0	0	0	-/-
2002	160	-	0	100	0	0	0	0	-/-
2007	160	-	25	75	0	0	0	0	-/-
2012	120	-	50	50	0	0	0	0	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Peraphyllum ramosissimum^P -- (wild crab apple)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	130/163
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	163/161
2017	-	-	-	-	-	-	-	-	173/176
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	100	0	0	0	0	0	101/131
2017	-	-	-	-	-	-	-	-	59/81
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
1997	40	-	0	100	0	0	100	0	59/83
2002	20	-	0	100	0	0	0	0	49/129
2007	-	-	-	-	-	-	-	-	77/99
2012	-	-	-	-	-	-	-	-	76/238
2017	-	-	-	-	-	-	-	-	79/120
2022	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^P -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	300	-	0	100	0	53	0	0	137/91
2007	220	-	9	73	18	0	0	27	-/-
2012	160	-	25	75	0	0	0	25	109/90
2017	120	-	33	67	0	67	0	0	74/91
2022	300	-	0	27	73	0	0	73	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	143/160
2017	-	-	-	-	-	-	-	-	54/61

t - Tree Species; p - Preferred Browse; i - Introduced Species

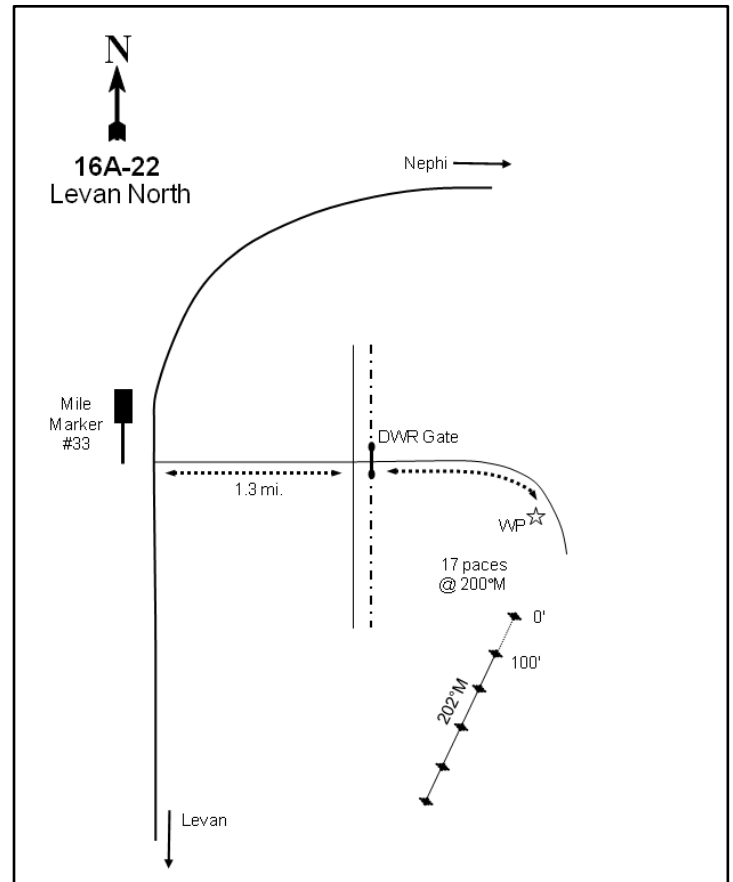
Table 16A-20.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	110	-	-	-	-	-	10.7
2007	117	5	20	25	25	25	10.7
2012	131	-	20	10	30	40	12.7
2017	10	-	100	-	-	-	31.0
2022	14	-	86	14	-	-	4.0
Juniperus scopulorum (Rocky Mountain juniper)							
2022	1	-	100	-	-	-	4.0

Table 16A-20.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	15.9	12.2	13.0	30.0	-0.3	6.6	0.0	77.4	Good
2002	18.6	6.3	4.4	30.0	-0.1	7.5	0.0	66.7	Fair
2007	15.5	5.2	3.3	30.0	-0.6	8.1	0.0	61.5	Fair
2012	15.0	9.9	8.5	30.0	0.0	6.7	0.0	70.0	Fair-Good
2017	7.2	11.5	15.0	30.0	-0.1	10.0	0.0	73.5	Good
2022	11.0	5.7	15.0	30.0	-0.9	10.0	0.0	70.8	Fair-Good

LEVAN NORTH - STUDY NO. 16A-22



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Levan NW; Township 14S, Range 1E, Section 16
NAD 83 UTM ZONE 12, 428447 East 4383802 North

Transect Information

Browse Tag # (0' Stake)	184
Transect Bearing	202° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Nephi, travel south on Highway 28 and turn left (east) at mile marker 33. Travel east for 1.3 miles; cross a road and a DWR fence that is immediately after the road. Continue east for 0.15 miles to a witness post on the right (south) side of the road. From the witness post, the 0-foot baseline stake is 17 paces away at 200 degrees magnetic and is marked by browse tag #184.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,460ft (1,664m)
Aspect	Northwest
Slope	5-10%
Sample Dates	06/18/2007, 05/24/2012, 05/24/2017, 05/11/2022

Table 16A-22.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Levan Wildlife Management Area Bullhog	3954	July 2017-June 2019	709
Seeding - Dribbler	Levan Wildlife Management Area Bullhog	3954	July 2017-June 2019	709
Chaining - Chain Unknown	-	-	Early 1970s	-
Seeding - Seed Unknown	-	-	Early 1970s	-
Hand Crew - Lop and Scatter	Levan Farm WMA Habitat Improvement	271	Fall 2006	700

Wildlife Habitat and Vegetation History

Table 16A-22.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 16A-22.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Perennial Grass/Mountain Big Sagebrush	Phase I
2012	Perennial Grass/Mountain Big Sagebrush	Phase I
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2022	Bulbous Bluegrass/Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

This study was established (in part) to replace the Levan Farm Chaining (16A-16) study.

Soils

Table 16A-22.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.9	67.2	15.5	17.3	2.9	11.9	227.2	0.8	06/18/2007

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2007, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site with antelope bitterbrush (*Purshia tridentata*) as a minor component. Utah juniper (*Juniperus osteosperma*) trees are also present, and despite a bullhog treatment performed in 2019 (Table 16A-22.1) the site remains in Phase I of woodland succession (Table 16A-22.4, Table 16A-22.12, Table 16A-22.13, Table 16A-22.14). The herbaceous understory has been abundant in all sample years, with a diverse mixture of perennial grasses including the introduced species crested wheatgrass (*Agropyron cristatum*) providing a large portion of the herbaceous cover; in 2017 and 2022 the introduced species bulbous bluegrass (*Poa bulbosa*) was the most abundant species. In addition, the noxious and introduced perennial forb field bindweed (*Convolvulus arvensis*) has been observed increasing in cover in each sample year, but remaining low in abundance. Native forbs, although diverse, have remained rare (Table 16A-22.7, Table 16A-22.10, Table 16A-22.11).

Trend Summary Tables

Table 16A-22.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2007	1.0	0.0	6.5	2.0	0.2	9.7
2012	1.2	0.1	5.1	2.9	-	8.3
2017	1.8	0.9	4.3	2.4	0.9	6.2
2022	3.5	4.2	0.1	2.8	2.9	-

Table 16A-22.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2007	370	362	344	62	10.9	22.0	3.1	0.6
2012	187	432	240	77	3.1	31.2	1.4	1.1
2017	151	436	265	98	4.3	34.9	5.5	1.7
2022	286	433	361	153	5.7	43.2	8.4	2.9

Table 16A-22.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	9.2	2.7	47.1	4.2	3.9	46.5
2012	9.5	1.0	50.2	3.5	4.7	51.1
2017	16.3	4.1	37.5	8.1	4.3	52.2
2022	7.9	5.6	37.6	5.5	5.4	58.8

Table 16A-22.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2007	6	23	5	53
2012	3	6	-	9
2017	5	14	2	18
2022	6	28	-	7
Year	Days Use Per Acre (ha)			
2007	12.3 (30.5)	37.5 (92.7)	1.3 (3.3)	-
2012	13.8 (34.1)	11.4 (28.1)	-	-
2017	11.6 (28.7)	20.8 (51.3)	-	-
2022	10.2 (25.1)	54.3 (134.1)	2.0 (5.0)	-

Table 16A-22.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency												
Agropyron cristatum ⁱ (crested wheatgrass)	278	45	1	357	5	-	-	54	109	80	14	79	
Bromus arvensis ^{ai} (field brome)	233	40	1	153	9	7	-	200	189	122	39	8	
Bromus inermis ⁱ (smooth brome)	281	66	8	100	8	-	-	323	61	46	71	-	
Bromus tectorum ^{ai} (cheatgrass)	288	144	7	190	5	-	10	384	93	25	8	-	
Dactylis glomerata ⁱ (orchardgrass)	Average Cover (%)												
Festuca idahoensis (Idaho fescue)	2007	15.2	0.2	0.0	10.1	0.2	-	-	1.2	2.6	2.4	0.3	0.7
Pascopyrum smithii (western wheatgrass)	2012	10.5	0.2	0.0	2.9	0.9	0.3	-	7.6	6.5	4.3	1.0	0.0
Poa bulbosa ⁱ (bulbous bluegrass)	2017	11.1	1.5	0.7	2.7	0.6	-	-	17.6	2.1	1.3	1.5	-
Poa secunda (Sandberg bluegrass)	2022	17.4	1.6	0.6	4.1	0.2	-	0.3	20.8	2.4	1.2	0.3	-
Pseudoroegneria spicata (bluebunch wheatgrass)	Nested Frequency												
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	2007	278	45	1	357	5	-	-	54	109	80	14	79
Vulpia myuros ^{ai} (annual fescue)	2012	233	40	1	153	9	7	-	200	189	122	39	8
	2017	281	66	8	100	8	-	-	323	61	46	71	-
	2022	288	144	7	190	5	-	10	384	93	25	8	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-22.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)	-	-	307	-	7	-	4	64	9	-	37	29	-	-	-	14	1	
Allium acuminatum (tapertip onion)	-	-	184	-	6	5	-	38	11	-	33	26	-	-	-	17	3	
Alyssum desertorum ^{ai} (desert madwort)	-	1	237	-	5	17	-	-	21	-	20	32	-	-	1	-	1	
Astragalus cibirius (browse milkvetch)	1	-	272	1	5	73	-	61	25	1	68	34	0	2	7	115	1	
Astragalus eurekaensis (Eureka milkvetch)	Average Cover (%)																	
Calochortus nuttallii (sego lily)	2007	-	-	1.4	-	0.0	-	0.0	0.2	0.1	-	0.1	0.4	-	-	-	0.1	0.0
Camelina microcarpa ^{ai} (litlepod false flax)	2012	-	-	0.6	-	0.1	0.0	-	0.1	0.3	-	0.1	0.2	-	-	-	0.0	0.1
Ceratocephala testiculata ^{ai} (curvseed butterwort)	2017	-	0.0	3.0	-	0.0	0.0	-	-	0.5	-	0.3	0.6	-	-	0.0	-	0.0
Chaetopappa ericoides (rose heath)	2022	0.0	-	1.4	0.2	0.0	0.2	-	0.1	0.5	0.2	0.3	1.1	0.0	0.1	0.0	0.3	0.0
Cirsium undulatum ^a (wavyleaf thistle)	Nested Frequency																	
Collinsia parviflora ^a (maiden blue eyed Mary)	2007	-	-	307	-	7	-	4	64	9	-	37	29	-	-	-	14	1
Convolvulus arvensis ^{ai} (field bindweed)	2012	-	-	184	-	6	5	-	38	11	-	33	26	-	-	-	17	3
Crepis acuminata (tapertip hawkbeard)	2017	-	1	237	-	5	17	-	-	21	-	20	32	-	-	1	-	1
Cymopterus longipes (longstalk springparsley)	2022	1	-	272	1	5	73	-	61	25	1	68	34	0	2	7	115	1
Descurainia pinnata ^a (western tansymustard)	Average Cover (%)																	
Draba ^a (draba)	2007	-	-	1.4	-	0.0	-	0.0	0.2	0.1	-	0.1	0.4	-	-	-	0.1	0.0
Eriogonum racemosum (redroot buckwheat)	2012	-	-	0.6	-	0.1	0.0	-	0.1	0.3	-	0.1	0.2	-	-	-	0.0	0.1
	2017	-	0.0	3.0	-	0.0	0.0	-	-	0.5	-	0.3	0.6	-	-	0.0	-	0.0
	2022	0.0	-	1.4	0.2	0.0	0.2	-	0.1	0.5	0.2	0.3	1.1	0.0	0.1	0.0	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES										
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)										
<i>Holosteum umbellatum</i> ^{ai} (jagged chickweed)										
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)										
<i>Lappula occidentalis</i> ^a (flatspine stickseed)										
<i>Microsteris gracilis</i> ^a (slender phlox)										
<i>Penstemon pachyphyllus</i> (thickleaf beardtongue)										
<i>Phlox longifolia</i> (longleaf phlox)										
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)										
<i>Sphaeralcea coccinea</i> (scarlet globemallow)										
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)										
year	Nested Frequency									
2007	63	140	6	-	13	-	2	1	17	6
2012	12	61	-	-	5	-	11	-	26	23
2017	61	5	19	-	-	-	8	-	26	7
2022	125	135	14	3	-	2	21	-	33	11
year	Average Cover (%)									
2007	0.5	0.8	0.0	-	0.0	-	0.0	0.0	0.2	0.0
2012	0.0	0.3	-	-	0.0	-	0.0	-	0.4	0.2
2017	2.0	0.0	0.0	-	-	-	0.0	-	0.5	0.0
2022	4.7	1.1	0.1	0.0	-	0.0	0.3	-	0.5	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-22.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)					
<i>Gutierrezia sarothrae</i> (broom snakeweed)					
<i>Juniperus osteosperma</i> ^t (Utah juniper)					
<i>Purshia stansburiana</i> ^p (Stansbury cliffrose)					
<i>Purshia tridentata</i> ^p (antelope bitterbrush)					
year	Line Intercept Cover (%)				
2007	1.8	0.2	9.7	-	0.2
2012	1.6	0	8.3	-	1.3
2017	2.4	0.9	6.2	-	0
2022	2.5	2.9	-	-	0.3
year	Quadrat Cover (%)				
2007	1.0	0.0	6.5	-	0.0
2012	1.2	0.1	5.1	-	0.0
2017	1.8	0.9	4.3	-	0.0
2022	3.5	4.2	0.1	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-22.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2007	480	-	0	17	83	21	54	79	64/83
2012	380	1020	5	53	42	26	16	0	62/78
2017	780	-	31	51	18	26	3	8	63/91
2022	720	580	17	72	11	6	8	61	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2007	-	-	-	-	-	-	-	-	23/47
2012	20	-	0	100	0	100	0	0	20/46
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ephedra viridis^p -- (mormon tea)									
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	92/105
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	33/34
2017	-	-	-	-	-	-	-	-	-/-
2022	-	180	0	0	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2007	80	-	50	50	0	0	0	0	21/29
2012	260	60	62	39	0	0	0	0	21/29
2017	1540	120	20	81	0	1	0	0	23/27
2022	9380	6160	53	45	2	0	0	2	- / -
Juniperus osteosperma^t -- (Utah juniper)									
2007	80	-	25	75	0	0	0	0	- / -
2012	160	20	13	75	13	0	13	14	- / -
2017	80	-	0	100	0	0	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
2007	-	-	-	-	-	-	-	-	161/117
2012	-	-	-	-	-	-	-	-	163/159
2017	-	-	-	-	-	-	-	-	184/186
2022	-	40	0	0	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2007	20	-	0	100	0	0	0	0	69/126
2012	180	-	0	100	0	11	89	0	62/105
2017	20	-	0	100	0	0	100	0	99/181
2022	20	20	0	100	0	0	100	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

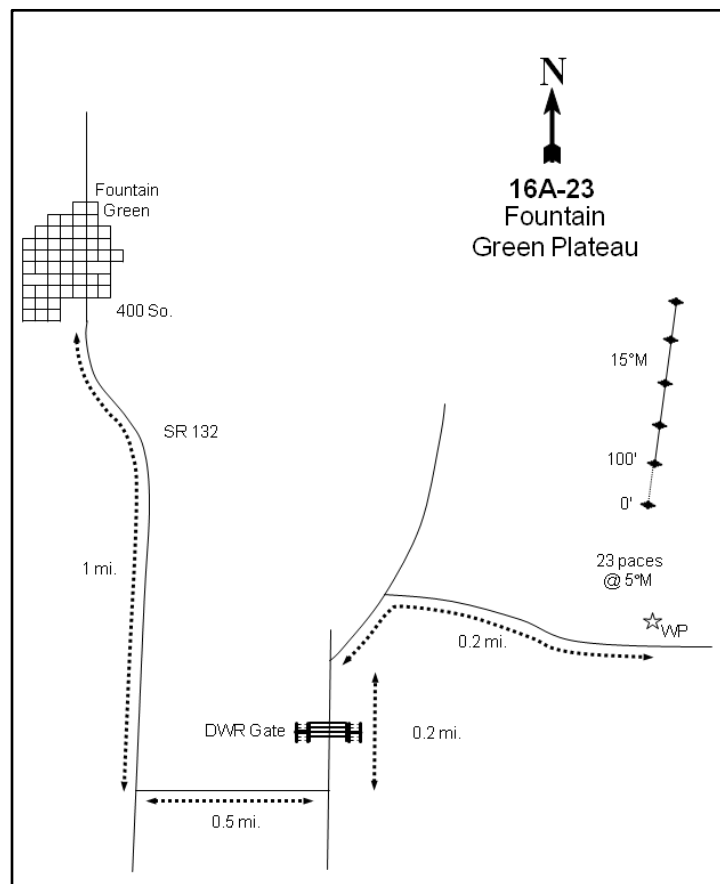
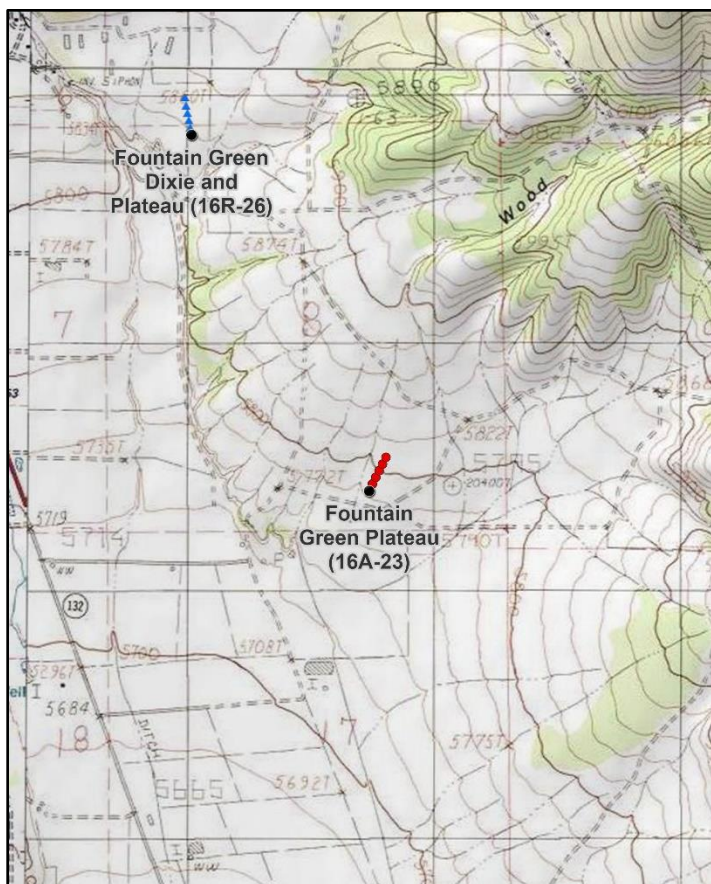
Table 16A-22.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2007	36	-	-	13	38	50	21.0
2012	28	8	8	25	25	33	16.7
2017	27	-	17	33	42	8	15.7
2022	4	-	33	33	-	33	24.3

Table 16A-22.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2007	2.6	0.0	0.0	30.0	-8.2	0.5	-2.0	22.9	Very Poor
2012	4.0	0.0	0.0	30.0	-2.3	1.9	-2.0	31.5	Very Poor
2017	3.0	0.0	0.0	30.0	-3.2	2.2	-2.0	30.0	Very Poor
2022	3.6	0.0	0.0	30.0	-4.3	3.6	-2.0	30.9	Very Poor

FOUNTAIN GREEN PLATEAU - STUDY NO. 16A-23



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Moroni NW; Township 14S, Range 3E, Section 08
NAD 83 UTM ZONE 12, 447673 East 4384594 North

Transect Information

Browse Tag # (0' Stake)	193
Transect Bearing	15° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the curve in SR-132 on the south end of Fountain Green, travel south on SR-132 for 1 mile and turn left (east) onto a dirt road that goes toward the GBRC farm. Travel on this road for 0.5 miles to a "T"-intersection and turn left (north) towards a hill. Travel for 0.2 miles up the hill, passing through a gate to the DWR property to an intersection. Turn right (east) here and travel 0.2 miles to the witness post on the left (north) side of the road. From the witness post, the 0-foot baseline stake is 23 paces away at 5 degrees magnetic and is marked by browse tag #193.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,775ft (1,760m)
Aspect	Southwest
Slope	5%
Sample Dates	07/03/2007, 05/14/2012, 05/15/2017, 05/09/2022

Table 16A-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Plateau	CRO WMA Upland Game Habitat Improvement - Phase II	3461	June 2016	94
Harrow - One-Way Chain	CRO WMA Upland Game Habitat Improvement - Phase II	3461	October 2016	94
Seeding - Broadcast Before	CRO WMA Upland Game Habitat Improvement - Phase II	3461	October 2016	94
Herbicide - Plateau	Fountain Green WMA Habitat Improvement	288	September 2007	275

Table 16A-23.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
CRO WMA			Broadcast	Oct 2016	57
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Leymus cinereus	Great Basin Wildrye	DWR IntMtn Tetra	0.88	0.59
G	Pascopyrum smithii	Western Wheatgrass	Arriba	0.88	0.81
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.44	0.35
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Columbia	1.75	1.55
F	Linum perenne	Blue Flax	Appar	0.88	0.78
F	Medicago sativa	Alfalfa	Ladak +	0.88	0.84
F	Onobrychis viciifolia	Sainfoin	Eski	3.51	3.33
F	Sanguisorba minor	Small Burnet	Delar	1.75	1.65
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	1.40	0.27

Wildlife Habitat and Vegetation History**Table 16A-23.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Greater Sage-Grouse	occupied	year-long

Table 16A-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2012	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2017	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2022	Annual Grass/Wyoming Big Sagebrush	No Encroachment

Site Notes

Two deer carcasses were found on site in 2007, and sheep were on the site when it was read in May of 2012.

Soils**Table 16A-23.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.0	56.2	24.0	19.8	1.6	12.3	486.4	0.6	07/03/2007

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047AX312UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has dominated the shrub component of this site since study establishment in 2007, although density decreased by over 2/3rds between 2012 and 2022 (Table 16A-23.12, Table 16A-23.13). The introduced annual grass cheatgrass (*Bromus tectorum*) is the most abundant species in the herbaceous understory. The first sampling after the herbicide treatment (Table 16A-23.1), cover and frequency of cheatgrass decreased while that of perennial grasses increased. Annual grasses cover has since increased, but frequency has remained similar each sample year; cheatgrass cover has increased to nearly double that of pre-herbicide treatment levels in 2022. As such, this study site may suffer the effects of an increased fuel load should a wildfire occur. Forbs have remained rare (Table 16A-23.7, Table 16A-23.10, Table 16A-23.11).

Trend Summary Tables

Table 16A-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2007	3.4	1.1	-	3.7	0.8	-
2012	8.2	1.0	-	8.2	1.6	-
2017	2.0	1.0	-	2.2	2.0	-
2022	1.8	0.3	-	1.7	0.4	-

Table 16A-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2007	475	221	396	77	27.1	1.9	4.3	0.4
2012	326	363	300	44	10.9	15.8	2.0	0.1
2017	451	317	327	77	26.3	8.1	3.5	0.5
2022	473	318	400	77	47.0	11.8	20.2	1.0

Table 16A-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	19.5	1.8	44.5	0.5	2.2	41.6
2012	21.5	0.9	40.9	0.3	2.5	37.8
2017	33.5	1.7	34.0	1.8	2.8	42.9
2022	12.8	0.3	47.6	1.0	2.1	70.2

Table 16A-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2007	-	52	5	-	60
2012	-	23	-	-	42
2017	1	23	-	-	52
2022	-	63	1	-	19
Year	Days Use Per Acre (ha)				
2007	-	87.8 (216.8)	1.3 (3.3)	-	-
2012	-	46.2 (114.2)	0.7 (1.7)	8.7 (21.5)*	-
2017	-	22.1 (54.6)	-	-	-
2022	-	127.3 (314.5)	-	-	-

*Pellets per acre (ha)

Table 16A-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ^a (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)	Sporobolus cryptandrus (sand dropseed)	Vulpia octiflora ^a (sixweeks fescue)
year	Nested Frequency									
2007	475	8	10	202	-	4	10	11	-	3
2012	326	0	25	349	-	9	13	-	3	-
2017	451	10	28	302	4	3	6	-	5	-
2022	473	-	28	297	16	8	3	-	18	7
year	Average Cover (%)									
2007	27.0	0.1	0.3	1.2	-	0.1	0.3	0.1	-	0.0
2012	10.9	0.0	0.1	14.7	-	0.1	0.9	-	0.0	-
2017	26.3	0.6	0.6	6.4	0.1	0.0	0.5	-	0.0	-
2022	47.0	-	2.4	8.5	0.5	0.0	0.4	-	0.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Calochortus nuttallii (sego lily)	Ceratophala testiculata ^{ai} (curveseed butterwort)	Crepis acuminata (tapertip hawkbeard)	Crepis atriobarba (slender hawkbeard)	Cymopterus purpurascens (widewing springparsley)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lotus utahensis (Utah bird's-foot trefoil)	Onobrychis vicifolia ^a (sainfoin)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency																
2007	376	-	160	-	-	-	-	-	103	-	1	-	-	-	-	2	77
2012	244	2	141	3	-	-	2	1	9	-	13	1	-	3	3	-	36
2017	158	7	293	6	-	-	7	-	23	20	-	2	22	1	-	-	42
2022	361	-	241	4	3	3	-	-	183	4	-	-	-	-	14	57	67
year	Average Cover (%)																
2007	2.0	-	0.5	-	-	-	-	-	1.7	-	0.0	-	-	-	-	0.0	0.4
2012	1.1	0.0	0.8	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.1
2017	0.3	0.1	3.0	0.0	-	-	0.0	-	0.1	0.1	-	0.0	0.1	0.0	-	-	0.3
2022	9.2	-	0.8	0.1	0.0	0.0	-	-	8.9	0.0	-	-	-	-	0.0	1.2	0.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	
Tragopogon dubius ^{ai} (yellow salsify)	
year	Nested Frequency
2007	-
2012	-
2017	-
2022	1
year	Average Cover (%)
2007	-
2012	-
2017	-
2022	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)			
Opuntia polyacantha (plains pricklypear)			
year	Line Intercept Cover (%)		
2007	3.7	-	0.8
2012	8.2	0	1.6
2017	2.2	-	2
2022	1.7	-	0.4
year	Quadrat Cover (%)		
2007	3.4	-	1.1
2012	8.2	0.0	1.0
2017	2.0	-	1.0
2022	1.8	-	0.3

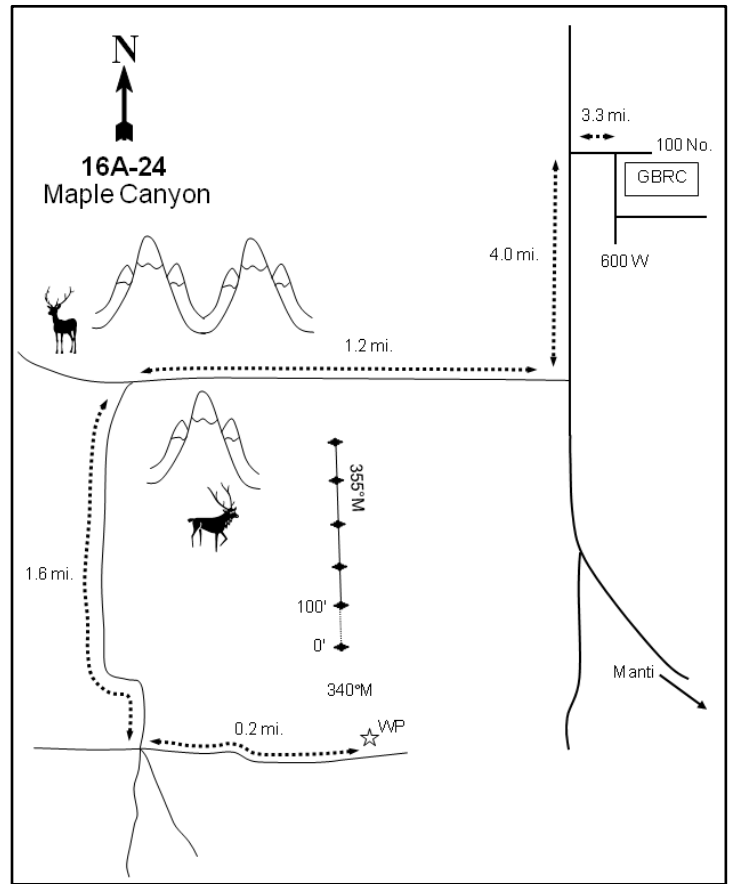
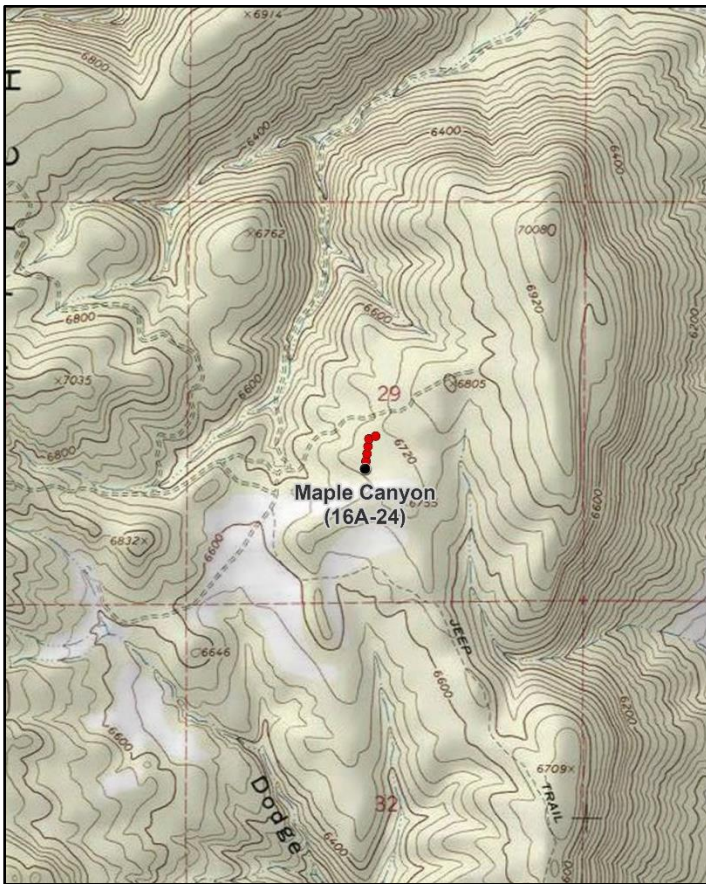
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2007	1200	-	0	32	68	12	87	55	73/101
2012	2460	760	47	38	15	26	9	9	76/100
2017	920	200	37	13	50	17	28	28	71/92
2022	800	20	8	45	48	48	45	50	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2007	-	-	-	-	-	-	-	-	53/124
2012	40	-	50	50	0	0	100	50	- / -
2017	-	-	-	-	-	-	-	-	18/20
2022	-	-	-	-	-	-	-	-	-/-
Echinocereus -- (hedgehog cactus)									
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	31/60
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
2007	440	-	0	91	9	0	0	0	20/47
2012	520	-	4	85	12	4	8	8	17/74
2017	1060	-	13	85	2	0	2	2	17/62
2022	620	-	0	55	45	0	0	68	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

MAPLE CANYON - STUDY NO. 16A-24



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Manti SW; Township 17S, Range 2E, Section 29
NAD 83 UTM ZONE 12, 437954 East 4350784 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

179
355° magnetic (Line 5: 66° magnetic)
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

Starting at the intersection of 100 North and 600 West in Ephraim, travel 3.3 miles west on 100 North. Turn left (south) at the intersection and travel 4.0 miles to another intersection. Turn right (west). Travel for 1.2 miles up the canyon to a "Y" intersection and turn left (south). Travel 1.6 miles to five point intersection on top of the ridge. Take the furthest left (east) road and travel 0.2 miles to a witness post on the north side of the road. The 0-foot stake (browse tag #179) is found 340 degrees magnetic from the witness post.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,660ft (2,030m)
Aspect	West
Slope	5%
Sample Dates	05/30/2012, 05/31/2017, 05/16/2022

Table 16A-24.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	San Pitch Mountain Seeding	LTDL	June-October 1969	392
Seeding - Aerial Before	San Pitch Mountain Seeding	LTDL	June-October 1969	392
Mechanical - Bullhog	Maple Canyon WMA Habitat Improvement	2352	September 2012-October 2013	514

Table 16A-24.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
			Aerial	Jun 1969	392
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Fairway	2.24	0.00
G	Agropyron desertorum	Desert Wheatgrass		1.01	0.00
G	Bromus inermis	Smooth Brome		1.53	0.00
G	Dactylis glomerata	Orchardgrass		0.46	0.00
G	Festuca ovina	Sheep Fescue		0.85	0.00
G	Pascopyrum smithii	Western Wheatgrass		0.48	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.48	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		1.55	0.00
F	Astragalus cicer	Cicer Milkvetch		0.08	0.00
F	Balsamorhiza sagittata	Arrowleaf Balsamroot		0.33	0.00
F	Hedysarum boreale	Utah Sweetvetch		0.19	0.00
F	Medicago sativa	Alfalfa	Ladak	0.42	0.00
F	Medicago sativa	Alfalfa	Nomad	0.44	0.00
F	Medicago sativa	Alfalfa	Rambler	0.41	0.00
F	Melilotus officinalis	Yellow Sweetclover		1.39	0.00
F	Sanguisorba minor	Small Burnet		1.31	0.00
S	Atriplex canescens	Fourwing Saltbush		0.78	0.00
S	Purshia tridentata	Bitterbrush		0.71	0.00

Wildlife Habitat and Vegetation History

Table 16A-24.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring

Table 16A-24.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Pinyon-Juniper	Phase II transitioning to Phase III
2017	Perennial Grass/Mountain Big Sagebrush	Phase I
2022	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16A-24.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	32.4	33.1	34.5	3.5	4.1	92.0	1.0	05/30/2012

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA312UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 2012, this study site was dominated by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) and was considered to be within Phase II transitioning to Phase III of woodland succession. The browse species mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) were present, but contributed little cover. A bullhog treatment in 2012/2013 removed most of the trees (Photos, Table 16A-24.1, Table 16A-24.4, Table 16A-24.12, Table 16A-24.13, Table 16A-24.14). After the treatment, the site transitioned to one dominated by perennial grasses -- namely the introduced species crested wheatgrass (*Agropyron cristatum*) and the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) -- and sagebrush (Table 16A-24.7, Table 16A-24.10). The densities and cover of both bitterbrush and sagebrush have since increased (Table 16A-24.12, Table 16A-24.13). Forbs have remained rare, and the noxious and introduced annual forb species nodding plumeless thistle (*Carduus nutans*) was observed in 2017 and 2022 (Table 16A-24.11).

Trend Summary Tables

Table 16A-24.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2012	2.5	-	14.6	2.0	-	19.6
2017	3.0	-	0.2	2.8	-	0.1
2022	4.9	0.1	0.5	4.5	0.1	0.3

Table 16A-24.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2012	-	249	105	119	-	10.8	0.3	0.9
2017	17	315	274	130	0.2	24.1	3.8	1.8
2022	18	308	371	129	0.1	26.6	7.2	2.6

Table 16A-24.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	21.7	2.7	38.6	15.5	4.5	30.4
2017	17.4	0.6	54.1	13.0	2.6	33.1
2022	12.8	0.0	47.6	18.0	2.6	40.1

Table 16A-24.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
2012	-	13	18
2017	6	14	41
2022	4	12	7
Year	Days Use Per Acre (ha)		
2012	-	8.1 (19.9)	-
2017	8.7 (21.5)	20.1 (49.7)	-
2022	13.1 (32.3)	6.0 (14.9)	-

Table 16A-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES								
Agropyron cristatum ⁱ (crested wheatgrass)								
Bromus tectorum ^{ai} (cheatgrass)								
Festuca idahoensis (Idaho fescue)								
Pascopyrum smithii (western wheatgrass)								
Poa secunda (Sandberg bluegrass)								
Psathyrostachys juncea ⁱ (Russian wildrye)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)								
year	Nested Frequency							
2012	133	-	32	4	104	12	36	3
2017	180	17	66	2	68	12	92	7
2022	200	18	64	8	20	6	77	23
year	Average Cover (%)							
2012	5.5	-	1.2	0.0	2.7	0.4	1.1	0.0
2017	11.5	0.2	4.5	0.0	0.8	0.8	6.2	0.2
2022	16.7	0.1	3.5	0.2	0.1	0.6	5.1	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-24.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Agoseris glauca (pale agoseris)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Antennaria dimorpha (low pussytoes)																		
Arenaria fendleri (Fendler's sandwort)																		
Astragalus cibaricus (browse milkvetch)																		
Astragalus eurekaensis (Eureka milkvetch)																		
Astragalus utahensis (Utah milkvetch)																		
Calochortus nuttallii (sego lily)																		
Carduus nutans ⁿⁱ (nodding plumeless thistle)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium undulatum ^a (wavyleaf thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Crepis acuminata (tapertip hawkbeard)																		
Cryptantha humilis (roundspike cryptantha)																		
Cymopterus longipes (longstalk springparsley)																		
Descurainia pinnata ^a (western tansymustard)																		
year	Nested Frequency																	
2012	2	24	18	-	-	11	4	-	-	72	-	-	8	1	-	25	-	
2017	37	170	9	4	-	11	2	8	0	135	6	7	11	-	3	46	34	
2022	32	346	-	4	3	11	-	15	0	188	-	3	5	6	-	76	28	
year	Average Cover (%)																	
2012	0.0	0.0	0.1	-	-	0.1	0.0	-	-	0.1	-	-	0.0	0.0	-	0.1	-	
2017	0.2	3.1	0.2	0.0	-	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.1	-	0.0	0.4	0.1	
2022	0.4	6.0	-	0.2	0.0	0.3	-	0.1	0.0	1.0	-	0.1	0.0	0.1	-	1.2	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum brevicale (shortstem buckwheat)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Microsteris gracilis ^a (slender phlox)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium longipes (longstalk clover)
year	Nested Frequency										
2012	3	-	5	28	46	3	-	4	3	-	30
2017	-	5	8	55	18	-	1	7	4	-	10
2022	-	-	4	9	2	3	4	3	-	1	13
year	Average Cover (%)										
2012	0.0	-	0.0	0.1	0.5	0.0	-	0.0	0.0	-	0.1
2017	-	0.0	0.3	0.1	0.1	-	0.0	0.1	0.0	-	0.0
2022	-	-	0.1	0.0	0.0	0.0	0.0	0.1	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-24.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Pinus edulis ^t (twoneedle pinyon)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)						
2012	0.1	0.8	-	-	12	7.6	1.1
2017	-	1.4	-	-	0.1	-	1.4
2022	-	3	-	0.1	0.3	-	1.5
year	Quadrat Cover (%)						
2012	0.0	1.2	0.1	-	8.5	6.0	1.1
2017	-	1.8	0.0	-	0.2	-	1.2
2022	-	3.0	0.2	0.1	0.3	0.1	1.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-24.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2012	60	-	0	100	0	0	0	0	47/133
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2012	400	40	10	60	30	39	11	6	47/60
2017	460	-	13	61	26	9	4	26	56/72
2022	660	60	21	70	9	52	9	15	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
2012	140	-	0	100	0	0	0	0	9/14
2017	120	-	0	100	0	0	0	0	10/19
2022	140	-	29	57	14	43	14	14	- / -
Ephedra viridis^p -- (mormon tea)									
2012	-	-	-	-	-	-	-	-	106/85
2017	-	-	-	-	-	-	-	-	96/114
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2012	-	-	-	-	-	-	-	-	94/45
2017	-	-	-	-	-	-	-	-	61/61
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2012	80	-	0	100	0	25	0	0	18/27
2017	20	-	0	100	0	0	0	0	15/19
2022	100	-	0	100	0	0	0	0	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2012	160	20	38	50	13	0	0	0	- / -
2017	40	60	50	50	0	0	0	50	- / -
2022	20	20	0	100	0	0	0	0	- / -
Peraphyllum ramosissimum^p -- (wild crab apple)									
2012	-	-	-	-	-	-	-	-	47/59
2017	-	-	-	-	-	-	-	-	33/34
2022	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2012	160	40	50	38	13	0	0	13	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	60	-	33	67	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2012	60	-	0	33	67	0	67	67	33/109
2017	320	-	0	100	0	75	25	0	27/73
2022	180	-	22	78	0	0	44	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

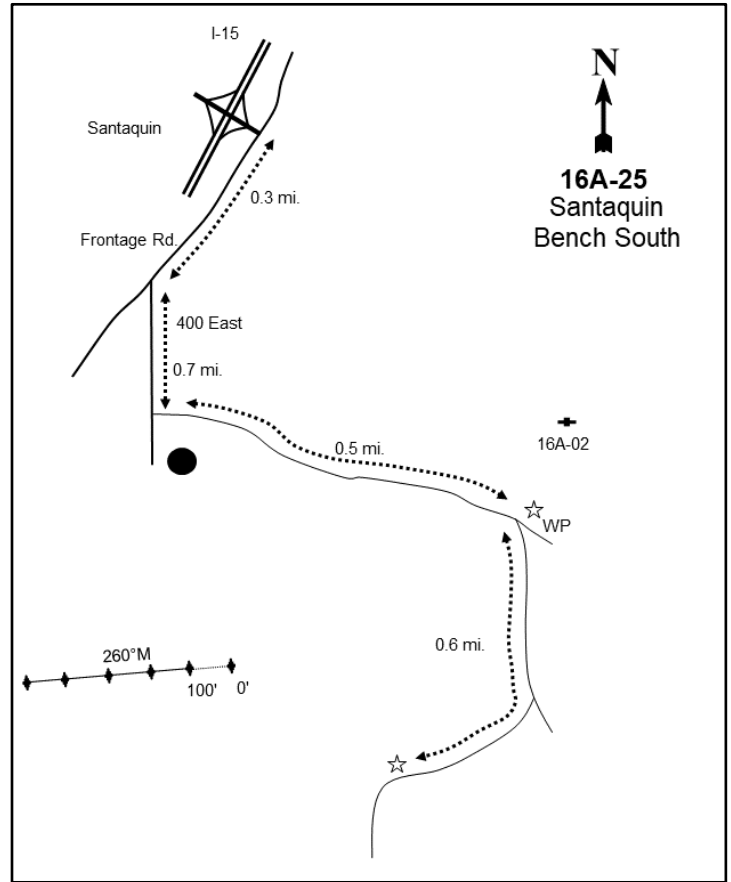
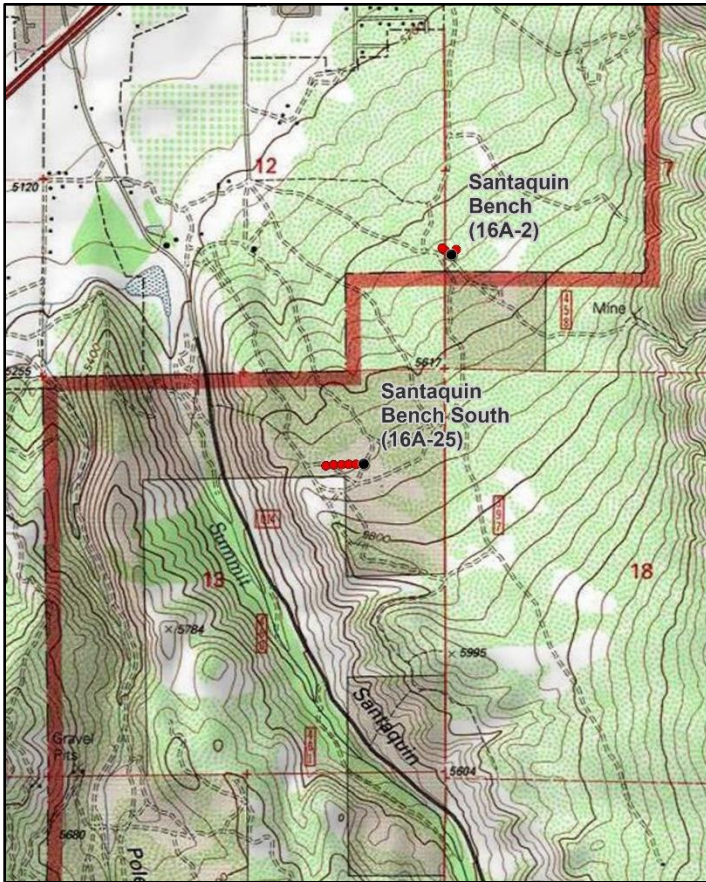
Table 16A-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2012	226	-	10	50	30	10	9.8
2017	38	10	90	-	-	-	6.8
2022	35	-	82	9	9	-	4.6
Pinus edulis (twoneedle pinyon)							
2012	165	5	10	40	40	5	8.3
2017	10	38	63	-	-	-	4.0
2022	11	11	67	22	-	-	3.6

Table 16A-24.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2012	2.8	0.0	0.0	21.7	0.0	1.8	0.0	26.3	Very Poor
2017	3.9	0.0	0.0	30.0	-0.2	3.5	-2.0	35.2	Very Poor-Poor
2022	6.0	0.0	0.0	30.0	-0.1	5.2	-2.0	39.1	Poor

SANTAQUIN BENCH SOUTH - STUDY NO. 16A-25



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Santaquin NE; Township 10S, Range 1E, Section 13
NAD 83 UTM ZONE 12, 434162 East 4422534 North

Transect Information

Browse Tag # (0' Stake)	78
Transect Bearing	260° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the I-15 interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland Drive) for a short distance to where there are several forks. Turn left on 400 East, which turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left (east) and travel 0.50 miles to a fork in the road. Turn right and travel for another 0.6 miles and park, using the GPS, as close as possible to the 0-foot stake. The 0-foot baseline stake is marked by browse tag #78.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	No data
Aspect	Northwest
Slope	5%%
Sample Dates	05/17/2022

Table 16A-25.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Transplant	Central Region Shrub Restoration Projects FY2020	4812	October 2020-March 2021	20
Fire - Wildfire	Mollie	-	2001	8021

Wildlife Habitat and Vegetation History**Table 16A-25.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring

Table 16A-25.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Perennial Grass	No Encroachment

Site Notes

No Notes

Soils**Table 16A-25.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.6	39.9	28.6	31.6	2.4	11.8	302.0	0.3	05/17/2022

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 2022, this study site was dominated by perennial grasses, namely the introduced species intermediate wheatgrass (*Thinopyrum intermedium*), bulbous bluegrass (*Poa bulbosa*), and smooth brome (*Bromus inermis*) (Table 16A-25.7, Table 16A-25.10). Browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and curl-leaf mountain mahogany (*Cercocarpus ledifolius*) were recently transplanted with most plants being considered young and healthy (Table 16A-25.1, Table 16A-25.12, Table 16A-25.13), but most were caged and contributed much less cover than other plant communities on the site. Without high amounts of herbivory or competition from perennial grasses these shrubs will likely transition to a mature age class with increased cover and production that will provide valuable forage for wildlife. Forbs are rare, but diverse, with most species being introduced annual species that comprise much of the herbaceous forb community (Table 16A-25.11).

Trend Summary Tables

Table 16A-25.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	0.4	0.3	-	0.3	0.1	-

Table 16A-25.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	60	446	195	272	0.6	60.5	7.2	8.2

Table 16A-25.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	31.2	-	27.5	0.7	0.6	63.6

Table 16A-25.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
2022	9	-
Year	Days Use Per Acre (ha)	
	2022	18.7 (46.3)

Table 16A-25.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency						
2022	28	126	32	394	7	4	313
year	Average Cover (%)						
2022	0.1	7.7	0.5	26.1	0.0	0.0	26.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16A-25.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Alyssum alyssoides ^{ai} (pale madwort)	5	6	1	10	37	0	11	7	20	56	7	16	2	3	30	7	4	
Alyssum desertorum ^{ai} (desert madwort)	Average Cover (%)																	
Astragalus cibaricus (browse milkvetch)	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.9	0.1	0.2	0.1	0.0	0.0	0.1	1.7	0.1	0.0	
Buglossoides arvensis ^{ai} (corn gromwell)	Nested Frequency																	
Calochortus nuttallii (sego lily)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Camelina microcarpa ^{ai} (tittlepod false flax)	Average Cover (%)																	
Ceratocephala testiculata ^{ai} (curveseed butterwort)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Cirsium undulatum ^a (wavyleaf thistle)	Nested Frequency																	
Claytonia perfoliata (miner's lettuce)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Collinsia parviflora ^a (maiden blue eyed Mary)	Average Cover (%)																	
Crepis acuminata (tapertip hawkbeard)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Cryptantha ^a (annual cryptantha)	Nested Frequency																	
Cymopterus longipes (longstalk springparsley)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Eriogonum racemosum (redroot buckwheat)	Average Cover (%)																	
Erodium cicutarium ^{ai} (redstem stork's bill)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Galium aparine ^a (stickywilly)	Nested Frequency																	
Helianthus annuus ^a (common sunflower)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																	
Holosteum umbellatum ^{ai} (jagged chickweed)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Lactuca serriola ^{ai} (prickly lettuce)	Average Cover (%)																	
Lathyrus brachycalyx (Bonneville pea)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Linum perenne ⁱ (blue flax)	Nested Frequency																	
Medicago sativa ⁱ (alfalfa)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Microseris nutans (nodding microseris)	Average Cover (%)																	
Microsteris gracilis ^a (slender phlox)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Penstemon (beardtongue)	Nested Frequency																	
Phlox longifolia (longleaf phlox)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Sanguisorba minor ⁱ (small burnet)	Average Cover (%)																	
Sisymbrium altissimum ^{ai} (tall tumblemustard)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Taraxacum officinale (common dandelion)	Nested Frequency																	
Tragopogon dubius ^{ai} (yellow salsify)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	
Veronica biloba ^{ai} (two-lobed speedwell)	Average Cover (%)																	
Vicia americana (American vetch)	0.1	0.3	0.9	0.1	5.8	0.0	0.1	0.2	0.1	0.1	3.1	0.0	0.3	0.1	0.0	0.0	0.6	
Wyethia amplexicaulis (mule-ears)	Nested Frequency																	
Zigadenus paniculatus (foothill deathcamas)	19	33	10	54	171	2	8	55	13	35	98	7	18	26	1	1	36	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16A-25.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	0.3	-	0.1	0	0
Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Quadrat Cover (%)				
Gutierrezia sarothrae (broom snakeweed)	0.2	0.1	0.3	0.1	0.0
Purshia tridentata ^p (antelope bitterbrush)	Line Intercept Cover (%)				
Quercus gambelii ^p (Gambel oak)	0.3	-	0.1	0	0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16A-25.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

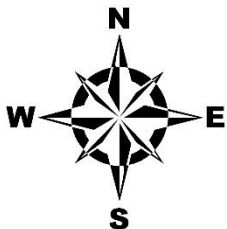
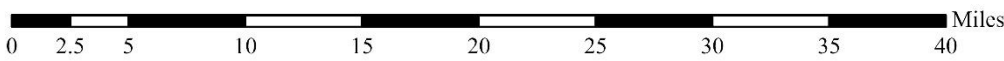
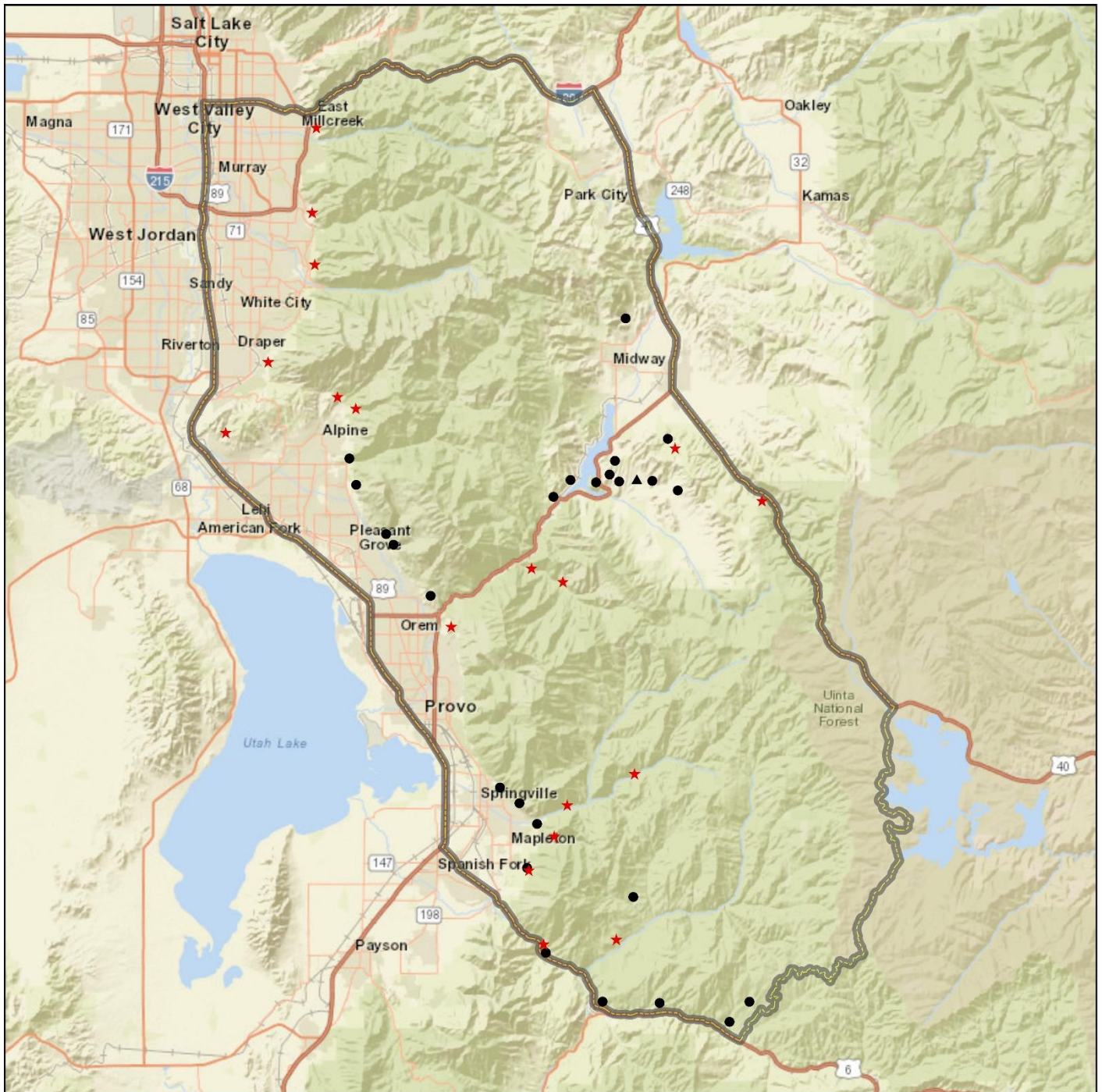
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p -- (mountain big sagebrush)									
2022	280	900	79	21	0	0	14	0	- / -
<i>Atriplex canescens</i> ^p -- (fourwing saltbush)									
2022	20	-	100	0	0	100	0	0	- / -
<i>Cercocarpus ledifolius</i> ^p -- (curl-leaf mountain mahogany)									
2022	400	220	100	0	0	5	10	0	- / -
<i>Gutierrezia sarothrae</i> -- (broom snakeweed)									
2022	460	4280	70	26	4	0	0	9	- / -
<i>Purshia tridentata</i> ^p -- (antelope bitterbrush)									
2022	320	840	94	0	6	0	0	19	- / -
<i>Quercus gambelii</i> ^p -- (Gambel oak)									
2022	60	-	33	67	0	0	100	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

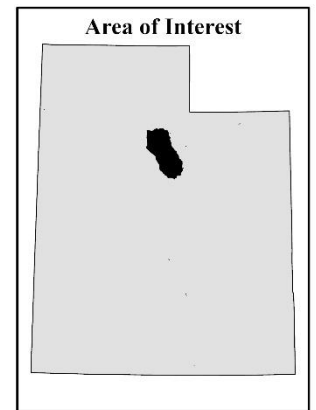
Table 16A-25.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	0.4	0.0	0.0	30.0	-0.5	10.0	0.0	39.9	Very Poor-Poor

WILDLIFE MANAGEMENT UNIT 17A – WASATCH MOUNTAINS, WEST

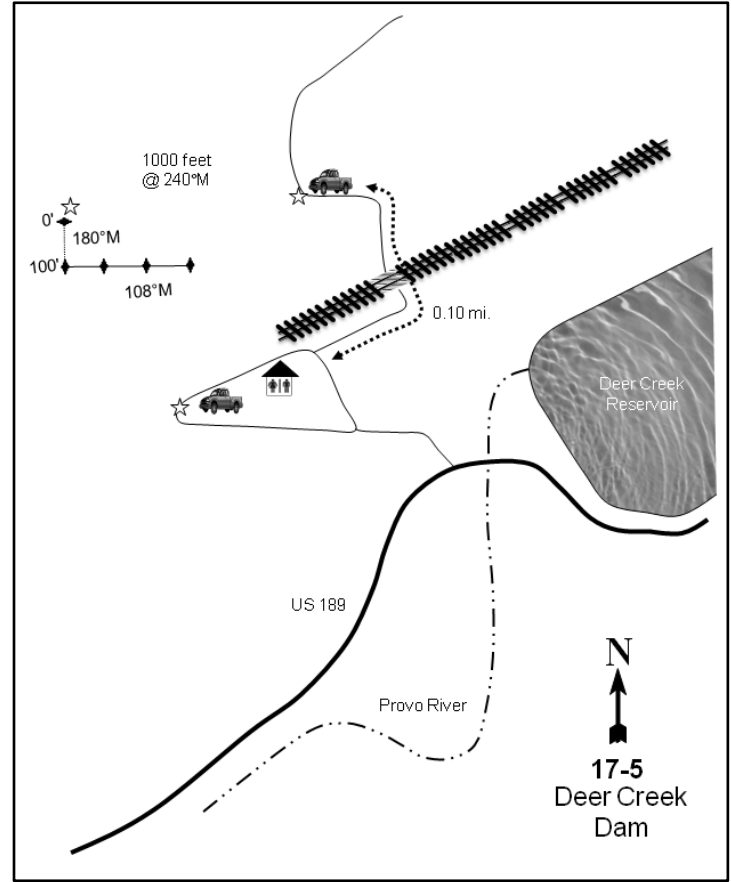


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 17A
★ RT, Suspended	
▲ WRI, Active	



Credits: County of Utah, Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS

DEER CREEK DAM - STUDY NO. 17-5

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Aspen Grove SE; Township 5S, Range 4E, Section 06
NAD 83 UTM ZONE 12, 454471 East 4473070 North

Transect Information

Browse Tag # (0' Stake)	3914
Transect Bearing	190° magnetic (Lines 2-4: 110° magnetic)
Length	400ft
Belt Placement	Line 1 (11 & 95ft), Line 2 (71ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belts 2 & 3: No Rebar

Directions to Site

From the dam at the south end of Deer Creek Reservoir, proceed south on U.S. 189 for approximately 0.10 miles and turn right (north) onto a road that leads to a parking lot at a trailhead (there is an outhouse in the parking lot). Park here and walk ~1000 feet northwest (a GPS may be useful), crossing railroad tracks and proceeding up a small hill to a full-high witness post. The 0-foot baseline stake is 20 feet from the witness post. A red browse tag, numbered 3914, is attached to the 0-foot baseline stake.

NOTE: Line 4 belt 3 was mistakenly put at 71 feet, and in order to be consistent, belt 3 has not been moved to 59 feet.

Site Information

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	5,550ft (1,692m)
Aspect	Southeast
Slope	12-20%
Sample Dates	05/16/1996, 06/27/2002, 07/02/2007, 07/30/2012, 07/12/2017, 07/13/2022

Table 17-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Other - Powerline	-	-	Prior to 1989	-
Fire - Wildfire	Deer Creek Trail	-	June 2018	-
Fire - Wildfire	Deer Creek	-	July 2018	-

Wildlife Habitat and Vegetation History**Table 17-05.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Shiras Moose	crucial	year-long

Table 17-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment
2022	Annual Grass-Forb	No Encroachment

Site Notes

The study is located half of a mile west of Deer Creek Dam on a moderately-sloped bench.

Soils**Table 17-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	29.3	42.7	28.0	3.3	12.9	150.4	0.7	11/12/2002
Clay Loam	7.4	28.6	37.0	34.4	4.9	10.7	99.2	0.8	05/16/1996

Site Potential

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) between 1983 to 2017. However, the area apparently burned in the summer of 2018 (Table 17-05.1), and much of the sagebrush and other preferred browse species such as chokecherry (*Prunus virginiana*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*) was removed as of 2022. More specifically, sagebrush cover decreased from 20% to 2% between 2017 and 2022, and density decreased from 6,000 plants/acre to 1,000 plants/acre over the same period. By contrast, yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*) effectively replaced the preferred browse component (Table 17-05.12, Table 17-05.13). The herbaceous understory is abundant and diverse overall. As of the 2017 sample year, dominant grasses on the site included the introduced annual species cheatgrass (*Bromus tectorum*) and the native perennial species bluebunch wheatgrass (*Pseudoroegneria spicata*). However, in 2022 annual brome species had increased significantly in both abundance and cover following the fire. Bluebunch wheatgrass had no significant change after the burn. Perennial and annual forbs have remained abundant and diverse over the course of the study. However, annual forbs increased in 2022, a trend largely driven by redstem stork's bill (*Erodium cicutarium*). The noxious weed species field bindweed (*Convolvulus arvensis*), gypsyflower (*Cynoglossum officinale*) and Dalmatian toadflax (*Linaria dalmatica*) have been present with bindweed and Dalmatian toad flax both increasing following the burn (Table 17-05.7, Table 17-05.10, Table 17-05.11). Current fine fuel loads and reduced ecological resilience will likely lead to increased fire return intervals and a reduction in forage.

Trend Summary Tables**Table 17-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	25.3	3.8	-	-	-	-
2002	28.5	3.1	-	32.1	4.7	-
2007	17.3	1.8	-	20.6	3.2	-
2012	18.0	3.5	-	20.8	3.9	-
2017	23.3	10.1	-	32.5	12.2	-
2022	3.9	7.6	-	2.4	11.5	-

Table 17-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	444	173	318	223	19.1	3.5	5.1	4.9
2002	238	164	273	227	3.1	3.1	3.7	6.3
2007	347	106	350	232	9.7	4.3	8.0	7.0
2012	163	140	306	314	2.8	8.5	6.7	9.1
2017	136	138	312	252	5.3	4.0	8.2	9.3
2022	390	88	383	223	15.3	5.0	19.6	8.0

Table 17-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.7	-	56.9	5.7	5.4	56.0
2002	16.9	-	45.2	6.7	3.3	46.5
2007	9.7	-	46.2	5.4	3.4	51.5
2012	10.8	-	45.9	11.2	7.6	44.2
2017	10.3	-	53.9	11.1	4.1	52.8
2022	22.7	-	44.0	11.6	7.8	54.5

Table 17-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	15	1	-
2002	11	3	-
2007	5	-	2
2012	-	-	-
2017	5	-	1
2022	6	12	1
Year	Days Use Per Acre (ha)		
1996	-	-	-
2002	32.2 (79.5)	6.0 (14.9)	-
2007	29.5 (72.8)	16.8 (41.4)	-
2012	7.4 (18.2)	-	-
2017	8.7 (21.5)	-	-
2022	4.0 (9.9)	16.8 (41.4)	-

Table 17-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aegilops cylindrica ⁿⁱ (jointed goatgrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ⁿⁱ (field brome)	Bromus tectorum ⁿⁱ (cheatgrass)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	-	-	-	-	444	-	5	3	-	-	104	-	-	82
2002	3	3	3	182	138	3	0	7	-	-	45	1	-	108
2007	-	2	2	123	329	-	5	3	-	1	28	-	-	69
2012	-	-	10	117	67	1	3	-	4	-	25	49	3	64
2017	-	-	3	56	107	4	-	1	1	-	-	1	-	129
2022	-	-	7	238	338	-	4	-	-	-	2	1	-	74
year	Average Cover (%)													
1996	-	-	-	-	19.1	-	0.2	0.0	-	-	1.2	-	-	2.1
2002	0.1	0.0	0.0	1.4	1.6	0.0	0.0	0.2	-	-	0.5	0.0	-	2.2
2007	-	0.0	0.1	1.0	8.7	-	0.8	0.2	-	0.0	0.3	-	-	2.9
2012	-	-	0.9	1.6	1.2	0.0	0.4	-	0.0	-	0.8	2.4	0.0	4.0
2017	-	-	0.1	1.0	4.2	0.0	-	0.0	0.0	-	-	0.0	-	3.8
2022	-	-	0.5	4.3	11.1	-	0.3	-	-	-	0.0	0.0	-	4.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ⁿⁱ (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ⁿⁱ (littletop false flax)	Ceratocephala testiculata ⁿⁱ (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Convolvulus arvensis ⁿⁱ (field bindweed)
year	Nested Frequency																
1996	-	18	111	-	7	-	-	24	-	-	-	12	48	-	-	2	-
2002	-	51	178	-	7	25	-	25	1	7	3	35	20	2	9	3	-
2007	3	22	261	-	5	7	5	47	-	2	51	147	13	2	6	25	-
2012	-	11	234	-	7	10	-	25	3	3	-	24	32	10	3	216	-
2017	-	70	132	1	13	1	2	41	1	16	9	108	14	-	57	29	1
2022	1	4	168	-	6	-	16	36	-	5	87	121	22	-	8	-	7
year	Average Cover (%)																
1996	-	0.1	0.4	-	0.1	-	-	0.2	-	-	-	0.1	0.8	-	-	0.0	-
2002	-	0.4	0.8	-	0.2	0.8	-	0.5	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.0	-
2007	0.0	0.1	1.8	-	0.2	0.2	0.1	1.7	-	0.0	0.2	1.3	0.2	0.0	0.0	0.1	-
2012	-	0.0	1.0	-	0.2	0.1	-	0.5	0.0	0.0	-	0.1	2.0	0.2	0.0	3.6	-
2017	-	1.1	0.6	0.0	0.4	0.0	0.0	1.9	0.0	0.1	0.1	0.8	0.4	-	0.3	0.4	0.0
2022	0.0	0.0	1.6	-	0.3	-	0.4	1.2	-	0.0	0.4	0.6	0.9	-	0.0	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cynoglossum officinale ^{ani} (gypsyflower)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)	Linaria dalmatica ^{ai} (Dalmatian toadflax)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1996	42	-	-	7	-	172	-	21	-	30	-	-	18	56	6	2	1
2002	-	-	-	1	13	67	-	3	-	-	-	6	3	45	6	0	0
2007	9	3	-	2	31	29	-	-	1	9	-	-	12	73	9	1	7
2012	3	9	-	-	17	10	-	-	-	12	4	-	20	107	6	4	4
2017	6	15	1	3	53	129	32	-	-	24	3	-	25	36	5	4	-
2022	-	-	-	-	283	6	2	-	-	17	-	-	6	113	25	-	-
year	Average Cover (%)																
1996	2.3	-	-	0.2	-	1.1	-	0.0	-	0.6	-	-	0.0	0.8	0.4	0.2	0.0
2002	-	-	-	0.0	0.1	1.1	-	0.0	-	-	-	0.0	0.0	1.4	0.2	0.2	0.0
2007	0.4	0.0	-	0.0	0.6	1.5	-	-	0.0	0.0	-	-	0.1	2.0	0.5	0.1	0.0
2012	0.2	0.0	-	-	0.1	0.1	-	-	-	0.6	0.0	-	1.1	2.4	0.2	0.2	0.0
2017	0.2	0.1	0.0	0.0	1.3	3.3	0.2	-	-	1.8	0.0	-	0.1	1.0	0.2	0.0	-
2022	-	-	-	-	15.8	0.0	0.0	-	-	0.5	-	-	0.0	3.4	1.5	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Melilotus officinalis ⁱ (sweetclover)	Mentzelia albicaulis ^a (whitestem blazingstar)	Microsteris gracilis ^a (slender phlox)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)
year	Nested Frequency								
1996	9	-	-	3	127	-	-	65	-
2002	-	-	4	-	145	-	-	96	-
2007	-	-	8	1	128	-	-	148	-
2012	8	-	-	8	91	4	-	111	2
2017	-	-	3	3	139	-	1	24	17
2022	3	2	4	-	63	-	-	6	23
year	Average Cover (%)								
1996	0.0	-	-	0.0	2.2	-	-	0.4	-
2002	-	-	0.0	-	2.6	-	-	1.1	-
2007	-	-	0.0	0.0	1.8	-	-	1.8	-
2012	0.3	-	-	0.2	0.7	0.0	-	2.0	0.0
2017	-	-	0.0	0.0	2.2	-	0.0	0.4	0.4
2022	0.0	0.0	0.0	-	0.4	-	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2002	0.2	24.8	1.5	1.3	2.6	0.6	0.9	-	4.9
2007	1	15.7	2.9	1.6	0.3	-	0.6	-	1.7
2012	1.1	12.3	3.2	2	0.7	-	1.3	-	4.1
2017	0.5	20.4	6.1	4	6.1	-	3.6	0.2	3.8
2022	-	2	7.6	0.3	3.5	0.4	-	0.1	-
year	Quadrat Cover (%)								
1996	-	20.6	3.5	0.9	0.3	-	0.4	0.1	3.2
2002	0.5	23.4	1.6	0.6	1.2	0.4	0.6	-	3.3
2007	0.1	14.0	1.3	1.0	0.4	-	0.9	0.0	1.2
2012	0.1	12.2	2.6	1.1	0.9	-	1.0	0.4	3.2
2017	0.3	14.2	6.0	3.0	4.1	-	2.4	0.4	3.1
2022	0.0	2.2	5.1	0.6	2.1	0.5	-	1.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Acer grandidentatumⁱ -- (bigtooth maple)									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	38/15
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	40	-	0	50	50	0	100	50	63/65
2002	60	-	0	67	33	0	33	0	175/144
2007	60	-	0	33	67	33	67	33	83/94
2012	40	-	0	100	0	50	0	50	128/141
2017	20	-	0	100	0	100	0	0	116/134
2022	20	-	0	100	0	0	0	0	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	4120	2020	38	54	8	18	2	15	62/100
2002	5320	-	15	70	15	17	2	9	62/71
2007	2800	-	4	63	34	27	16	36	75/99
2012	2940	3280	30	45	25	11	0	18	66/91
2017	6140	280	27	67	6	2	0	3	52/76
2022	1060	-	68	28	4	6	0	4	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	2060	120	14	86	0	11	0	0	32/55
2002	1760	-	0	98	2	0	0	1	30/43
2007	1300	-	9	80	11	0	0	8	29/47
2012	1080	-	0	93	7	0	0	32	35/60
2017	1460	-	6	95	0	0	0	0	36/62
2022	2440	-	1	98	1	0	0	1	- / -
Crataegus douglasii -- (black hawthorn)									
1996	-	-	-	-	-	-	-	-	- / -
2002	40	-	0	100	0	0	100	0	72/101
2007	-	-	-	-	-	-	-	-	79/84
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1996	580	-	14	69	17	3	21	24	57/62
2002	520	-	0	69	31	0	0	23	52/63
2007	320	-	0	56	44	0	0	25	76/75
2012	460	-	9	70	22	0	0	9	71/81
2017	580	-	0	83	17	7	0	10	75/82
2022	140	-	29	57	14	0	0	14	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	1140	600	30	67	4	2	2	5	15/23
2002	2940	-	3	90	8	0	0	3	26/34
2007	600	20	7	93	0	0	0	0	26/22
2012	1420	80	76	24	0	0	0	4	27/42
2017	2540	-	0	100	0	0	0	0	36/51
2022	2260	-	0	97	3	0	0	3	- / -
Mahonia repens -- (creeping barberry)									
1996	-	-	-	-	-	-	-	-	- / -
2002	5180	-	0	100	0	0	0	0	9/13
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	14/17
2022	2920	-	0	100	0	0	0	0	- / -
Prunus virginiana^P -- (chokecherry)									
1996	320	420	88	13	0	13	0	0	138/58
2002	680	-	3	94	3	12	68	3	28/21
2007	700	-	100	0	0	0	0	0	- / -
2012	280	-	14	86	0	7	0	0	81/92
2017	1080	-	0	100	0	0	0	0	60/28
2022	-	-	-	-	-	-	-	-	- / -

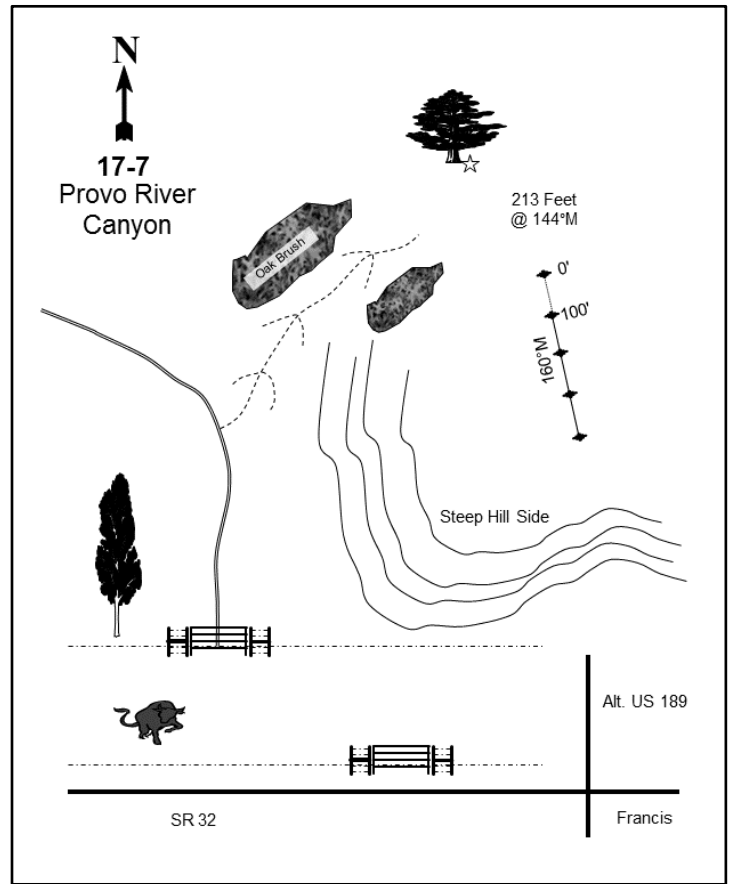
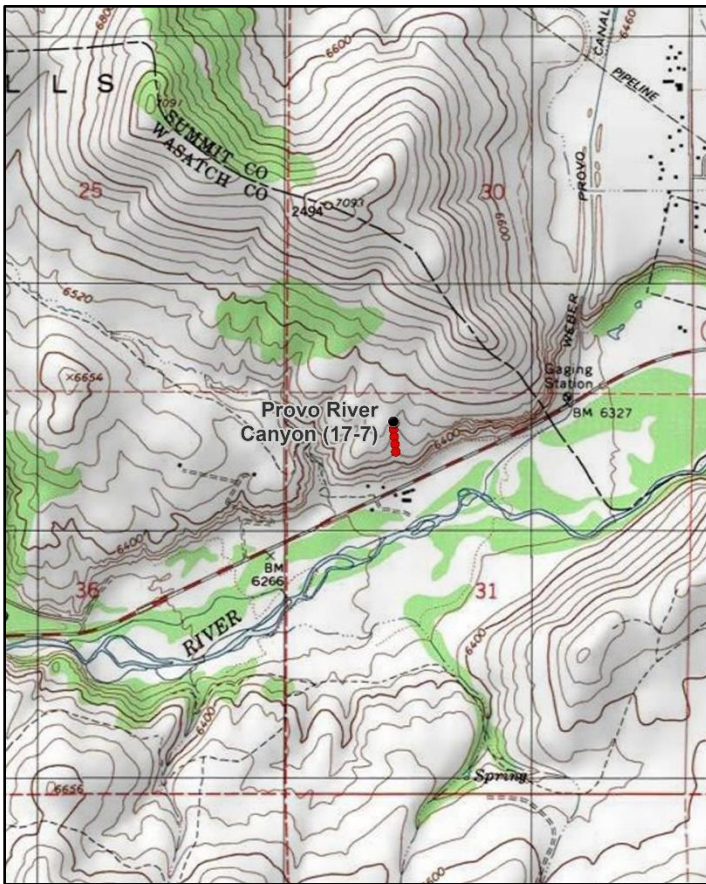
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
1996	100	20	20	80	0	80	0	0	33/113
2002	20	-	0	100	0	100	0	0	47/83
2007	20	-	0	100	0	0	100	0	35/112
2012	40	-	0	100	0	100	0	0	53/192
2017	40	-	0	100	0	100	0	0	50/116
2022	40	-	0	100	0	50	0	0	- / -
Quercus gambelii^p -- (Gambel oak)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	95/68
2007	20	-	0	100	0	0	0	100	47/81
2012	-	-	-	-	-	-	-	-	62/51
2017	-	-	-	-	-	-	-	-	61/85
2022	-	-	-	-	-	-	-	-	-/-
Rhus trilobata^p -- (skunkbush sumac)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	208/239
2022	-	-	-	-	-	-	-	-	-/-
Ribes aureum^p -- (golden currant)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	109/100
2017	-	-	-	-	-	-	-	-	110/109
2022	-	-	-	-	-	-	-	-	-/-
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	100	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	540	-	11	89	0	7	11	0	66/87
2002	480	-	4	79	17	8	8	0	64/83
2007	300	-	7	80	13	27	7	7	61/102
2012	420	-	0	91	10	19	0	57	63/90
2017	720	-	0	92	8	0	0	11	53/72
2022	40	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-05.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	12.8	15.0	7.0	-14.3	8.1	-4.0	54.5	Poor-Fair
2002	30.0	10.2	6.4	6.3	-2.3	9.9	-4.0	56.6	Poor-Fair
2007	25.6	5.0	3.1	8.6	-7.2	9.9	-6.0	38.9	Very Poor-Poor
2012	25.3	9.3	9.7	17.0	-2.1	10.0	-4.0	65.2	Fair
2017	30.0	12.9	8.5	8.0	-4.0	10.0	-6.0	59.4	Fair
2022	3.0	0.0	0.0	10.1	-11.5	8.8	-4.0	6.4	Very Poor

PROVO RIVER CANYON - STUDY NO. 17-7



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Francis NW; Township 2S, Range 6E, Section 31
NAD 83 UTM ZONE 12, 473378 East 4495437 North

Transect Information

Browse Tag # (0' Stake)	7960
Transect Bearing	160° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: No Rebar

Directions to Site

From the junction of SR-32 and Alt US-189 in Francis, proceed west on Highway 32 for 1.7 miles and stop at an old corral in a marshy pasture on the right (north), opposite Victory Ranch Club (6480 E. Hwy 32). Walk to the large, narrow-leaf cottonwood northwest of the corral; the tree is at the mouth of a small canyon. Walk up the canyon for approximately 500 feet until the first drainage on the right is reached. A drainage begins where the road crosses the creek for the second time. Walk up this drainage past the oak clumps to a point where the gully flattens out. Locate a three-trunked, high-lined juniper to the right. From the juniper, walk 213 feet at 144 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7960. The baseline runs in a direction of 160 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,550ft (1,996m)
Aspect	South
Slope	5-12%
Sample Dates	09/12/1996, 07/02/2001, 08/07/2007, 07/31/2012, 07/10/2017, 07/11/2022

Wildlife Habitat and Vegetation History

Table 17-07.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter/spring	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 17-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	NA
1990	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush	NA
2001	Mountain Big Sagebrush	NA
2007	Mountain Big Sagebrush/Annual Grass	NA
2012	Mountain Big Sagebrush	NA
2017	Mountain Big Sagebrush	NA
2022	Mountain Big Sagebrush	NA

Site Notes

The nearest perennial source of water is a spring that is 950 feet south of the site, near an abandoned house.

Soils

Table 17-07.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.6	41.8	27.4	30.7	3.5	23.1	275.2	0.4	09/12/1996

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1984; intercept cover has increased since 2007, but density has decreased overall since 1984. Antelope bitterbrush (*Purshia tridentata*) is also present, but contributes much less cover than sagebrush (Photos, Pre-1992 Data, Table 17-07.12, Table 17-07.13). The herbaceous understory has fluctuated over the study period. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in moderate abundance in most sample years, and was a co-dominant vegetation component in 2007. Perennial grasses, in particular the native species Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), have provided over 10% cover combined during the last three sample years; Sandberg bluegrass alone provided over 12% cover in 2022 (Table 17-07.10). Annual forb cover increased over 18% between 2012 and 2017, but most of the increase can be attributed to the introduced species desert madwort (*Alyssum desertorum*). However, annual forb cover decreased by 12% in 2022. Both perennial and annual forbs have been rare in other sample years (Table 17-07.7, Table 17-07.11).

Trend Summary Tables

Table 17-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	33.2	0.0	-	-	-	-
2001	32.7	0.1	-	-	-	-
2007	17.0	0.0	-	29.8	0.1	-
2012	17.6	0.1	-	26.7	0.1	-
2017	18.5	0.2	-	33.3	0.1	-
2022	23.1	0.1	-	32.8	-	-

Table 17-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	330	248	52	22	7.4	6.7	0.2	0.3
2001	173	294	211	156	1.5	9.0	2.3	3.8
2007	408	240	246	38	19.4	8.7	2.6	0.6
2012	244	326	254	30	6.5	15.3	1.9	0.1
2017	223	286	378	101	8.9	13.9	20.1	1.1
2022	275	358	390	73	7.8	23.1	8.5	1.2

Table 17-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.2	4.7	58.6	0.7	1.4	49.8
2001	17.9	7.4	50.1	1.1	1.8	49.8
2007	9.6	1.2	44.7	1.4	1.4	57.8
2012	5.9	3.2	50.7	1.6	2.8	49.9
2017	7.8	8.5	46.6	1.9	1.8	51.5
2022	10.6	1.3	46.3	3.3	2.9	56.3

Table 17-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency					
1996	-	-	30	2	-	9
2001	-	-	26	-	-	31
2007	5	-	27	-	-	38
2012	1	-	28	-	-	16
2017	-	-	26	7	1	18
2022	-	-	44	2	-	1
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	1.5 (3.6)	-	34.9 (86.1)	2.7 (6.6)	-	-
2007	10.9 (26.9)	-	30.2 (74.5)	5.3 (13.2)	-	-
2012	2.9 (7.2)	-	28.8 (71.2)	6.0 (14.9)	52.3 (129.1)*	-
2017	1.5 (3.6)	-	50.9 (125.8)	40.9 (101.0)	-	-
2022	-	8.7 (21.5)*	14.1 (34.8)	0.7 (1.7)	-	-

*Pellets per acre (ha)

Table 17-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Leymus cinereus (basin wildrye)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency											
1996	-	11	-	330	34	4	9	-	-	90	145	-
2001	-	24	3	173	38	13	0	-	-	191	97	-
2007	-	23	12	406	12	17	4	-	4	159	84	-
2012	2	18	45	229	30	61	5	-	-	208	134	-
2017	-	20	15	209	49	33	5	2	12	188	75	10
2022	8	18	1	275	51	75	5	1	12	244	95	8
year	Average Cover (%)											
1996	-	0.7	-	7.4	0.9	0.0	0.0	-	-	2.4	2.7	-
2001	-	0.5	0.0	1.5	0.6	0.1	0.0	-	-	5.5	2.3	-
2007	-	0.6	0.0	19.4	0.1	0.3	0.0	-	0.0	4.5	3.1	-
2012	0.0	1.1	1.6	4.8	0.5	1.6	0.0	-	-	6.3	5.7	-
2017	-	0.6	0.1	8.8	1.0	0.7	0.2	0.0	0.6	8.6	2.2	0.1
2022	0.2	1.1	0.0	7.8	1.7	1.9	0.3	0.0	0.5	12.8	4.4	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcross)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epiobium brachycarpum ^a (tall annual willowherb)
year	Nested Frequency																
1996	2	-	-	21	-	5	-	3	-	-	16	20	-	7	-	-	1
2001	-	-	2	22	6	-	120	11	-	1	117	80	-	6	-	2	-
2007	1	3	-	192	5	-	18	1	-	-	87	37	-	2	11	1	-
2012	-	-	4	250	3	-	5	2	2	-	15	5	-	6	-	-	-
2017	9	-	5	340	-	-	58	15	3	-	82	40	5	-	5	-	-
2022	-	-	-	380	3	1	26	8	1	15	85	6	1	18	2	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.0	-	0.0	-	0.0	-	-	0.0	0.1	-	0.1	-	-	0.0
2001	-	-	0.0	0.1	0.0	-	3.4	0.0	-	0.0	1.2	0.4	-	0.1	-	0.0	-
2007	0.0	0.0	-	2.2	0.0	-	0.3	0.0	-	-	0.3	0.1	-	0.1	0.0	0.0	-
2012	-	-	0.0	1.9	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-
2017	0.0	-	0.0	18.4	-	-	0.5	0.2	0.0	-	1.1	0.1	0.2	-	0.0	-	-
2022	-	-	-	7.6	0.0	0.0	0.6	0.1	0.0	0.1	0.3	0.0	0.0	0.1	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Orthocarpus ^a (owl's-clover)	Phlox longifolia (longleaf phlox)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^a (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency													
1996	-	-	-	-	3	2	-	4	2	-	-	-	-	-
2001	-	5	-	-	1	19	13	38	26	2	11	1	-	-
2007	-	-	4	-	-	1	13	-	6	-	3	-	-	6
2012	2	-	-	-	1	3	2	-	7	-	-	-	4	2
2017	-	21	-	3	-	0	7	-	11	-	15	5	-	4
2022	-	4	13	3	-	2	-	-	4	0	1	-	1	13
year	Average Cover (%)													
1996	-	-	-	-	0.0	0.2	-	0.1	0.0	-	-	-	-	-
2001	-	0.0	-	-	0.0	0.1	0.0	0.4	0.1	0.0	0.1	0.0	-	-
2007	-	-	0.0	-	-	0.0	0.0	-	0.1	-	0.0	-	-	0.0
2012	0.0	-	-	-	0.0	0.0	0.0	-	0.0	-	-	-	0.0	0.0
2017	-	0.2	-	0.1	-	0.0	0.0	-	0.0	-	0.1	0.0	-	0.0
2022	-	0.0	0.5	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Opuntia (pricklypear)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2007	-	27.4	-	0.1	2.4
2012	-	25.3	-	0.1	1.4
2017	-	31.7	-	0.1	1.6
2022	-	31.9	-	-	0.9
year	Quadrat Cover (%)				
1996	-	32.1	0.0	0.0	1.1
2001	0.0	30.8	0.0	0.0	1.9
2007	-	16.5	-	0.0	0.5
2012	-	17.6	0.0	0.0	0.0
2017	-	17.9	0.1	0.0	0.7
2022	-	22.4	0.0	0.1	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

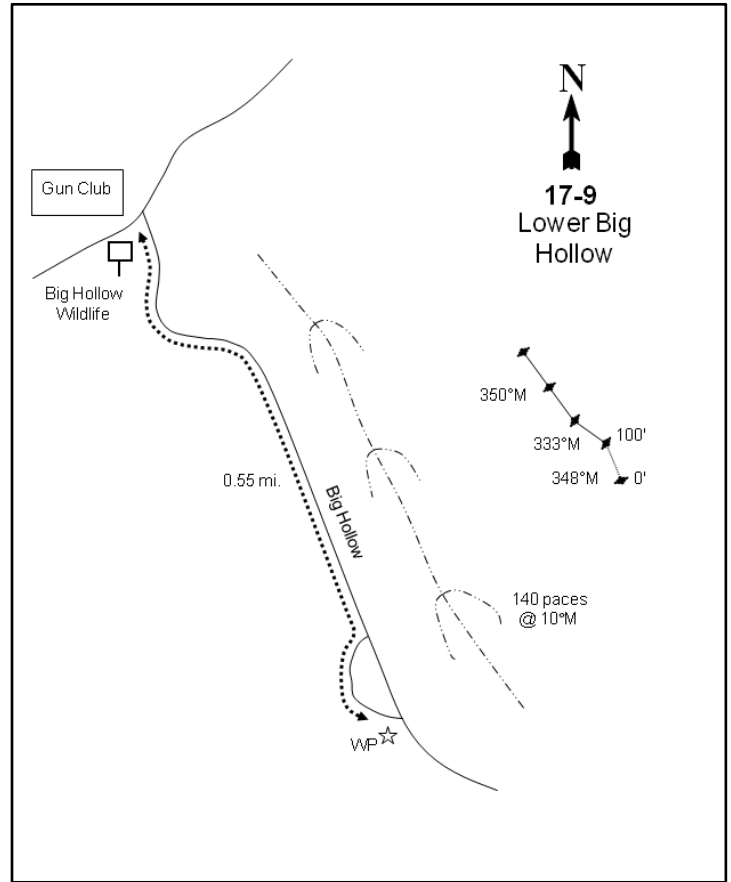
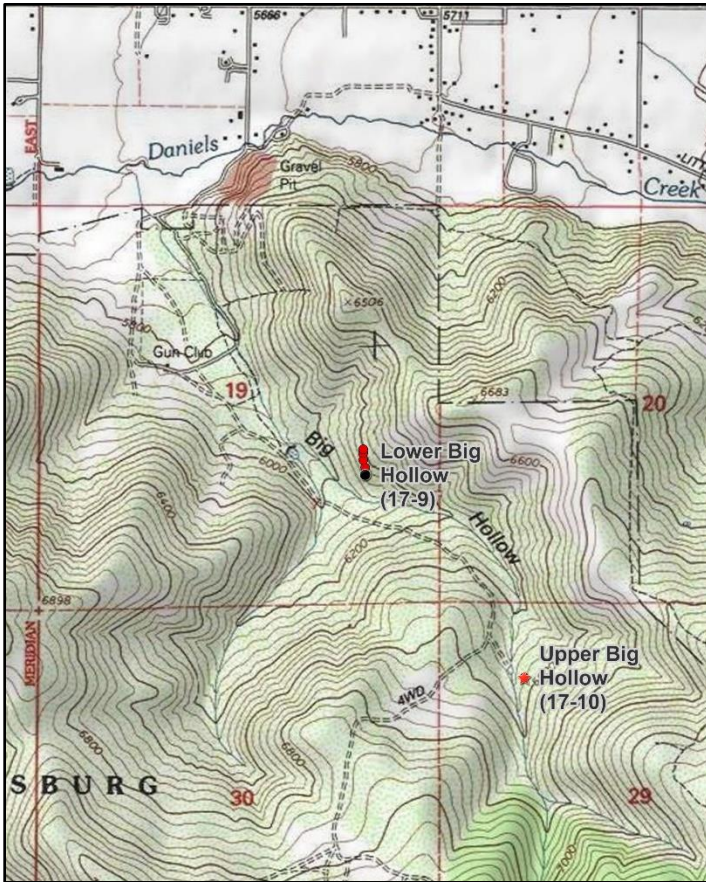
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	20	0	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	4120	20	3	77	20	37	5	3	87/129
2001	4280	-	2	61	37	32	8	23	92/109
2007	2920	20	1	49	50	33	11	34	94/116
2012	2600	20	0	60	40	54	10	50	92/111
2017	3140	1720	3	71	26	54	12	19	88/119
2022	3360	-	10	73	18	19	0	21	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	20	-	100	0	0	0	0	0	-/-
2001	20	-	0	100	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	26/33
2012	-	20	0	0	0	0	0	0	22/23
2017	20	-	0	100	0	0	0	0	36/35
2022	40	-	0	100	0	0	0	0	-/-
Opuntia -- (pricklypear)									
1996	200	-	0	100	0	10	0	0	14/52
2001	60	-	0	100	0	0	0	0	13/46
2007	120	-	17	83	0	0	0	0	12/24
2012	100	-	0	100	0	0	0	20	11/20
2017	140	-	0	100	0	0	0	0	14/21
2022	260	-	0	100	0	0	0	8	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1996	180	-	0	89	11	11	67	0	60/114
2001	240	-	0	100	0	33	50	0	83/106
2007	200	-	0	60	40	10	80	10	76/94
2012	200	-	0	90	10	0	100	30	68/87
2017	180	-	0	33	67	0	89	67	70/91
2022	200	-	0	90	10	10	50	30	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-07.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	9.0	1.4	13.4	-5.6	0.5	0.0	48.7	Poor
2001	30.0	4.4	0.9	18.0	-1.1	7.6	0.0	59.7	Fair
2007	30.0	0.2	0.6	17.3	-14.6	1.3	0.0	34.9	Very Poor
2012	30.0	3.5	0.0	30.0	-4.8	0.3	0.0	58.9	Fair
2017	30.0	6.6	1.2	27.7	-6.7	2.3	0.0	61.0	Fair
2022	30.0	9.7	4.6	30.0	-5.8	2.4	0.0	70.9	Fair-Good

LOWER BIG HOLLOW - STUDY NO. 17-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston NE; Township 4S, Range 5E, Section 19
NAD 83 UTM ZONE 12, 464570 East 4478191 North

Transect Information

Browse Tag # (0' Stake)	67
Transect Bearing	346° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Belt 5: 3ft

Directions to Site

Beginning at the gun club parking lot at the mouth of Big Hollow, proceed east for 0.10 miles to the road, which runs up Big Hollow. Turn right and proceed up Big Hollow for 0.55 miles to a turnoff to the south and a green steel "T" fencepost. From the fencepost, the 0-foot baseline stake is located 140 paces away across Big Hollow at an azimuth of 10 degrees magnetic. A red browse tag with number 67 is attached to the 0-foot stake of the frequency baseline.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	Southwest
Slope	30-35%
Sample Dates	09/25/1996, 07/25/2002, 07/03/2007, 08/01/2012, 07/10/2017, 07/13/2022

Table 17-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Big Hollow	-	July-August 2020	-
Fire - Wildfire	Big Hollow	-	Summer 2019	-
Fire - Wildfire	-	-	1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

Wildlife Habitat and Vegetation History

Table 17-09.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush/Annual Grass	No Encroachment
2022	Annual Grass	No Encroachment

Site Notes

This study is located approximately 0.5 miles above the mouth of Big Hollow with an ephemeral stream 200 feet to the west. In management terms the area is likely significant as fawn-rearing habitat for deer and spring-fall range for elk. It was noted in 2017 that some oak (*Quercus gambelii*) plants had galls and that fungus affected some brome grass (*Bromus sp.*) seed heads.

Soils

Table 17-09.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	49.8	19.4	30.7	3.0	13.2	128.0	0.6	09/25/1996

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

This site existed as a stable mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community between 1983 to 2020, with other preferred browse such as Gambel oak (*Quercus gambelii*), Stansbury cliffrose (*Purshia stansburiana*), Utah serviceberry (*Amelanchier utahensis*), and alderleaf mountain mahogany (*Cercocarpus montanus*) scattered throughout the area. Following the 2019/2020 Big Hollow fires (Table 17-09.1), however, total preferred browse cover decreased 18% with much of the loss being attributed to the loss of sagebrush. More specifically, sagebrush cover decreased from 21% in 2017 to 5% in 2022 (Photos, Table 17-09.12, Table 17-09.13). The herbaceous component has remained diverse in composition and is considered abundant. Following the burn, annual grasses -- namely the introduced species cheatgrass (*Bromus tectorum*) -- were at their highest cover value in 2022 at 27%. However, a mixture of native and introduced perennial species remain as of the most recent sample year and provide soil stability and some forage to wildlife (Table 17-09.7, Table 17-09.10, Table 17-09.11).

Trend Summary Tables

Table 17-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	22.1	0.3	-	-	-	-
2002	22.7	0.0	-	27.9	0.2	-
2007	15.8	0.0	-	23.5	0.1	-
2012	23.0	0.4	-	34.3	0.4	-
2017	17.0	0.8	-	29.6	0.4	-
2022	8.0	0.4	-	11.6	0.1	-

Table 17-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	361	156	195	117	13.4	5.8	1.4	2.2
2002	283	140	164	44	7.3	7.0	1.5	1.6
2007	375	143	102	53	16.7	7.0	0.4	1.8
2012	227	181	200	103	3.7	9.4	0.7	3.4
2017	347	171	218	83	20.3	11.0	3.9	3.5
2022	420	169	270	30	27.4	9.9	9.2	3.1

Table 17-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	3.6	0.1	58.6	2.4	10.4	42.7
2002	12.0	0.6	54.6	5.5	13.8	38.0
2007	6.8	0.1	47.1	3.3	11.7	44.1
2012	10.5	0.1	41.9	4.5	16.9	41.9
2017	8.4	0.2	38.8	8.2	17.0	51.4
2022	12.4	0.1	34.2	6.3	19.3	51.8

Table 17-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	8	3	3
2002	8	2	-
2007	8	2	3
2012	7	1	-
2017	12	3	5
2022	9	1	1
Year	Days Use Per Acre (ha)		
1996	-	-	-
2002	38.2 (94.4)	4.0 (9.9)	-
2007	29.5 (72.8)	2.0 (5.0)	-
2012	27.5 (67.9)	2.7 (6.6)	-
2017	22.1 (54.6)	8.7 (21.5)	-
2022	28.1 (69.5)	1.3 (3.3)	-

Table 17-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency												
Bromus arvensis ^{ai} (field brome)	2	4	361	1	1	1	10	28	37	74	20	-	
Bromus inermis ⁱ (smooth brome)	9	6	276	-	3	9	6	-	55	57	15	-	
Bromus tectorum ^{ai} (cheatgrass)	7	20	375	1	-	24	2	-	49	60	10	-	
Dactylis glomerata ⁱ (orchardgrass)	4	15	227	1	-	37	2	-	51	88	11	-	
Elymus elymoides (squirreltail)	54	11	312	6	-	55	3	-	6	87	28	-	
Poa bulbosa ⁱ (bulbous bluegrass)	2022	5	31	420	6	-	35	-	-	29	74	37	9
Poa fendleriana (muttongrass)	Average Cover (%)												
Poa pratensis ⁱ (Kentucky bluegrass)	1996	0.0	0.1	13.4	0.0	0.0	0.0	0.6	0.3	0.6	3.3	0.8	-
Poa secunda (Sandberg bluegrass)	2002	0.2	0.3	7.1	-	0.1	0.5	0.2	-	1.1	3.9	0.8	-
Pseudoroegneria spicata (bluebunch wheatgrass)	2007	0.0	1.1	16.7	0.0	-	0.5	0.0	-	0.9	4.0	0.5	-
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	2012	0.0	0.8	3.7	0.0	-	0.9	0.0	-	0.8	5.8	1.0	-
Vulpia myuros ^{ai} (annual fescue)	2017	1.8	0.6	18.5	0.1	-	1.6	0.0	-	0.1	6.4	2.3	-
	2022	0.0	1.9	27.4	0.1	-	0.8	-	-	0.2	4.3	2.5	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)	-	187	19	-	-	5	-	-	-	4	6	-	2	6	-	3	-	
Alyssum desertorum ^{ai} (desert madwort)	-	115	-	-	-	9	2	4	-	-	-	4	29	3	13	-	-	
Arabis (rockcress)	1	81	-	-	-	2	-	1	4	-	-	-	9	1	-	3	-	
Astragalus (milkvetch)	5	181	3	1	-	13	-	3	-	-	1	6	3	14	7	-	-	
Astragalus utahensis (Utah milkvetch)	1	148	-	-	4	29	-	17	1	-	2	10	102	4	2	2	-	
Balsamorhiza sagittata (arrowleaf balsamroot)	2	165	-	3	-	11	-	-	-	-	3	1	2	-	-	-	1	
Calochortus nuttallii (sego lily)	Average Cover (%)																	
Camelina microcarpa ^{ai} (tittlepod false flax)	1996	-	1.1	0.0	-	-	0.7	-	-	-	0.1	0.2	-	0.0	0.0	-	0.0	-
Castilleja angustifolia (northwestern Indian paintbrush)	2002	-	0.8	-	-	-	1.1	0.0	0.1	-	-	-	0.0	0.1	0.0	0.3	-	-
Chaenactis douglasii (Douglas' dusty maiden)	2007	0.0	0.2	-	-	-	1.1	-	0.0	0.0	-	-	-	0.0	0.0	-	0.0	-
Cirsium (thistle)	2012	0.0	0.6	0.0	0.0	-	1.9	-	0.0	-	-	-	0.0	0.0	0.0	0.1	0.1	-
Collinsia parviflora ^a (maiden blue eyed Mary)	2017	0.0	2.1	-	-	0.0	2.8	-	0.1	0.0	-	0.0	0.0	0.7	0.0	0.0	0.0	-
Collomia linearis ^a (tiny trumpet)	2022	0.0	2.1	-	0.0	-	2.6	-	-	-	-	0.0	0.0	0.1	-	-	-	0.0
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawkbeard)																		
Descurainia ^a (tansymustard)																		
Descurainia pinnata ^a (western tansymustard)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Orobanche (broomrape)	Orthocarpus tolimiei ^a (Tolmie's owl's-clover)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
1996	2	28	-	-	4	37	3	3	1	-	21	-	-	3	3	-	2
2002	-	-	-	3	-	9	-	-	-	4	-	28	-	13	2	-	-
2007	-	-	-	7	-	29	-	3	-	-	-	-	10	-	-	5	-
2012	-	24	-	-	-	28	-	3	4	7	2	4	16	3	4	-	-
2017	-	1	6	7	-	38	-	6	2	16	-	8	1	-	1	-	-
2022	-	-	48	-	-	9	-	3	2	29	-	-	-	-	-	-	-
year	Average Cover (%)																
1996	0.0	0.4	-	-	0.0	0.4	0.0	0.0	0.0	-	0.2	-	-	0.0	0.1	-	0.0
2002	-	-	-	0.2	-	0.1	-	-	-	0.0	-	0.3	-	0.0	0.0	-	-
2007	-	-	-	0.2	-	0.6	-	0.0	-	-	-	-	0.0	-	-	0.0	-
2012	-	0.3	-	-	-	0.2	-	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-	-
2017	-	0.0	0.4	0.4	-	0.5	-	0.0	0.0	0.1	-	0.0	0.0	-	0.0	-	-
2022	-	-	2.5	-	-	0.4	-	0.0	0.1	0.1	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina ^a (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphyotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency			
1996	-	-	8	20
2002	11	-	7	-
2007	9	-	-	-
2012	3	1	13	4
2017	-	7	2	2
2022	2	91	-	5
year	Average Cover (%)			
1996	-	-	0.0	0.2
2002	0.1	-	0.0	-
2007	0.1	-	-	-
2012	0.0	0.0	0.6	0.0
2017	-	0.0	0.1	0.0
2022	0.0	4.3	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Purshia stansburiana ^p (Stansbury cliffrose)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2002	0.9	16.5	-	-	0.2	1.7	8.6	0.2
2007	-	15.5	-	-	0.1	1.2	6.3	0.5
2012	0.1	21	0.3	-	0.1	1.6	10.8	0.8
2017	0	21.2	0.1	0.1	0.2	2	5.6	0.8
2022	-	5.1	-	-	0.1	-	6.3	0.2
year	Quadrat Cover (%)							
1996	1.9	11.5	0.1	-	0.2	1.8	6.8	0.1
2002	2.3	12.9	-	-	0.0	0.7	6.2	0.6
2007	0.0	10.4	-	-	0.0	0.0	5.1	0.2
2012	0.0	13.7	0.4	-	0.0	0.4	7.7	1.2
2017	0.0	11.1	0.6	0.0	0.2	1.3	4.1	0.5
2022	-	3.6	-	0.1	0.3	-	3.9	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	120	-	33	67	0	17	0	0	94/138
2002	400	-	65	20	15	65	15	45	63/51
2007	40	-	0	100	0	100	0	0	65/89
2012	20	-	0	100	0	0	0	0	76/80
2017	100	-	80	20	0	60	40	0	86/94
2022	60	-	33	67	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	1540	140	22	60	18	22	0	1	65/128
2002	1920	-	3	73	24	15	1	10	73/111
2007	1500	-	0	84	16	29	5	88	82/118
2012	1360	80	4	81	15	13	2	3	88/131
2017	1460	-	0	85	15	41	16	23	85/131
2022	380	-	21	74	5	5	0	5	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	176/209
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	181/142
2017	-	-	-	-	-	-	-	-	197/166
2022	-	-	-	-	-	-	-	-	- / -

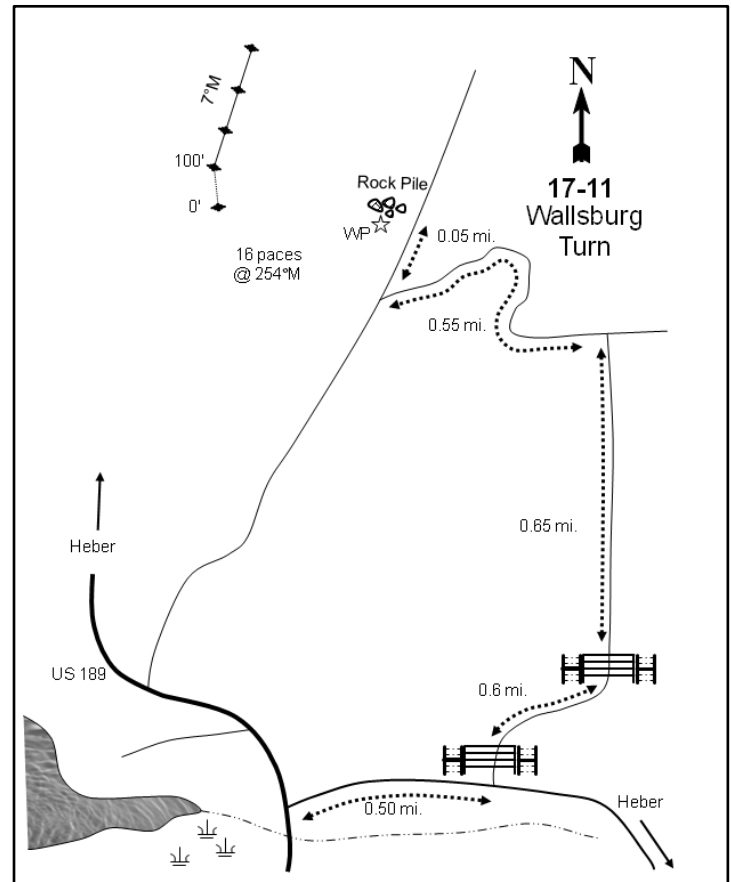
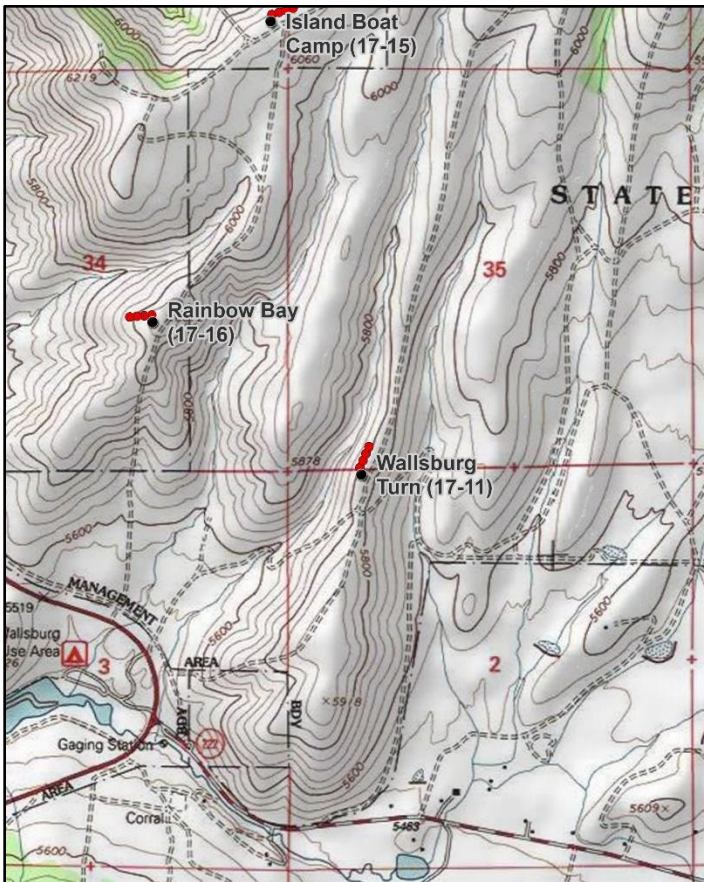
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	360	40	17	83	0	0	0	0	27/37
2002	-	-	-	-	-	-	-	-	23/25
2007	-	-	-	-	-	-	-	-	33/47
2012	20	-	0	100	0	0	0	0	36/50
2017	60	-	0	100	0	0	0	0	35/44
2022	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1996	20	-	0	100	0	0	0	0	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	6/13
2017	440	-	0	100	0	0	0	0	11/6
2022	120	-	0	100	0	0	0	0	-/-
Opuntia -- (pricklypear)									
1996	200	-	0	100	0	0	0	0	13/34
2002	160	-	0	50	50	0	0	38	12/28
2007	100	-	0	100	0	0	0	0	13/23
2012	140	-	0	100	0	0	0	0	17/30
2017	120	-	0	100	0	0	0	0	16/30
2022	240	-	0	100	0	0	0	17	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
1996	140	-	0	86	14	71	29	0	64/177
2002	120	-	0	50	50	0	83	17	62/157
2007	20	-	0	100	0	0	100	0	69/154
2012	40	-	50	50	0	0	0	0	70/109
2017	20	-	0	100	0	0	100	0	69/112
2022	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^p -- (Gambel oak)									
1996	1200	-	17	82	2	2	0	2	101/79
2002	2840	-	16	82	2	8	0	1	86/50
2007	1900	40	10	85	5	3	0	25	93/52
2012	2300	100	35	63	3	20	0	0	80/70
2017	2740	20	33	67	0	50	5	0	90/54
2022	4540	-	7	93	0	0	0	0	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	100	-	20	80	0	0	0	0	47/73
2002	160	-	0	100	0	0	13	0	64/65
2007	160	-	0	88	13	0	0	38	54/75
2012	480	-	0	88	13	4	0	17	53/52
2017	300	-	40	60	0	0	0	20	61/72
2022	180	-	11	89	0	0	0	11	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-09.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	26.8	11.7	9.8	11.6	-10.1	4.4	0.0	54.2	Poor-Fair
2002	27.4	9.8	6.3	13.0	-5.5	3.2	0.0	54.1	Poor-Fair
2007	28.0	11.3	1.3	13.1	-12.6	3.6	0.0	44.6	Poor
2012	30.0	12.0	8.0	17.0	-2.8	6.8	0.0	70.9	Fair-Good
2017	30.0	11.8	3.6	18.8	-15.2	7.0	0.0	56.0	Poor-Fair
2022	12.9	14.3	6.6	18.1	-20.0	6.3	0.0	38.2	Very Poor-Poor

WALLSBURG TURN - STUDY NO. 17-11

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SW; Township 5S, Range 4E, Section 02
NAD 83 UTM ZONE 12, 460271 East 4474420 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

DWR 46
338° magnetic (Lines 2-4: 7° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: No Rebar; Belt 4: 2ft, Belt 5: 1ft

Directions to Site

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for 0.8 miles, passing through two DWR gates. Continue on this road for 0.65 miles to another intersection. Turn left at the intersection and go 0.55 miles to another intersection. Turn right and continue for 0.05 miles to a small rock pile on the left (east) side of the road. From the rock monument, walk 16 paces at an azimuth of 264 degrees magnetic to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,800ft (1,768m)
Aspect	West
Slope	25%
Sample Dates	05/29/1996, 06/25/2002, 07/02/2007, 07/26/2012, 07/11/2017, 07/12/2022

Table 17-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	August 1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

Wildlife Habitat and Vegetation History**Table 17-11.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 17-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Perennial Grass	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment
2022	Mountain Big Sagebrush	No Encroachment

Site Notes

No Notes

Soils**Table 17-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Silty Clay Loam	7.6	18.9	53.1	28.0	3.1	16.3	156.8	0.5	05/29/1996

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 1983, this study site was dominated by perennial grasses; mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and other browse species were also present. As sagebrush matured and increased in abundance the site transitioned from being dominated by perennial grasses to one dominated by sagebrush in 1989 (Photos, Table 17-11.12, Table 17-11.13). The herbaceous understory has continued to be abundant and diverse throughout the study years. The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) and the native species Sandberg bluegrass (*Poa secunda*) have contributed the most cover over the study period. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed since 1996 and contributed high amounts of cover in 2017 and 2022 at 11% and 9%, respectively. The introduced perennial species bulbous bluegrass (*P. bulbosa*) is also present and has steadily increased in abundance and cover since its introduction in 2007 (Table 17-11.7, Table 17-11.10). Alfalfa (*Medicago sativa*) has been the most abundant forb in most study years, but has steadily decreased over time (Table 17-11.11).

Trend Summary Tables**Table 17-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	10.1	1.9	-	-	-	-
2002	12.6	1.0	-	13.7	1.0	-
2007	12.8	1.4	-	14.8	1.0	-
2012	14.0	1.8	-	15.7	2.4	-
2017	9.5	3.0	-	12.2	2.7	-
2022	12.9	2.2	-	11.9	3.3	-

Table 17-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	35	379	350	174	0.6	16.0	2.5	12.5
2002	43	375	332	167	0.6	21.4	8.9	9.6
2007	184	388	389	113	3.3	20.4	5.6	4.9
2012	44	417	258	101	0.3	25.4	0.9	3.5
2017	211	393	366	150	11.1	24.6	8.7	5.8
2022	204	377	399	61	9.2	28.5	5.9	1.6

Table 17-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	11.8	2.2	41.3	9.2	11.9	44.0
2002	8.9	1.7	44.0	7.7	8.7	48.5
2007	7.1	0.7	37.6	8.3	6.8	52.6
2012	6.8	1.0	43.8	8.5	7.8	50.0
2017	4.0	4.4	38.4	11.7	8.9	54.9
2022	13.3	2.4	44.4	10.5	10.0	54.0

Table 17-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	2	12	7	2
2002	-	21	6	5
2007	-	20	6	14
2012	-	8	4	-
2017	1	6	3	7
2022	2	17	2	20
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	-	54.3 (134.1)	17.4 (43.0)	-
2007	5.8 (14.3)	52.3 (129.1)	34.9 (86.1)	-
2012	6.5 (16.1)	10.0 (24.8)	4.7 (11.6)	-
2017	5.1 (12.6)	7.4 (18.2)	0.7 (1.7)	-
2022	5.8 (14.3)	53.0 (130.8)	-	-

Table 17-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency								
1996	255	-	-	35	-	140	8	159	-
2002	222	3	-	42	-	144	3	219	2
2007	229	11	-	181	6	207	18	178	-
2012	256	2	-	42	8	188	6	188	-
2017	246	4	2	209	69	183	32	117	10
2022	221	1	3	204	98	212	4	121	-
year	Average Cover (%)								
1996	8.6	-	-	0.6	-	1.9	0.5	5.0	-
2002	11.3	0.0	-	0.6	-	2.1	0.4	7.6	0.0
2007	8.4	0.1	-	3.3	0.0	4.5	0.5	6.9	-
2012	17.0	0.0	-	0.3	0.1	3.3	0.2	4.9	-
2017	12.0	0.0	0.0	10.7	2.4	5.8	1.2	3.3	0.4
2022	13.5	0.0	0.0	9.2	4.6	5.8	0.0	4.4	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron divergens ^a (spreading fleabane)
year	Nested Frequency																
1996	12	1	140	43	-	8	9	31	3	163	88	-	18	1	-	32	48
2002	9	23	11	21	2	-	9	39	-	290	7	-	9	-	-	31	-
2007	7	3	103	27	5	-	1	62	-	303	1	-	10	-	3	144	-
2012	5	-	45	5	5	-	-	2	-	157	13	-	3	-	-	19	-
2017	-	11	89	31	11	2	7	30	-	221	10	2	21	-	5	49	-
2022	-	-	140	16	-	-	-	53	-	285	-	-	6	-	4	96	-
year	Average Cover (%)																
1996	0.1	0.0	0.3	1.1	-	0.0	0.0	0.1	0.0	1.0	0.2	-	0.1	0.0	-	0.2	0.1
2002	0.0	0.2	0.0	0.2	0.0	-	0.2	0.1	-	8.1	0.0	-	0.1	-	-	0.1	-
2007	0.0	0.0	0.2	0.3	0.0	-	0.0	0.3	-	3.7	0.0	-	0.1	-	0.0	0.5	-
2012	0.0	-	0.1	0.1	0.0	-	-	0.0	-	0.5	0.1	-	0.0	-	-	0.0	-
2017	-	0.1	2.5	0.3	0.0	0.0	0.1	0.6	-	2.8	0.0	0.0	0.1	-	0.0	0.5	-
2022	-	-	1.0	0.1	-	-	-	0.2	-	3.6	-	-	0.0	-	0.0	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES														
Eriogonum racemosum (redroot buckwheat)														
Erodium cicutarium ^{ai} (redstem stork's bill)														
Gayophytum ramosissimum ^a (pinyon groundsmoke)														
Helianthus annuus ^{ai} (common sunflower)														
Holosteum umbellatum ^{ai} (jagged chickweed)														
Lactuca serriola ^{ai} (prickly lettuce)														
Medicago sativa ⁱ (alfalfa)														
Microsteris gracilis ^a (slender phlox)														
Polygonum douglasii ^a (Douglas' knotweed)														
Solidago (goldenrod)														
Sphaeralcea coccinea (scarlet globemallow)														
Symphotrichum ascendens (western aster)														
Tragopogon dubius ^{ai} (yellow salsify)														
year	Nested Frequency													
1996	23	-	3	-	230	6	90	-	2	-	2	-	2	
2002	15	-	-	3	108	-	104	12	2	-	-	-	-	
2007	13	-	-	-	188	-	67	10	2	-	-	-	-	
2012	21	-	-	-	128	-	68	3	-	-	-	3	-	
2017	16	9	-	-	62	3	81	79	-	-	-	2	-	
2022	6	12	-	-	167	2	32	4	-	2	-	-	-	
year	Average Cover (%)													
1996	0.3	-	0.0	-	0.5	0.0	10.8	-	0.0	-	0.0	-	0.0	
2002	0.2	-	-	0.0	0.6	-	8.7	0.0	0.0	-	-	-	-	
2007	0.1	-	-	-	0.8	-	4.3	0.0	0.0	-	-	-	-	
2012	0.3	-	-	-	0.3	-	3.1	0.0	-	-	-	0.0	-	
2017	0.1	0.2	-	-	0.4	0.0	5.0	1.8	-	-	-	0.0	-	
2022	0.2	0.1	-	-	0.7	0.0	1.2	0.0	-	0.0	-	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)				
Gutierrezia sarothrae (broom snakeweed)				
Opuntia polyacantha (plains pricklypear)				
year	Line Intercept Cover (%)			
1996	-	-	-	-
2002	13.7	0.7	0.1	0.2
2007	14.8	0.9	-	0.1
2012	15.7	1.9	-	0.5
2017	12.2	2.4	-	0.3
2022	11.9	2.9	-	0.4
year	Quadrat Cover (%)			
1996	10.1	0.5	1.2	0.2
2002	12.6	0.6	0.1	0.3
2007	12.8	1.3	0.0	0.1
2012	14.0	1.1	-	0.8
2017	9.5	2.7	0.0	0.3
2022	12.9	2.0	0.2	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

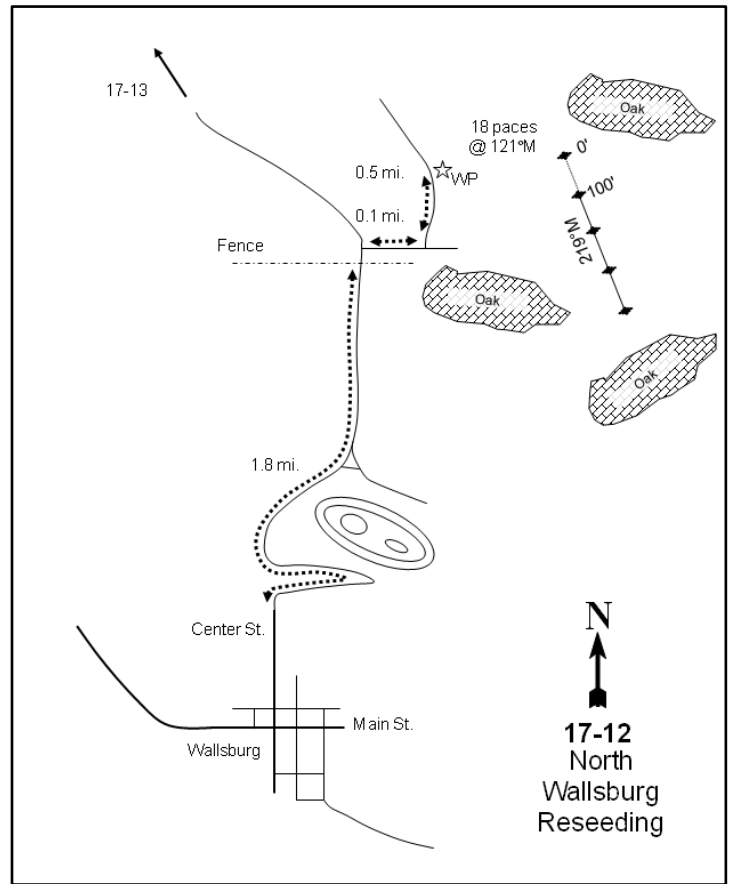
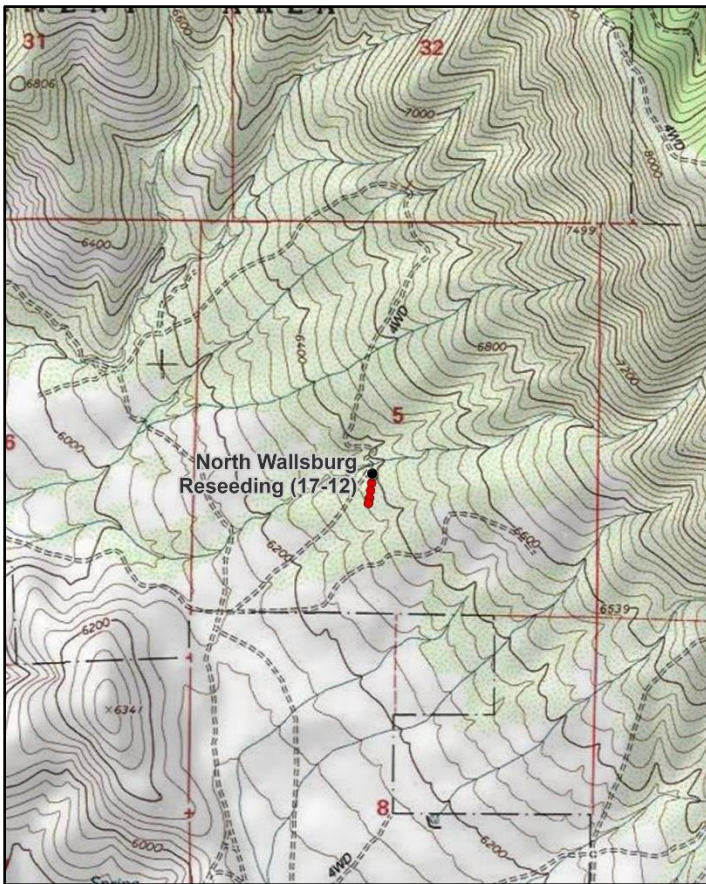
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	2320	40	8	91	1	66	17	5	52/91
2002	2160	-	2	72	26	41	44	14	63/89
2007	1780	20	0	47	53	29	1	67	78/109
2012	1700	-	6	71	24	37	13	29	71/99
2017	1800	-	2	71	27	36	0	14	72/109
2022	1440	-	0	53	47	33	13	65	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	200	80	40	60	0	0	0	0	23/34
2002	1360	-	2	90	9	0	0	0	18/26
2007	1200	-	0	98	2	0	0	13	26/31
2012	1200	-	0	100	0	0	0	8	25/37
2017	1280	-	3	97	0	3	0	0	33/49
2022	1320	20	6	86	8	0	0	14	- / -
Ephedra viridis^p -- (mormon tea)									
1996	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	53/57
2017	-	-	-	-	-	-	-	-	55/59
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	2600	440	12	88	0	0	0	0	22/35
2002	400	-	0	80	20	0	0	0	18/13
2007	100	-	0	100	0	0	0	0	24/24
2012	-	-	-	-	-	-	-	-	28/49
2017	320	-	6	94	0	0	0	0	31/36
2022	60	40	0	100	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1996	120	20	0	100	0	0	0	0	14/46
2002	140	-	0	100	0	0	0	0	15/67
2007	120	-	0	67	33	0	0	17	16/41
2012	320	-	0	100	0	0	0	6	12/26
2017	200	-	10	90	0	0	0	0	15/31
2022	140	-	0	100	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	48/170
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	36/92
2012	-	-	-	-	-	-	-	-	48/100
2017	20	-	0	100	0	100	0	0	63/132

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17.11.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	12.6	14.7	3.9	30.0	-0.4	10.0	0.0	70.9	Fair-Good
2002	15.7	7.2	0.9	30.0	-0.5	10.0	0.0	63.4	Fair
2007	18.5	-0.8	0.0	30.0	-2.5	9.8	0.0	54.9	Poor-Fair
2012	19.6	8.0	3.0	30.0	-0.3	7.1	0.0	67.3	Fair
2017	15.3	7.0	1.1	30.0	-8.3	10.0	0.0	55.0	Poor-Fair
2022	14.9	0.8	0.0	30.0	-6.9	3.3	0.0	42.0	Poor

NORTH WALLSBURG RESEEDING - STUDY NO. 17-12



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SE; Township 5S, Range 5E, Section 05
NAD 83 UTM ZONE 12, 465440 East 4473635 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

DWR73
172° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belts 4 & 5: No Rebar; Line 4: 72ft Long

Directions to Site

From the town of Wallsburg, travel on Center Street and continue north for 1.8 miles, staying on the main road until a gate is reached. Proceed through the gate and turn east immediately after passing through the gate. Continue east, traveling along the fence line, for 0.10 miles to another intersection. Turn left at the intersection and proceed north for 0.50 miles to a green steel "T" fencepost on the right (east) side of the road. From the fencepost, the 0-foot baseline stake is 18 paces away at an azimuth of 121 degrees magnetic. A red browse tag, number 3953, is attached to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	Southwest
Slope	10-15%
Sample Dates	09/24/1996, 06/26/2002, 07/06/2007, 07/25/2012, 07/10/2017, 07/11/2022

Table 17-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	August 1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

Wildlife Habitat and Vegetation History**Table 17-12.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter

Table 17-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Gambel Oak/Mixed Mountain Brush	No Encroachment
1989	Gambel Oak/Mixed Mountain Brush	No Encroachment
1996	Gambel Oak/Mixed Mountain Brush	No Encroachment
2002	Gambel Oak/Mixed Mountain Brush	No Encroachment
2007	Gambel Oak/Mixed Mountain Brush	No Encroachment
2012	Gambel Oak/Mixed Mountain Brush	No Encroachment
2017	Gambel Oak/Mixed Mountain Brush	No Encroachment
2022	Gambel Oak/Mixed Mountain Brush	No Encroachment

Site Notes

The study is within the boundaries of a 1976 wildfire that occurred between Main Canyon and Daniels Canyon. The fire varied in intensity, leaving patches of shrubs that survived. The area was seeded later that year.

Soils**Table 17-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	40.2	29.1	30.7	3.5	21.1	163.2	0.7	09/24/1996

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been co-dominated by Gambel oak (*Quercus gambelii*) and mixed mountain brush, mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), since study establishment in 1983; other shrubs are present in lesser amounts (Table 17-12.12, Table 17-12.13). Perennial grasses have dominated the herbaceous understory in each sample year (Table 17-12.7). More specifically, intermediate wheatgrass (*Thinopyrum intermedium*) and crested wheatgrass (*Agropyron cristatum*) were the dominant perennial grasses in 1983 and 1989 (Pre-1992 Data) and Idaho fescue (*Festuca idahoensis*) has contributed the most cover since 1996. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has steadily increased in both abundance and cover since 1996 (Table 17-12.10). Forbs, although diverse, have remained rare (Table 17-12.11).

Trend Summary Tables

Table 17-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	8.5	1.3	-	-	-	-
2002	12.0	0.6	-	18.3	1.1	-
2007	9.0	0.6	-	14.3	1.8	-
2012	14.4	0.2	-	18.0	1.4	-
2017	11.6	0.7	-	15.3	1.0	-
2022	11.4	0.5	-	17.6	0.7	-

Table 17-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	18	371	161	76	0.1	21.1	0.4	1.5
2002	8	350	36	54	0.5	18.6	0.1	0.6
2007	41	396	125	71	1.0	29.9	0.6	1.1
2012	23	424	26	59	0.1	38.8	0.1	1.3
2017	19	386	69	64	0.6	33.4	0.5	1.7
2022	32	383	120	46	1.3	28.8	0.7	1.3

Table 17-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.0	0.8	40.0	10.1	6.8	34.8
2002	20.5	0.1	58.4	4.4	5.1	32.8
2007	14.8	0.1	42.6	2.8	3.7	47.9
2012	10.4	0.1	38.3	3.7	3.3	56.8
2017	14.4	0.1	57.9	4.5	4.2	47.3
2022	21.5	0.3	55.0	4.4	5.0	40.8

Table 17-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1996	5	-	27	5	8
2002	-	-	24	5	-
2007	-	-	30	6	17
2012	-	-	6	5	-
2017	-	-	24	3	14
2022	-	-	32	4	4
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2002	-	-	69.0 (170.5)	10.0 (24.8)	-
2007	-	-	48.3 (119.2)	18.7 (46.3)	-
2012	-	-	17.4 (43.0)	2.7 (6.6)	-
2017	-	8.7 (21.5)*	40.2 (99.3)	7.4 (18.2)	-
2022	-	-	29.5 (72.8)	-	-

Pellets per acre (ha)

Table 17-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency												
1996	-	73	18	-	1	219	-	34	-	31	26	157	-
2002	4	61	8	0	1	188	2	102	-	8	7	179	-
2007	-	62	38	3	-	213	1	137	-	-	8	214	3
2012	5	46	23	10	-	273	2	154	2	-	5	198	-
2017	-	37	19	-	-	257	3	148	-	-	7	201	-
2022	2	35	32	-	1	208	-	181	1	-	11	163	-
year	Average Cover (%)												
1996	-	2.4	0.1	-	0.0	14.3	-	0.6	-	0.4	0.1	3.3	-
2002	0.2	1.3	0.5	0.0	0.0	8.3	0.0	2.8	-	0.0	0.1	5.9	-
2007	-	2.2	0.6	0.0	-	16.2	0.0	4.2	-	-	0.1	7.2	0.4
2012	0.2	2.2	0.1	0.0	-	26.7	0.0	4.0	0.0	-	0.0	5.6	-
2017	-	1.6	0.6	-	-	21.3	0.0	4.0	-	-	0.0	6.5	-
2022	0.5	1.5	1.3	-	0.0	15.1	-	5.0	0.0	-	0.1	6.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)
year	Nested Frequency																
1996	2	-	158	1	-	11	-	-	-	3	6	-	-	-	-	3	1
2002	1	2	26	9	-	11	-	2	-	-	-	6	3	4	-	-	-
2007	1	1	99	8	9	5	1	3	4	-	4	1	-	9	21	-	-
2012	1	-	12	6	4	4	-	-	-	-	7	-	-	-	-	-	2
2017	-	-	44	7	4	7	1	9	-	-	2	22	-	-	-	-	4
2022	-	3	87	7	6	2	1	-	-	-	0	27	-	-	2	-	3
year	Average Cover (%)																
1996	0.0	-	0.4	0.0	-	0.3	-	-	-	0.0	0.3	-	-	-	-	0.0	0.0
2002	0.0	0.0	0.1	0.1	-	0.1	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-
2007	0.0	0.0	0.5	0.1	0.1	0.2	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.1	-	-
2012	0.0	-	0.0	0.1	0.2	0.0	-	-	-	-	0.0	-	-	-	-	-	0.0
2017	-	-	0.2	0.3	0.2	0.2	0.0	0.0	-	-	0.0	0.3	-	-	-	-	0.0
2022	-	0.0	0.5	0.1	0.2	0.1	0.1	-	-	-	0.0	0.1	-	-	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Euphorbia brachycera (horned spurge)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Grindelia squarrosa (curlycup gumweed)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus ^a (common sunflower)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola ^{a,i} (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Medicago sativa ⁱ (alfalfa)	Orthocarpus ^a (owl's-clover)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Silene antirrhina ^a (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarum ascendens (western aster)
year	Nested Frequency																
1996	7	-	-	3	-	-	10	-	3	1	11	2	23	6	-	-	-
2002	3	-	-	6	-	-	-	-	1	12	5	-	11	-	-	1	-
2007	6	-	-	-	-	-	1	-	1	2	2	-	32	1	-	2	2
2012	4	3	5	-	-	3	-	1	-	8	3	-	25	-	3	-	5
2017	13	1	-	-	-	-	4	3	-	5	5	-	14	-	-	4	-
2022	2	-	-	-	3	-	-	-	-	2	9	-	15	-	-	5	-
year	Average Cover (%)																
1996	0.1	-	-	0.1	-	-	0.2	-	0.0	0.1	0.3	0.0	0.1	0.0	-	-	-
2002	0.0	-	-	0.0	-	-	-	-	0.0	0.1	0.2	-	0.0	-	-	0.0	-
2007	0.0	-	-	-	-	-	0.0	-	0.0	0.2	0.3	-	0.1	0.0	-	0.0	0.0
2012	0.2	0.0	0.0	-	-	0.0	-	0.0	-	0.4	0.3	-	0.1	-	0.0	-	0.1
2017	0.1	0.0	-	-	-	-	0.0	0.0	-	0.4	0.4	-	0.1	-	-	0.0	-
2022	0.1	-	-	-	0.1	-	-	-	-	0.1	0.6	-	0.1	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius ^{a,i} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	10	-
2002	2	-
2007	1	-
2012	1	2
2017	1	2
2022	8	1
year	Average Cover (%)	
1996	0.0	-
2002	0.0	-
2007	0.0	-
2012	0.0	0.0
2017	0.0	0.0
2022	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2002	0.3	4.6	-	0.3	-	0	2.1	11.3	-	0.8
2007	0.1	4.3	-	0.9	0.1	0	2	7.9	-	0.8
2012	0.2	2.5	-	0.9	-	0.1	4.2	11.1	-	0.4
2017	0.1	1.8	-	0.2	0.2	0	3.6	9.8	-	0.6
2022	0.4	1.4	-	0.3	-	0.4	2.4	13.4	-	-
year	Quadrat Cover (%)									
1996	-	1.6	0.0	0.7	0.5	0.0	1.6	5.1	0.1	0.1
2002	0.4	3.9	-	0.0	0.0	0.0	1.7	6.0	-	0.5
2007	0.2	3.2	-	0.1	0.0	0.0	1.9	3.7	-	0.5
2012	0.1	3.5	-	0.2	-	0.0	3.5	7.3	-	0.1
2017	0.1	2.1	-	0.2	0.2	0.0	3.1	6.3	-	0.3
2022	0.5	2.9	-	0.1	0.2	0.2	2.4	5.6	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	50	50	0	78/89
2007	40	-	0	100	0	50	0	0	69/91
2012	120	-	83	17	0	17	0	0	67/79
2017	180	-	0	100	0	0	0	0	57/60
2022	60	-	0	67	33	0	67	33	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	340	-	18	77	6	53	6	0	72/119
2002	320	-	0	88	13	44	56	0	65/96
2007	360	-	0	56	44	39	6	78	75/125
2012	280	-	0	64	36	64	36	43	65/115
2017	280	-	7	50	43	36	43	36	68/121
2022	320	-	19	50	31	31	50	38	-/-
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1996	20	-	0	100	0	0	100	0	80/96
2002	-	-	-	-	-	-	-	-	69/89
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-

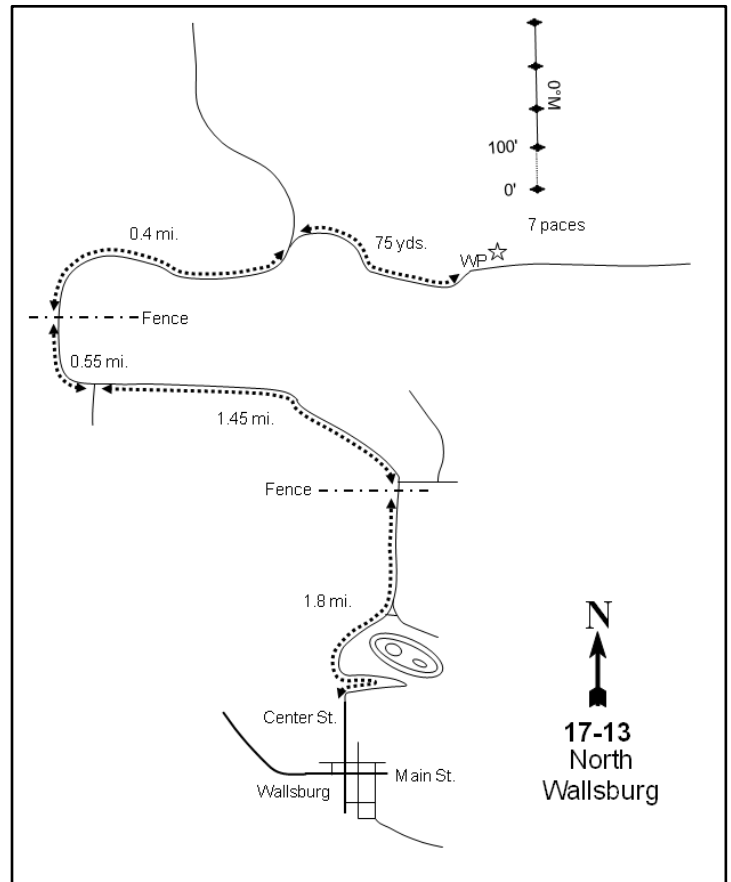
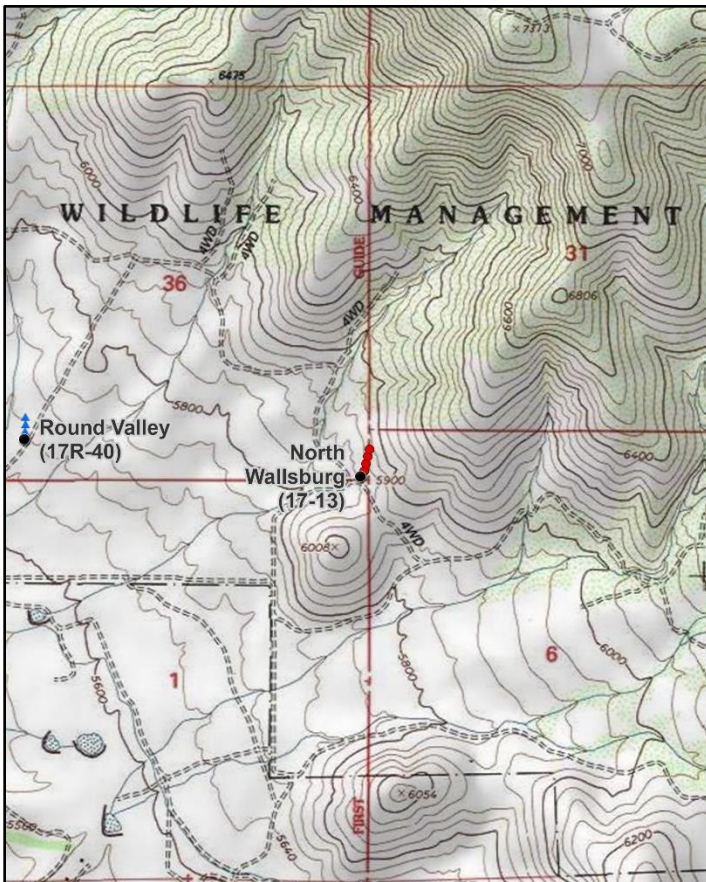
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	1300	60	15	79	6	0	0	2	25/49
2002	480	-	4	92	4	0	0	4	18/37
2007	340	-	0	77	24	0	0	6	24/37
2012	300	-	13	87	0	7	0	0	25/45
2017	280	-	7	86	7	21	0	0	28/47
2022	320	-	6	94	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	840	20	33	67	0	0	0	0	21/27
2002	120	-	0	83	17	0	0	0	17/21
2007	80	-	0	75	25	0	0	25	25/31
2012	20	-	0	100	0	0	0	0	19/32
2017	260	-	8	92	0	0	0	8	33/38
2022	260	20	15	85	0	15	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1996	160	-	0	100	0	0	13	0	12/51
2002	80	-	0	100	0	0	0	0	12/20
2007	80	-	0	75	25	0	0	0	12/24
2012	60	-	0	100	0	0	0	0	13/34
2017	40	-	50	50	0	0	0	0	15/32
2022	140	-	43	57	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	100	-	0	100	0	40	0	0	78/196
2002	80	-	0	100	0	0	50	0	91/187
2007	80	-	0	100	0	75	0	0	104/186
2012	240	-	0	92	8	42	42	8	92/181
2017	300	-	0	100	0	40	40	0	91/154
2022	340	-	29	59	12	0	71	24	- / -
Quercus gambelii^p -- (Gambel oak)									
1996	2840	240	20	74	6	51	4	49	123/85
2002	4400	-	26	71	2	0	0	31	123/65
2007	5320	-	45	40	15	3	0	34	173/94
2012	3200	480	56	44	0	4	0	1	98/65
2017	6680	340	60	39	2	1	0	1	117/74
2022	9360	80	77	21	3	68	4	3	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	20	-	0	100	0	0	0	0	78/83
2002	-	-	-	-	-	-	-	-	62/121
2007	-	-	-	-	-	-	-	-	105/188
2012	-	-	-	-	-	-	-	-	89/97
2017	-	-	-	-	-	-	-	-	105/129
2022	-	-	-	-	-	-	-	-	- / -
Tetradymia canescens -- (spineless horsebrush)									
1996	400	-	20	80	0	0	0	0	22/37
2002	640	-	16	84	0	0	0	0	23/57
2007	680	-	9	85	6	0	0	27	22/42
2012	560	-	0	100	0	0	0	0	16/32
2017	560	-	4	96	0	0	0	0	18/48
2022	460	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-12.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	9.7	13.5	7.6	30.0	-0.1	3.0	0.0	63.8	Fair
2002	14.0	13.5	6.6	30.0	-0.4	1.2	0.0	65.0	Fair
2007	16.4	8.5	12.5	30.0	-0.7	2.3	0.0	68.9	Fair-Good
2012	20.8	12.9	15.0	30.0	-0.1	2.6	0.0	81.2	Good
2017	17.6	13.2	15.0	30.0	-0.4	3.4	0.0	78.7	Good
2022	19.4	12.9	15.0	30.0	-1.0	2.7	0.0	79.0	Good

NORTH WALLSBURG - STUDY NO. 17-13



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SE; Township 4S, Range 4E, Section 36
NAD 83 UTM ZONE 12, 463193 East 4474482 North

Transect Information

Browse Tag # (0' Stake)	3955
Transect Bearing	0° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: 5ft

Directions to Site

Beginning at the town of Wallsburg, proceed northerly for 1.80 miles, staying on the main road. At 1.80 miles the road will come to a fence line and a gate: proceed through the gate and turn left (west). Proceed west for 1.45 miles to where the road bends northward at the DWR fence line. Continue on the same road northward for 0.55 additional miles to a cattle guard. Cross the fence and take the immediate right fork, then proceed 0.40 miles to another fork in the road. Walk 75 yards up the old road to a red steel fencepost and a full-high witness post on the left (north) side of the road and stop. From the fencepost, the 0-foot stake of the baseline is 7 paces northeast.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	West
Slope	10-20%
Sample Dates	09/24/1996, 06/26/2002, 07/06/2007, 07/25/2012, 07/10/2017, 07/11/2022

Wildlife Habitat and Vegetation History**Table 17-13.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 17-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	NA
1989	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush/Annual Grass	NA
2002	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2007	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2012	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2022	Mountain Big Sagebrush/Bulbous Bluegrass	NA

Site Notes

There is an ephemeral stream 700 feet to the west and a group of stock ponds approximately 1 mile southwest of the site.

Soils**Table 17-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	50.9	23.7	25.4	2.4	16.2	172.8	0.6	09/24/1996

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1983 (Photos, Table 17-13.12, Table 17-13.13). The herbaceous understory has remained abundant throughout the study years (Table 17-13.7). However, the main herbaceous components have been the introduced annual grass cheatgrass (*Bromus tectorum*) and the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) since 1996, although other perennial grasses are present in much lesser amounts (Table 17-13.10). Forbs, while somewhat diverse, have remained rare throughout the study years; the introduced annual forb redstem stork's bill (*Erodium cicutarium*) contributed the most cover of any one species in the 2022 sample year (Table 17-13.11).

Trend Summary Tables

Table 17-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	10.9	2.3	-	-	-	-
2002	14.7	0.3	-	17.3	0.2	-
2007	11.9	0.3	-	19.5	0.9	-
2012	11.3	0.5	-	24.8	1.2	-
2017	14.4	3.7	-	19.5	4.4	-
2022	12.0	1.3	-	15.6	1.7	-

Table 17-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	370	324	211	11	16.0	11.8	1.2	0.1
2002	232	404	80	14	5.2	26.9	0.3	0.0
2007	358	422	118	23	9.1	27.9	1.4	0.1
2012	293	401	58	12	7.1	32.1	0.7	0.1
2017	428	384	231	10	20.6	27.3	4.9	0.1
2022	382	359	238	1	13.3	19.8	8.5	0.0

Table 17-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.3	1.0	44.3	3.8	12.0	43.9
2002	12.4	0.9	40.8	4.5	11.6	47.5
2007	6.5	0.2	38.9	2.5	11.0	54.4
2012	8.0	0.6	33.9	3.6	16.4	55.2
2017	6.9	0.5	53.2	2.6	10.8	62.3
2022	16.3	0.1	55.8	5.7	12.3	52.1

Table 17-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency			
1996	36	12	11	1
2002	47	4	6	-
2007	56	10	2	-
2012	45	10	-	1
2017	42	5	5	-
2022	36	3	2	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	151.5 (374.1)	8.7 (21.5)	-	-
2007	147.4 (364.2)	37.5 (92.7)	-	-
2012	93.2 (230.1)	4.7 (11.6)	-	-
2017	102.6 (253.3)	4.0 (9.9)	-	-
2022	72.4 (178.8)	-	-	-

Table 17-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency								
1996	6	-	370	9	-	181	193	-	-
2002	18	2	232	3	4	348	156	-	11
2007	5	3	358	-	4	363	140	1	7
2012	10	8	293	2	9	384	79	16	-
2017	7	9	428	-	9	379	9	1	26
2022	6	3	382	-	9	351	17	-	19
year	Average Cover (%)								
1996	0.4	-	16.0	0.2	-	7.5	3.7	-	-
2002	0.7	0.0	5.2	0.0	0.2	22.6	2.7	-	0.7
2007	0.2	0.3	9.1	-	0.0	23.8	3.5	0.0	0.2
2012	0.2	0.4	7.1	0.0	0.0	29.7	1.4	0.2	-
2017	0.2	0.2	20.6	-	0.2	25.9	0.1	0.0	0.7
2022	0.4	0.3	13.3	-	0.4	18.1	0.4	-	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
1996	4	120	1	-	1	-	-	-	-	9	6	6	59	-	-	-	4
2002	-	14	-	0	4	1	-	-	-	-	-	3	32	2	38	6	-
2007	-	8	-	-	2	7	-	3	30	-	0	3	68	-	53	8	-
2012	2	1	-	-	5	-	-	-	-	-	25	3	8	-	9	2	-
2017	-	38	-	-	-	7	0	0	3	2	1	2	185	-	9	-	-
2022	-	48	-	-	1	-	-	-	-	-	28	-	188	-	9	-	-
year	Average Cover (%)																
1996	0.0	0.7	0.0	-	0.0	-	-	-	-	0.0	0.0	0.0	0.2	-	-	-	0.0
2002	-	0.0	-	0.0	0.0	0.0	-	-	-	-	-	0.0	0.1	0.0	0.1	0.0	-
2007	-	0.0	-	-	0.0	0.0	-	0.0	0.1	-	0.0	0.0	0.9	-	0.4	0.0	-
2012	0.0	0.0	-	-	0.0	-	-	-	-	-	0.6	0.0	0.0	-	0.1	0.0	-
2017	-	0.2	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	-	0.0	-	-
2022	-	0.6	-	-	0.0	-	-	-	-	-	0.4	-	7.4	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES				
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)				
<i>Sphaeralcea coccinea</i> (scarlet globemallow)				
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)				
<i>Zizadenus paniculatus</i> (foothill deathcamas)				
year	Nested Frequency			
1996	-	-	32	-
2002	5	-	-	-
2007	0	-	1	3
2012	4	-	15	-
2017	-	0	-	1
2022	6	-	2	-
year	Average Cover (%)			
1996	-	-	0.2	-
2002	0.0	-	-	-
2007	0.0	-	0.0	0.0
2012	0.0	-	0.0	-
2017	-	0.0	-	0.0
2022	0.1	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)					
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)					
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)					
<i>Gutierrezia sarothrae</i> (broom snakeweed)					
<i>Opuntia polyacantha</i> (plains pricklypear)					
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2002	16.1	-	1.2	0.2	-
2007	17.7	-	1.8	0.6	0.3
2012	22.4	-	2.4	1.2	-
2017	17.8	-	1.7	4.4	-
2022	14.9	-	0.7	1.7	-
year	Quadrat Cover (%)				
1996	9.1	-	1.8	2.0	0.3
2002	13.5	-	1.2	0.1	0.2
2007	11.0	-	0.9	0.1	0.2
2012	10.5	-	0.8	0.3	0.2
2017	13.5	0.4	0.9	3.2	0.1
2022	11.5	0.1	0.6	1.1	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

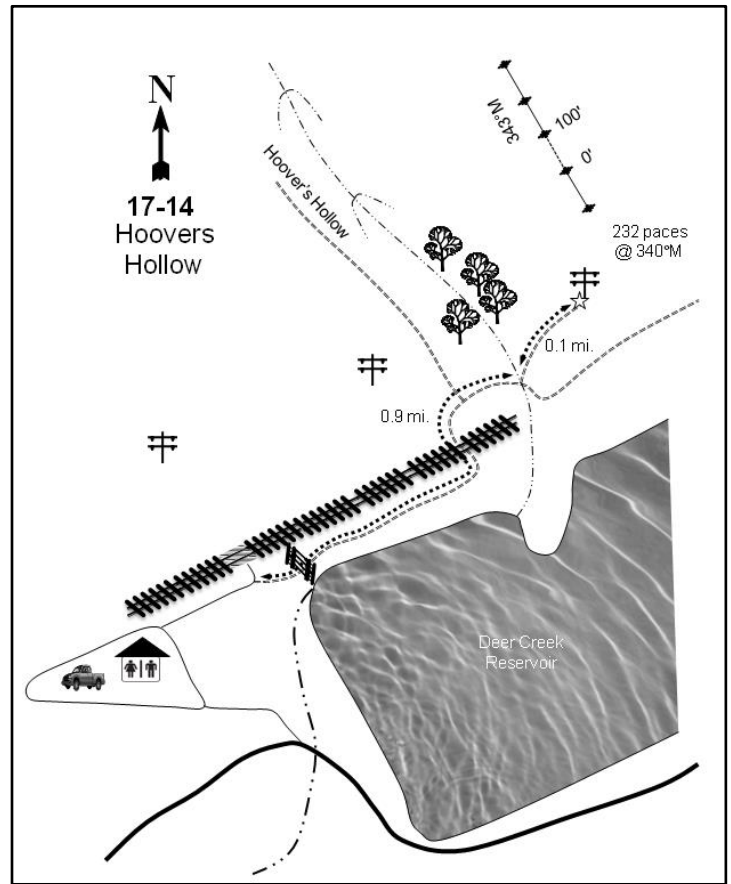
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	2240	380	16	53	31	38	8	8	59/112
2002	2540	-	5	62	33	32	30	11	53/76
2007	1800	-	2	56	42	39	13	71	68/100
2012	1620	100	1	82	17	33	20	12	71/110
2017	1640	-	2	73	24	48	38	21	66/106
2022	1440	-	3	61	36	40	21	38	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	21/28
2007	-	-	-	-	-	-	-	-	26/34
2012	20	-	0	100	0	0	0	0	13/16
2017	20	-	0	100	0	0	0	0	30/35
2022	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1996	360	120	11	67	22	11	6	11	78/115
2002	280	-	0	21	79	0	0	29	52/57
2007	280	-	0	21	79	0	0	36	66/75
2012	140	-	0	71	29	0	0	0	67/89
2017	200	-	0	70	30	0	0	10	73/101
2022	200	-	0	50	50	0	0	50	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	4500	100	12	88	0	0	0	0	24/34
2002	520	-	0	77	23	0	0	8	21/21
2007	660	20	12	82	6	0	0	0	21/24
2012	1880	80	52	48	0	0	0	0	25/31
2017	6420	20	7	94	0	0	0	0	25/29
2022	7560	24940	79	19	3	0	1	2	- / -
Opuntia polyacantha -- (plains pricklypear)									
1996	420	-	10	81	10	0	0	0	12/43
2002	380	-	11	79	11	0	0	0	12/28
2007	260	-	0	92	8	0	0	8	15/32
2012	400	-	5	90	5	0	0	35	13/32
2017	300	-	7	87	7	0	0	7	16/40
2022	300	300	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-13.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	13.6	6.0	7.6	8.5	-12.0	0.2	0.0	23.9	Very Poor
2002	18.4	3.9	2.2	8.7	-3.9	0.1	0.0	29.3	Very Poor
2007	24.4	1.3	1.0	8.4	-6.8	0.3	0.0	28.6	Very Poor
2012	30.0	9.5	0.5	4.7	-5.4	0.1	0.0	39.5	Very Poor-Poor
2017	24.4	7.5	1.1	2.8	-15.4	0.2	0.0	20.6	Very Poor
2022	19.5	4.0	1.3	3.5	-9.9	0.1	0.0	18.5	Very Poor

HOOVERS HOLLOW - STUDY NO. 17-14



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Aspen Grove SE; Township 4S, Range 4E, Section 32
NAD 83 UTM ZONE 12, 455968 East 4474548 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3949
343° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 5: 1ft

Directions to Site

From the locked gate at the southwest corner of Deer Creek Reservoir, walk 0.9 miles on the maintenance road along the northern edge of the reservoir, crossing the railroad tracks. Stop where the road crosses Hoovers Hollow. Follow a faint road that leads through the brush across the hollow, and then to the first power pole northeast of the hollow. From the power pole, walk 232 paces at an azimuth of 340 degrees magnetic to the 0-foot baseline stake. A red browse tag, numbered 3949, is attached to the 0-foot baseline stake.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,820ft (1,774m)
Aspect	Southwest
Slope	30-40%
Sample Dates	05/24/1996, 06/28/2002, 07/05/2007, 07/30/2012, 07/10/2017, 07/11/2022

Table 17-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Cascade 2	-	2003	7834

Wildlife Habitat and Vegetation History

Table 17-14.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Shiras Moose	substantial	winter

Table 17-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	NA
1989	Mountain Big Sagebrush/Perennial Grass	NA
1996	Mountain Big Sagebrush	NA
2002	Mountain Big Sagebrush/Annual Grass	NA
2007	Annual Grass	NA
2012	Annual Grass/Perennial Grass	NA
2017	Annual Grass	NA
2022	Annual Grass/Perennial Grass	NA

Site Notes

This study is located on a ridge top near the mouth of Hoovers Hollow, and on the west side of Deer Creek Reservoir.

Soils

Table 17-14.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	34.9	35.1	30.0	2.6	25.6	92.8	0.5	05/24/1996

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

This study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Photos, Table 17-14.12, Table 17-14.13) and perennial grass, namely Sandberg bluegrass (*Poa secunda*) (Pre-1992 Data, Table 17-14.10), plant community from establishment in 1983 to 1989. Perennial grasses decreased in 1996, leaving sagebrush as the sole dominant component (Table 17-14.7). In 2002, the introduced annual grass species cheatgrass (*Bromus tectorum*) increased in abundance, transitioning the study site to one co-dominated by annual grasses. Then, in 2003, the Cascade wildfire (Table 17-14.1) removed most of the browse component. Annual grasses have dominated the study site in the sample years following the burn, with perennial grasses co-dominating in 2012. In addition, the cover of cheatgrass more than tripled from 12.3% in 2012 to 41.6% in 2017, but decreased by the same magnitude in 2022 (Table 17-14.10); the presence of cheatgrass adds to the risk of future wildfire and a decrease in the communities' resilience and resistance to future disturbance.

Trend Summary Tables

Table 17-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	2.2	4.3	-	-	-	-
2002	3.0	1.5	-	3.7	1.8	-
2007	0.9	0.7	-	0.4	0.9	-
2012	0.4	1.2	-	0.5	1.3	-
2017	1.0	1.7	-	0.4	2.8	-
2022	-	3.9	-	0.1	5.4	-

Table 17-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	426	220	456	242	5.8	7.3	13.1	3.5
2002	423	229	380	98	20.8	7.0	5.6	2.1
2007	437	261	442	147	14.6	7.0	13.8	3.8
2012	416	318	413	132	12.7	13.8	10.1	6.4
2017	489	212	446	111	41.7	4.7	16.7	3.7
2022	440	290	411	115	13.9	16.1	17.0	4.5

Table 17-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.4	2.8	28.1	7.7	18.4	35.8
2002	15.8	1.2	23.2	9.4	17.4	45.6
2007	10.8	0.3	28.6	6.3	16.8	50.5
2012	8.3	0.1	39.7	11.4	16.2	41.1
2017	5.4	0.4	28.6	15.3	15.3	58.4
2022	12.6	0.3	34.9	13.0	17.9	46.3

Table 17-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	28	11	1
2002	-	29	12	2
2007	-	32	36	-
2012	-	28	16	1
2017	-	7	8	1
2022	-	45	6	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	1.5 (3.6)	68.3 (168.8)	21.5 (53.0)	-
2007	-	118.6 (293.0)	58.3 (144.0)	-
2012	-	40.2 (99.3)	33.5 (82.8)	-
2017	-	11.4 (28.1)	25.5 (62.9)	-
2022	-	88.5 (218.5)	5.3 (13.2)	-

Table 17-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency						
1996	-	426	-	177	72	5	-
2002	97	422	2	171	110	-	-
2007	7	437	6	208	104	-	-
2012	37	402	14	228	160	-	-
2017	14	489	18	143	97	-	-
2022	8	440	59	194	108	19	29
year	Average Cover (%)						
1996	-	5.8	-	3.7	3.6	0.0	-
2002	0.6	20.2	0.0	2.5	4.5	-	-
2007	0.1	14.6	0.2	3.8	3.1	-	-
2012	0.4	12.3	0.6	4.5	8.8	-	-
2017	0.1	41.6	1.5	1.4	1.8	-	-
2022	0.0	13.9	2.0	3.0	9.4	0.7	1.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cymopterus (springparsley)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)
year	Nested Frequency																
1996	33	18	371	-	4	15	12	8	67	70	211	21	33	59	-	12	372
2002	1	32	225	4	-	6	13	1	74	2	167	3	33	-	5	1	89
2007	-	-	331	-	-	10	-	-	116	7	22	-	44	19	-	4	409
2012	7	-	306	-	-	7	-	-	84	15	33	32	28	7	8	7	290
2017	-	-	346	-	-	10	-	-	-	0	6	-	25	3	-	8	409
2022	-	1	154	-	-	4	4	-	23	-	6	-	19	25	5	7	388
year	Average Cover (%)																
1996	0.2	0.1	1.6	-	0.0	0.1	0.0	0.1	0.2	1.1	1.1	0.1	0.1	0.1	-	0.0	6.4
2002	0.0	0.1	2.1	0.2	-	0.2	0.0	0.1	0.2	0.0	1.2	0.0	0.4	-	0.0	0.0	0.8
2007	-	-	1.6	-	-	0.1	-	-	0.4	0.1	0.0	-	0.1	0.1	-	0.2	10.4
2012	0.0	-	1.7	-	-	0.2	-	-	0.4	0.3	0.0	0.1	0.4	0.0	0.0	0.1	6.2
2017	-	-	2.7	-	-	0.2	-	-	-	0.0	0.0	-	0.1	0.0	-	0.1	13.8
2022	-	0.0	0.7	-	-	0.0	0.0	-	0.1	-	0.0	-	0.1	0.1	0.1	0.1	14.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																
Galium aparine ^a (stickywilly)																	
Gilia inconspicua ^a (shy gilia)																	
Helianthella uniflora (oneflower helianthella)																	
Helianthus annuus ^{ai} (common sunflower)																	
Heterotheca villosa (hairy false goldenaster)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Lappula occidentalis ^a (flatspine stickseed)																	
Linaria dalmatica ^{ai} (Dalmatian toadflax)																	
Machaeranthera (tansyaster)																	
Oenothera pallida ^a (pale evening primrose)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Sanguisorba minor ^a (small burnet)																	
Saxifraga (saxifrage)																	
Silene antirrhina ^a (sleepy silene)																	
Tragopogon dubius ^{ai} (yellow salsify)																	
Verbascum thapsus ^{ai} (common mullein)																	
year	Average Cover (%)																
1996	1	-	-	-	95	2	-	4	46	26	3	-	-	225	77	4	
2002	-	1	-	110	33	-	4	1	-	8	-	-	-	194	3	-	
2007	-	-	2	-	62	-	3	13	-	-	-	10	32	251	40	-	
2012	-	-	-	-	88	11	-	3	-	29	-	6	-	233	63	-	
2017	-	-	5	1	66	2	-	13	15	-	-	4	-	-	15	-	
2022	-	-	-	-	60	3	6	35	-	-	2	11	-	178	23	-	
year	Average Cover (%)																
1996	0.0	-	-	-	1.7	0.0	-	0.0	0.1	0.0	0.0	-	-	2.6	0.8	0.2	
2002	-	0.0	-	0.3	0.9	-	0.0	0.0	-	0.0	-	-	-	0.9	0.0	-	
2007	-	-	0.1	-	2.5	-	0.0	0.1	-	-	-	0.2	0.5	1.0	0.3	-	
2012	-	-	-	-	5.1	0.1	-	0.1	-	0.2	-	0.2	-	0.7	0.6	-	
2017	-	-	0.1	0.0	2.8	0.0	-	0.1	0.1	-	-	0.3	-	-	0.1	-	
2022	-	-	-	-	2.3	0.0	0.1	1.7	-	-	0.0	0.3	-	0.9	0.3	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Amelanchier utahensis ^p (Utah serviceberry)							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)							
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Opuntia (pricklypear)							
Symphoricarpos oreophilus ^p (mountain snowberry)							
year	Quadrat Cover (%)						
1996	-	-	-	-	-	-	-
2002	-	2.3	1.4	-	1.8	-	-
2007	0.1	-	0.3	0.2	0.7	-	-
2012	0.2	-	0.3	0.1	1.2	-	-
2017	0.2	-	0.2	0.1	2.7	-	-
2022	-	0.1	-	0.8	4.6	-	-
year	Quadrat Cover (%)						
1996	0.1	1.2	0.7	1.6	2.8	0.1	
2002	0.4	1.3	1.2	-	1.5	0.1	
2007	0.6	0.1	0.0	0.1	0.6	0.1	
2012	0.4	-	0.0	0.3	0.9	-	
2017	0.6	-	0.4	0.2	1.5	-	
2022	-	0.0	-	0.7	3.3	-	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1996	40	-	0	50	50	50	50	0	32/53
2002	20	-	0	100	0	0	100	0	44/63
2007	20	-	0	100	0	0	0	0	61/80
2012	20	-	0	100	0	100	0	0	73/96
2017	40	-	0	100	0	50	0	0	73/88
2022	20	-	0	100	0	100	0	0	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1996	340	80	18	65	18	47	29	6	44/79
2002	340	-	0	88	12	65	12	0	49/82
2007	20	-	0	0	100	100	0	0	53/96
2012	-	-	-	-	-	-	-	-	51/87
2017	20	-	0	100	0	0	0	0	48/100
2022	20	-	0	100	0	0	0	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	44/43
2017	-	-	-	-	-	-	-	-	41/100
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1996	480	40	8	67	25	33	21	17	59/99
2002	180	-	0	44	56	11	11	22	73/94
2007	20	-	0	100	0	0	0	0	58/71
2012	40	-	0	100	0	0	0	0	60/98
2017	20	-	0	100	0	0	0	0	59/110
2022	20	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	11540	21280	59	41	0	0	0	0	13/20
2002	160	-	13	75	13	0	0	13	13/17
2007	80	-	0	100	0	0	0	0	21/31
2012	160	-	25	75	0	0	0	0	28/50
2017	560	-	11	89	0	4	0	0	24/33
2022	980	20	10	90	0	0	0	12	- / -
Opuntia -- (pricklypear)									
1996	1000	20	4	56	40	0	0	18	15/85
2002	1400	-	11	61	27	0	1	13	13/39
2007	1000	-	6	92	2	0	0	0	13/28
2012	1660	-	1	99	0	1	0	31	14/40
2017	1700	-	4	95	1	0	0	29	15/50
2022	3060	-	3	88	9	0	0	11	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	17/71
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	21/96
2012	-	-	-	-	-	-	-	-	29/177
2017	-	-	-	-	-	-	-	-	45/166
2022	-	-	-	-	-	-	-	-	- / -

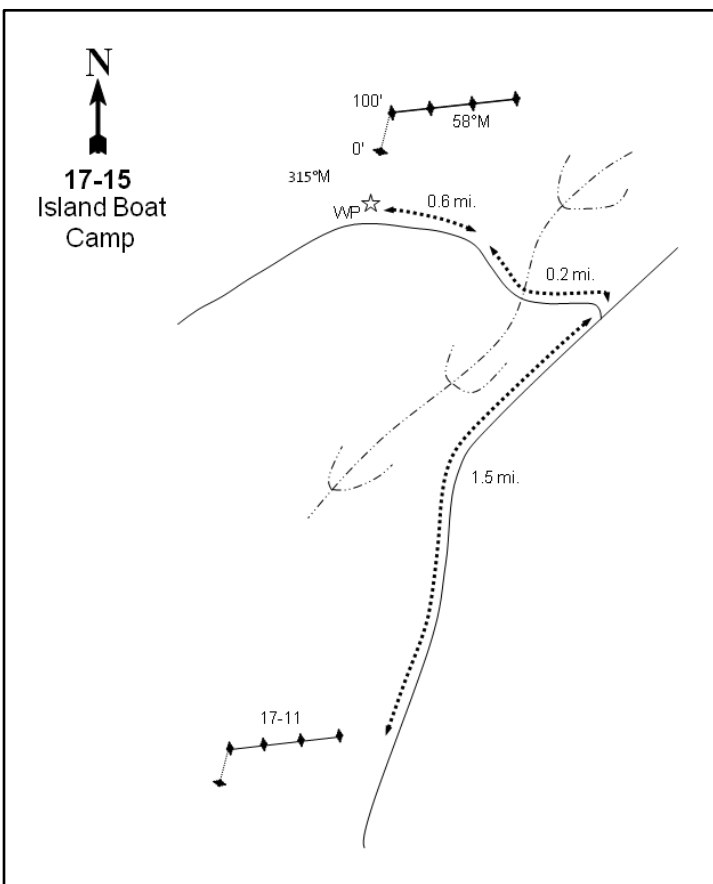
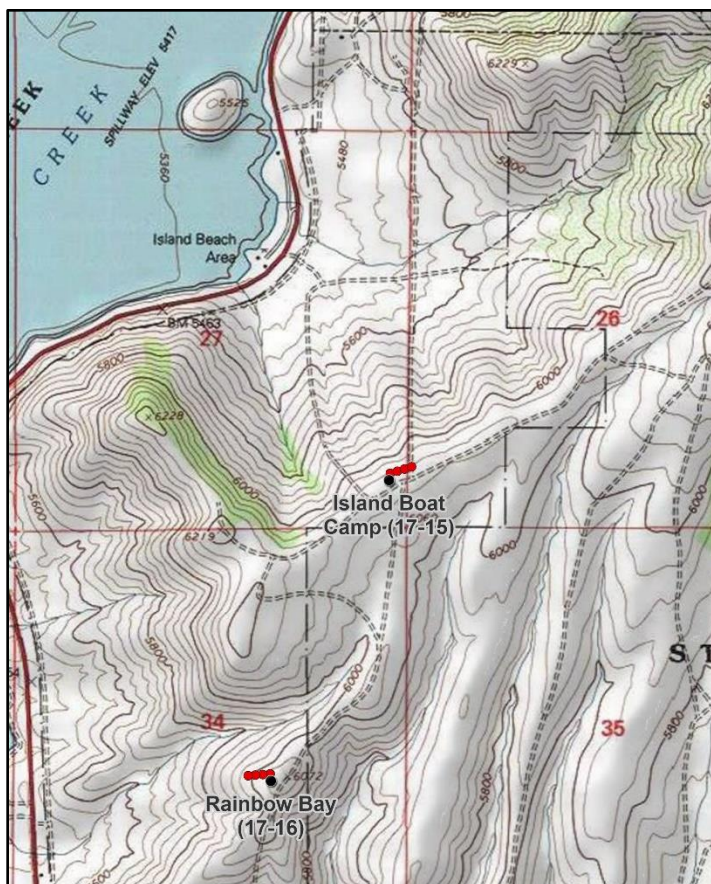
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Quercus gambelii^p -- (Gambel oak)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	122/198
2017	-	-	-	-	-	-	-	-	130/192
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	20	-	100	0	0	0	0	0	16/27
2002	20	-	0	100	0	0	0	0	19/35
2007	20	-	0	100	0	0	100	0	11/21
2012	-	-	-	-	-	-	-	-	43/85

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-14.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	2.7	0.0	0.0	14.7	-4.4	7.0	-2.0	18.0	Very Poor
2002	3.8	0.0	0.0	14.0	-15.6	4.1	-2.0	4.2	Very Poor
2007	0.5	0.0	0.0	13.7	-11.0	7.5	-2.0	8.8	Very Poor
2012	0.7	0.0	0.0	26.5	-9.5	10.0	-2.0	25.6	Very Poor
2017	0.6	0.0	0.0	6.4	-20.0	7.4	-2.0	-7.7	Very Poor
2022	0.1	0.0	0.0	28.3	-10.5	5.7	-2.0	21.7	Very Poor

ISLAND BOAT CAMP - STUDY NO. 17-15

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SW; Township 4S, Range 4E, Section 27
NAD 83 UTM ZONE 12, 459903 East 4476256 North

Transect Information

Browse Tag # (0' Stake)	415
Transect Bearing	355° magnetic (Lines 2-4: 58° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (34ft), Line 4 (59ft)
Belt Marker Placement	Standard

Directions to Site

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile, passing through two DWR gates, to another intersection, and turn right. Proceed 0.05 miles to a small rock pile on the left (east) side of the road, which marks study 17-11, Wallsburg Turn. Continue down the road for 1.5 miles, traveling north and passing a left fork to another fork. Bear left and go 0.2 miles, passing through a drainage to another ridge top, and bear left again. Drive along the ridge for 0.6 miles to a witness post on the north side of the road. The 0-foot stake is marked with a browse tag #415.

Site Information

Land Ownership	Federal
Land Administrator	DWR
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	Northeast
Slope	5%
Sample Dates	05/30/1996, 06/25/2002, 07/03/2007, 08/02/2012, 07/12/2017, 07/11/2022

Wildlife Habitat and Vegetation History**Table 17-15.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 17-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	NA
1989	Mixed Mountain Brush	NA
1996	Mixed Mountain Brush	NA
2002	Mixed Mountain Brush	NA
2007	Mixed Mountain Brush	NA
2012	Mixed Mountain Brush	NA
2017	Mixed Mountain Brush	NA
2022	Mixed Mountain Brush	NA

Site Notes

This winter range study is located on a ridge overlooking both Wallsburg and the Island Boat Camp.

Soils**Table 17-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.6	32.9	33.1	34.0	4.8	12.8	160.0	0.7	05/30/1996

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1983, this study site has existed as a mixed mountain brush plant community with Utah serviceberry (*Amelanchier utahensis*), antelope bitterbrush (*Purshia tridentata*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the main browse species. Other subordinate shrub species such as yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and mountain snowberry (*Symphoricarpos oreophilus*) are also present (Photos, Table 17-15.12, Table 17-15.13). The herbaceous understory has remained dominated by a number of introduced and native perennial grasses in most study years. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed in low amounts from 1996 to 2012. Cheatgrass increased and contributed 11% cover in 2017, but decreased to 8.5% cover in 2022. The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has steadily increased in abundance and cover over the course of the study (Table 17-15.7, Table 17-15.10). Both annual and perennial forbs are diverse and abundant; the noxious weed species gypsflyer (*Cynoglossum officinale*) was present in 1996 and was again observed in 2017 (Table 17-15.11).

Trend Summary Tables

Table 17-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	21.1	7.8	-	-	-	-
2002	26.5	8.0	-	25.8	7.5	-
2007	9.8	9.7	-	15.3	13.8	-
2012	13.6	11.3	-	19.2	7.6	-
2017	11.4	11.0	-	20.0	16.5	-
2022	11.5	10.4	-	24.3	9.6	-

Table 17-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	77	384	267	383	0.7	13.7	1.2	15.6
2002	7	398	257	325	0.0	23.2	1.6	11.4
2007	199	348	361	242	2.4	18.2	5.0	8.7
2012	116	391	107	262	0.3	21.5	0.3	7.1
2017	253	326	373	228	11.1	18.3	10.3	8.9
2022	236	351	366	224	8.8	23.1	8.5	9.3

Table 17-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	8.5	0.6	61.4	2.7	1.5	54.4
2002	7.3	1.0	55.1	4.3	0.7	59.8
2007	7.3	0.4	39.2	3.4	0.7	61.1
2012	5.7	0.0	45.1	4.9	0.5	56.5
2017	7.0	0.1	41.1	4.5	1.5	62.0
2022	15.1	0.6	51.4	5.7	0.7	60.5

Table 17-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1996	1	-	35	19	5
2002	-	-	52	17	1
2007	6	-	29	12	2
2012	1	-	20	4	-
2017	-	-	26	2	6
2022	4	-	41	1	6
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2002	0.7 (1.8)	-	123.3 (304.6)	31.5 (77.8)	-
2007	18.9 (46.6)	-	66.4 (163.9)	8.7 (21.5)	-
2012	0.7 (1.8)	8.7 (21.5)*	61.7 (152.3)	4.0 (9.9)	-
2017	2.9 (7.2)	-	65.7 (162.2)	6.7 (16.6)	-
2022	12.3 (30.5)	-	132.0 (326.1)	-	-

*Pellets per acre (ha)

Table 17-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Poa (bluegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency															
1996	26	-	9	-	-	77	-	-	5	-	-	230	6	66	208	-
2002	34	-	28	-	-	7	0	-	7	19	-	197	8	140	239	-
2007	2	-	35	1	-	199	-	2	0	-	1	51	8	179	223	-
2012	5	2	106	3	-	116	-	-	-	-	-	78	14	132	216	-
2017	-	14	179	4	2	249	1	3	7	-	4	65	1	122	99	2
2022	2	-	174	24	-	233	-	16	-	-	8	24	-	129	156	-
year	Average Cover (%)															
1996	0.9	-	0.1	-	-	0.7	-	-	0.1	-	-	5.0	0.1	1.3	6.3	-
2002	1.3	-	1.8	-	-	0.0	0.0	-	0.2	1.5	-	5.0	0.2	2.5	10.7	-
2007	0.0	-	1.7	0.0	-	2.4	-	0.0	0.0	-	0.0	0.8	0.3	2.9	12.3	-
2012	0.1	0.0	6.0	0.0	-	0.3	-	-	-	-	-	2.2	0.5	3.5	9.1	-
2017	-	0.3	10.2	0.0	0.0	11.0	0.0	0.1	0.1	-	0.1	0.6	0.0	3.9	2.9	0.1
2022	0.1	-	11.6	0.3	-	8.5	-	0.9	-	-	0.0	0.2	-	4.1	6.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcross)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rusby milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlped false flax)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	152	32	124	45	-	99	3	92	14	-	3	2	3	1	3	227	30
2002	38	102	20	36	-	54	11	58	3	-	-	4	-	-	1	247	3
2007	31	19	304	-	3	25	17	78	3	-	-	-	10	3	-	212	49
2012	34	3	86	2	3	1	11	69	-	-	-	4	2	7	3	30	2
2017	3	80	308	-	3	18	26	87	10	26	-	2	-	-	0	117	137
2022	14	57	296	-	-	26	31	79	4	6	-	-	-	-	-	217	49
year	Average Cover (%)																
1996	0.9	0.1	0.2	0.5	-	2.7	0.0	4.4	0.0	-	0.0	0.0	0.0	0.0	0.0	0.7	0.1
2002	0.2	0.4	0.0	0.6	-	0.7	0.1	4.7	0.0	-	-	0.1	-	-	0.0	1.1	0.0
2007	0.2	0.1	3.6	-	0.0	0.1	0.3	5.3	0.0	-	-	-	0.0	0.0	-	1.0	0.1
2012	0.1	0.0	0.2	0.0	0.0	0.0	0.1	4.5	-	-	-	0.0	0.0	0.0	0.0	0.1	0.0
2017	0.0	0.6	6.6	-	0.0	0.2	0.3	6.1	0.0	0.2	-	0.0	-	-	0.0	1.4	1.3
2022	0.1	0.4	6.3	-	-	0.1	0.3	6.7	0.0	0.0	-	-	-	-	-	1.8	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Comandra umbellata (bastard toadflax)																		
Cordylanthus ^a (bird's-beak)																		
Crepis acuminata (tapertip hawkbeard)																		
Cryptantha (cryptantha)																		
Cymopterus longipes (longstalk springparsley)																		
Cynoglossum officinale ^{ani} (gypsyflower)																		
Delphinium nuttallianum (two-lobed larkspur)																		
Descurainia pinnata ^a (western tansymustard)																		
Erigeron divergens ^a (spreading fleabane)																		
Erigeron pumilus (shaggy fleabane)																		
Erigeron ovalifolium (cushion buckwheat)																		
Erigeron racemosus (redroot buckwheat)																		
Erigeron umbellatum (sulphur-flower buckwheat)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Galium ^a (bedstraw)																		
Hackelia patens (spotted stickseed)																		
Linum lewisii (Lewis flax)																		
year	Nested Frequency																	
1996	24	-	99	-	74	3	45	-	-	26	-	15	157	-	3	20	21	
2002	3	-	28	-	30	-	3	-	10	21	3	16	113	-	-	11	13	
2007	6	-	25	3	3	-	-	25	6	27	-	7	56	-	-	-	3	
2012	24	2	17	3	2	-	-	6	-	16	-	6	63	-	-	2	3	
2017	24	6	7	-	5	2	-	9	-	7	-	2	32	2	-	5	-	
2022	13	3	17	-	-	-	-	25	3	18	5	11	9	4	-	5	-	
year	Average Cover (%)																	
1996	0.1	-	0.5	-	0.3	0.0	0.1	-	-	0.1	-	0.1	2.5	-	0.0	0.1	0.2	
2002	0.0	-	0.6	-	0.1	-	0.0	-	0.2	0.1	0.0	0.2	2.0	-	-	0.1	0.1	
2007	0.0	-	0.4	0.0	0.0	-	-	0.0	0.2	0.2	-	0.1	0.6	-	-	-	0.0	
2012	0.1	0.0	0.2	0.1	0.0	-	-	0.0	-	0.2	-	0.1	0.6	-	-	0.0	0.0	
2017	0.1	0.2	0.1	-	0.0	0.0	-	0.1	-	0.1	-	0.0	0.4	0.1	-	0.0	-	
2022	0.1	0.0	0.2	-	-	-	-	0.0	0.0	0.4	0.2	0.2	0.2	0.0	-	0.1	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Lomatium triternatum (nineleaf biscuitroot)																		
Lupinus argenteus (silvery lupine)																		
Machaeranthera canescens (hoary tansyaster)																		
Medicago sativa ⁱ (alfalfa)																		
Mertensia (bluebells)																		
Microsteris gracilis ^a (slender phlox)																		
Orthocarpus ^a (owl's-clover)																		
Packera multilobata (lobeleaf groundsel)																		
Phlox longifolia (longleaf phlox)																		
Polygonum douglasii ^a (Douglas' knotweed)																		
Silene antirrhina ^a (sleepy silene)																		
Sisymbrium altissimum ^{ai} (tall tumblemustard)																		
Taraxacum officinale (common dandelion)																		
Tragopogon dubius ^{ai} (yellow salsify)																		
Vicia americana (American vetch)																		
Viola (violet)																		
year	Nested Frequency																	
1996	17	45	4	-	8	-	9	10	149	22	-	-	1	28	-	113		
2002	-	20	-	-	-	7	-	9	156	3	-	-	4	30	-	-		
2007	-	19	-	-	-	15	-	-	69	-	3	2	-	1	-	-		
2012	3	15	1	-	-	11	-	-	125	4	4	1	-	2	7	-		
2017	-	14	-	0	-	41	-	2	15	3	8	0	11	4	4	-		
2022	2	5	-	-	-	28	-	-	47	-	0	-	-	5	-	-		
year	Average Cover (%)																	
1996	0.0	1.0	0.0	-	0.1	-	0.1	0.0	0.3	0.0	-	-	0.0	0.1	-	1.4		
2002	-	0.4	-	-	-	0.0	-	0.0	0.9	0.0	-	-	0.0	0.2	-	-		
2007	-	1.1	-	-	-	0.0	-	-	0.3	-	0.0	0.0	-	0.0	-	-		
2012	0.0	0.4	0.1	-	-	0.0	-	-	0.4	0.0	0.0	0.0	-	0.0	0.0	-		
2017	-	0.7	-	0.0	-	0.3	-	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-		
2022	0.0	0.0	-	-	-	0.1	-	-	0.2	-	0.0	-	-	0.0	-	-		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2002	5.6	10.2	7.3	0.2	7.9	2.1	-
2007	4.8	3.1	13.2	0.5	3.7	3.7	0.1
2012	7.5	2.8	7.4	0.2	6.6	2.3	-
2017	5.2	4.3	15.5	0.8	6.8	3.7	0.2
2022	7	5.1	9.6	-	6	6.2	-
year	Quadrat Cover (%)						
1996	3.9	10.2	7.4	0.3	5.1	1.9	0.0
2002	4.7	10.4	7.4	0.5	7.7	3.7	0.1
2007	3.0	0.9	9.3	0.2	2.5	3.4	0.2
2012	3.8	2.1	10.5	0.8	4.3	3.4	0.0
2017	4.6	2.1	10.0	0.8	3.3	1.4	0.2
2022	3.8	2.3	10.1	0.1	2.8	2.6	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	1220	60	33	61	7	26	12	0	79/102
2002	700	-	17	54	29	26	51	6	80/88
2007	780	-	5	90	5	36	10	0	89/93
2012	800	-	8	85	8	33	38	18	92/91
2017	1120	40	20	80	0	48	7	0	91/90
2022	920	-	13	80	7	28	28	30	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	2080	-	2	71	27	56	12	10	69/108
2002	1740	-	6	56	38	35	17	13	72/89
2007	520	40	15	19	65	31	23	39	87/96
2012	560	60	7	54	39	18	25	25	69/76
2017	600	-	0	93	7	33	13	7	84/88
2022	540	-	4	63	33	26	4	33	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	6060	60	11	89	0	1	0	0	30/53
2002	4760	-	4	95	1	0	0	0	27/43
2007	4140	-	1	90	9	0	0	1	35/57
2012	4480	280	1	96	3	0	0	23	30/47
2017	5680	-	3	97	1	3	0	1	35/56
2022	6220	300	7	92	2	0	0	2	- / -

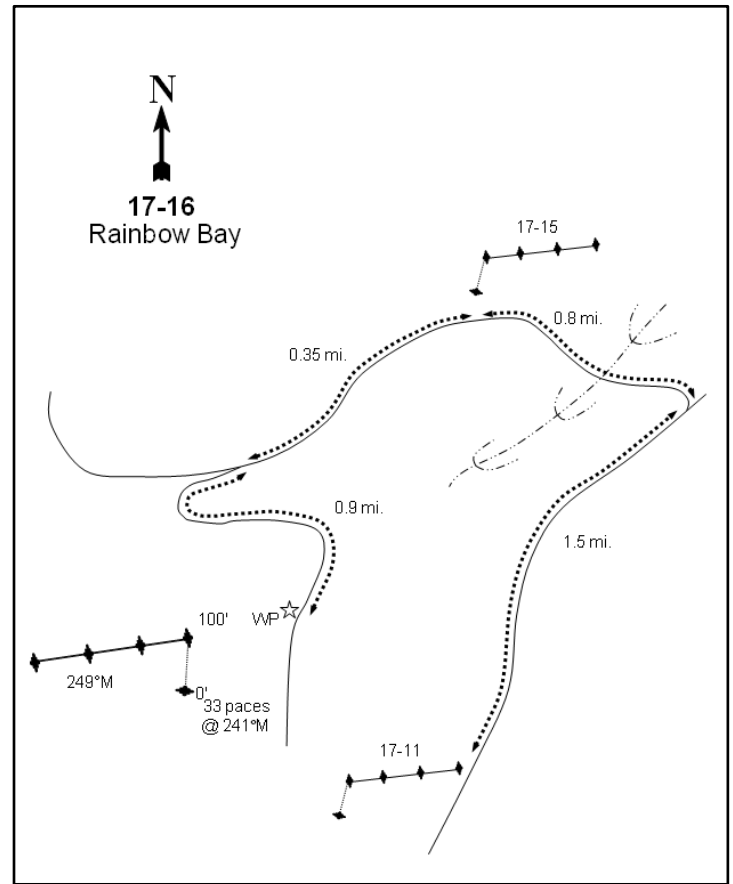
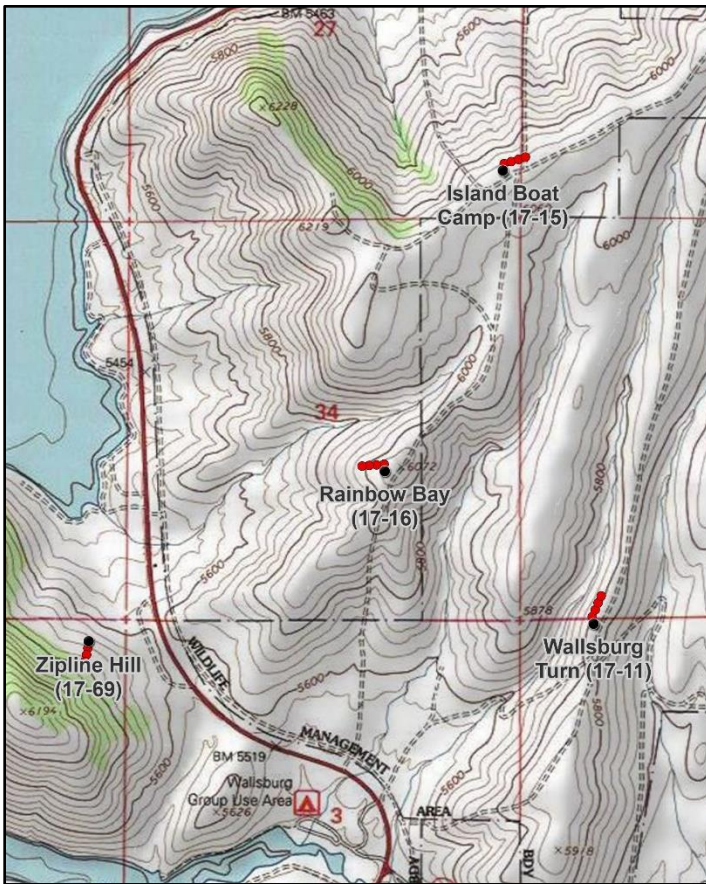
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	920	100	28	61	11	0	0	0	18/23
2002	580	-	0	93	7	0	3	7	16/18
2007	820	-	0	98	2	0	0	0	21/22
2012	720	-	6	94	0	0	0	0	20/24
2017	820	-	22	78	0	0	0	0	27/35
2022	140	-	0	100	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	600	-	0	87	13	20	77	13	100/176
2002	560	-	0	71	29	18	79	11	109/159
2007	400	-	0	65	35	40	55	5	103/120
2012	600	-	3	73	23	43	37	22	105/147
2017	540	-	0	100	0	70	26	0	107/136
2022	420	-	0	76	24	29	57	29	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	560	20	32	68	0	4	0	0	58/72
2002	540	-	0	96	4	0	0	4	69/81
2007	520	280	8	92	0	0	0	4	77/108
2012	960	-	0	98	2	4	0	60	66/76
2017	1320	20	2	99	0	33	0	0	62/67
2022	1040	-	12	89	0	6	39	2	- / -
Tetradymia canescens -- (spineless horsebrush)									
1996	160	-	63	38	0	13	0	0	23/32
2002	160	-	25	75	0	13	0	0	24/49
2007	120	-	0	83	17	17	0	0	23/47
2012	120	-	0	100	0	0	0	50	24/36
2017	160	-	0	100	0	0	0	0	30/49
2022	40	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-15.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	28.1	9.8	4.9	27.4	-0.5	10.0	-2.0	77.6	Good
2002	30.0	6.4	2.6	30.0	0.0	10.0	0.0	79.0	Good
2007	20.3	8.0	3.3	30.0	-1.8	10.0	0.0	69.8	Fair-Good
2012	27.0	9.9	2.5	30.0	-0.2	10.0	0.0	79.2	Good
2017	27.1	14.6	2.7	30.0	-8.3	10.0	-2.0	74.0	Good
2022	30.0	10.6	3.7	30.0	-6.6	10.0	0.0	77.7	Good

RAINBOW BAY - STUDY NO. 17-16



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SW; Township 4S, Range 4E, Section 34
NAD 83 UTM ZONE 12, 459424 East 4475038 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3947
345° magnetic (Lines 2-4: 249° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt 2: No Rebar

Directions to Site

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile, passing through two DWR gates, to another intersection, and turn right. Proceed for 0.05 miles to a small rock pile on the left (east) side of the road, which marks study 17-11, Wallsburg Turn. Continue down the road 1.5 miles from study 17-11 to a fork. Bear left and go 0.2 miles through a drainage to another ridge top and bear left. Drive along the ridge for 0.6 miles to a witness post on the north side of the road, which marks study 17-15, Island Boat Camp. Continue down this road for 0.35 miles to an intersection with a short telephone post and a Mountain Bell wire warning sign. Turn left and stay left for 0.9 miles to a witness post on the north side of the road. From the witness post, the 0-foot stake is 33 paces away at an azimuth of 241 degrees magnetic, marked with browse tag #3947.

Site Information

Land Ownership	Federal
Land Administrator	DWR
Allotment	No data
Elevation	6,040ft (1,841m)
Aspect	West
Slope	15-20%
Sample Dates	05/31/1996, 06/25/2002, 07/03/2007, 07/31/2012, 07/12/2017, 07/12/2022

Table 17-16.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 17-16.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 17-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Bitterbrush	NA
1989	Mountain Big Sagebrush/Bitterbrush	NA
1996	Mountain Big Sagebrush/Bitterbrush	NA
2002	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	NA
2007	Perennial Grass/Mountain Big Sagebrush/Bitterbrush	NA
2012	Perennial Grass/Mountain Big Sagebrush/Bitterbrush	NA
2017	Annual Grass/Mountain Big Sagebrush/Bitterbrush	NA
2022	Annual-Perennial Grass/Bitterbrush/Mountain Big Sagebrush	NA

Site Notes

No Notes

Soils

Table 17-16.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	42.6	27.4	30.0	3.6	27.5	285.6	0.7	05/31/1996

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been the dominant browse species since the study was established in 1983 (Photos, Table 17-16.12, Table 17-16.13). The herbaceous understory has remained abundant and diverse through the study years (Table 17-16.7). Perennial grasses -- mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) -- increased over time as browse cover decreased, and were a co-dominant site component from 2002 to 2012. The cover of the introduced annual grass species cheatgrass (*Bromus tectorum*) increased by over 30% between 2012 and 2017, replacing perennial grass as co-dominant vegetation and remaining dominant in 2022 (Table 17-16.10). Both perennial and annual forbs are present on this study site, with the perennial forb arrowleaf balsamroot (*Balsamorhiza sagittata*) and the annual forbs desert madwort (*Alyssum desertorum*), maiden blue eyed Mary (*Collinsia parviflora*), and redstem stork's bill (*Erodium cicutarium*) as the most abundant forb species in 2017 and 2022 (Table 17-16.11).

Trend Summary Tables

Table 17-16.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.0	4.9	-	-	-	-
2002	12.6	5.0	-	12.4	3.3	-
2007	7.4	4.4	-	8.2	2.7	-
2012	7.6	2.6	-	9.7	3.1	-
2017	6.6	3.3	-	12.1	4.6	-
2022	8.5	2.0	-	12.4	4.1	-

Table 17-16.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	329	309	448	282	3.0	13.2	5.8	11.7
2002	317	329	413	177	8.0	16.6	6.6	7.1
2007	374	316	391	134	9.0	15.7	4.2	6.6
2012	197	381	278	196	1.4	18.0	1.5	7.1
2017	419	299	379	137	32.0	15.9	13.2	7.8
2022	386	349	388	111	22.1	19.0	11.3	8.0

Table 17-16.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.2	1.4	49.6	6.5	6.0	49.3
2002	11.0	0.8	47.9	10.8	3.9	47.7
2007	6.5	0.1	41.1	7.2	2.3	53.4
2012	8.2	0.0	40.2	9.9	2.5	46.9
2017	4.8	0.4	39.0	9.3	4.3	61.0
2022	10.1	0.1	48.8	9.0	3.9	60.9

Table 17-16.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	40	21	-
2002	-	53	9	4
2007	-	45	9	1
2012	-	29	3	-
2017	-	32	2	8
2022	-	33	-	5
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	-	100.5 (248.3)	26.2 (64.6)	-
2007	-	111.3 (274.8)	12.8 (31.5)	-
2012	-	22.1 (54.6)	3.4 (8.3)	-
2017	-	39.6 (97.7)	4.0 (9.9)	-
2022	2.2 (5.4)	126.6 (312.8)	-	-

Table 17-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
1996	11	20	-	329	-	-	6	48	257	12
2002	5	50	44	308	1	30	-	102	213	9
2007	0	29	41	369	2	22	-	122	230	-
2012	-	64	61	159	1	36	5	156	241	-
2017	-	93	12	419	4	99	5	125	127	3
2022	0	68	9	386	-	106	-	170	175	-
year	Average Cover (%)									
1996	0.2	1.4	-	3.0	-	-	0.1	0.5	10.9	0.2
2002	0.2	3.5	0.2	7.8	0.0	0.6	-	1.9	10.3	0.0
2007	0.0	2.1	0.2	8.9	0.0	0.4	-	2.0	11.1	-
2012	-	4.0	0.4	1.1	0.0	0.8	0.1	2.6	10.5	-
2017	-	5.9	1.1	30.9	0.0	2.6	0.0	3.2	4.2	0.0
2022	0.1	4.4	0.1	22.0	-	2.3	-	4.3	7.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	91	13	349	3	-	130	2	6	77	13	43	5	8	297	107	-	14
2002	17	43	93	3	-	22	-	1	68	13	13	10	-	400	3	-	12
2007	12	-	296	1	-	17	-	-	80	0	3	5	3	233	2	7	6
2012	32	-	127	7	4	9	-	5	91	-	6	1	5	127	-	9	15
2017	6	1	316	-	4	18	-	1	83	-	9	-	2	134	22	7	-
2022	1	-	270	1	2	1	-	-	86	-	-	4	-	200	2	5	3
year	Average Cover (%)																
1996	0.8	0.0	1.4	0.0	-	4.2	0.0	0.0	4.8	0.0	0.2	0.0	0.1	2.1	0.3	-	0.1
2002	0.1	0.2	0.3	0.0	-	0.1	-	0.0	5.3	0.0	0.4	0.0	-	5.6	0.0	-	0.2
2007	0.1	-	1.8	0.0	-	0.3	-	-	5.2	0.0	0.1	0.0	0.1	0.8	0.0	0.2	0.3
2012	0.2	-	0.3	0.0	0.0	0.0	-	0.0	5.7	-	0.2	0.0	0.1	0.5	-	0.0	0.1
2017	0.2	0.0	5.4	-	0.0	0.3	-	0.0	6.1	-	0.2	-	0.0	0.9	0.1	0.1	-
2022	0.0	-	2.0	0.0	0.0	0.0	-	-	7.3	-	-	0.0	-	2.8	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthus annuus ^{ai} (common sunflower)	Heliomeris multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Linaria dalmatica ^{ai} (Dalmatian toadflax)
year	Nested Frequency																
1996	-	103	13	-	64	10	-	23	4	-	3	3	-	6	212	-	-
2002	-	27	5	1	39	-	2	31	-	-	-	8	25	-	96	-	4
2007	-	5	-	-	103	1	1	19	3	45	-	-	-	2	175	5	-
2012	-	5	1	5	23	6	1	26	7	20	6	-	-	-	126	4	38
2017	2	1	-	-	6	-	5	17	-	139	-	1	-	-	17	-	5
2022	-	-	-	2	57	-	-	19	5	134	-	-	-	-	47	-	0
year	Average Cover (%)																
1996	-	0.8	0.1	-	0.2	0.0	-	0.2	0.0	-	0.0	0.0	-	0.0	1.2	-	-
2002	-	0.2	0.0	0.0	0.1	-	0.0	0.3	-	-	-	0.0	0.1	-	0.3	-	0.2
2007	-	0.0	-	-	0.4	0.0	0.0	0.1	0.0	0.2	-	-	-	0.0	0.4	0.0	-
2012	-	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	-	-	-	0.3	0.0	0.3
2017	0.0	0.0	-	-	0.0	-	0.1	0.3	-	6.2	-	0.0	-	-	0.1	-	0.0
2022	-	-	-	0.0	0.2	-	-	0.4	0.0	5.9	-	-	-	-	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Orthocarpus ^a (owl's-clover)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberry-leaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Vicia americana (American vetch)
year	Nested Frequency												
1996	8	5	2	-	4	9	117	-	-	-	4	82	-
2002	10	1	-	44	-	-	-	-	1	2	-	-	-
2007	3	-	-	19	-	5	7	15	-	1	-	3	10
2012	2	1	-	30	-	6	32	1	-	1	-	24	-
2017	5	-	2	43	-	-	1	7	5	2	-	5	3
2022	3	-	-	20	-	-	-	9	-	3	-	-	3
year	Average Cover (%)												
1996	0.1	0.3	0.0	-	0.0	0.0	0.2	-	-	-	0.0	0.5	-
2002	0.1	0.1	-	0.2	-	-	-	-	0.0	0.0	-	-	-
2007	0.0	-	-	0.1	-	0.0	0.0	0.3	-	0.0	-	0.0	0.0
2012	0.1	0.0	-	0.1	-	0.0	0.1	0.0	-	0.0	-	0.1	-
2017	0.3	-	0.0	0.2	-	-	0.0	0.2	0.2	0.0	-	0.0	0.0
2022	0.0	-	-	0.0	-	-	-	0.1	-	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2002	0.1	6	1.8	0.9	0.1	6.3	-	0.5
2007	0.3	4	2	0.6	0	3.9	-	0.1
2012	0.4	4.3	1.6	0.7	0.8	5	-	-
2017	0.3	3.5	2.9	1.2	0.5	8.2	0.1	-
2022	0.5	5.5	2.7	0.4	1	6.4	-	-
year	Quadrat Cover (%)							
1996	-	9.2	1.4	3.2	0.1	3.8	-	0.1
2002	0.0	6.1	2.2	2.1	0.4	6.5	0.0	0.4
2007	0.0	3.5	3.2	0.7	0.4	4.0	-	0.0
2012	0.0	3.1	1.2	0.6	0.7	4.5	-	-
2017	0.1	1.7	2.1	0.6	0.7	4.8	0.0	-
2022	0.2	3.6	1.2	0.4	0.4	4.8	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-16.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	60	-	67	33	0	67	0	0	33/40
2002	60	-	67	33	0	33	67	0	27/29
2007	60	-	33	67	0	33	67	0	45/57
2012	60	-	0	100	0	67	33	33	51/54
2017	80	-	0	100	0	75	25	0	51/54
2022	100	-	40	60	0	0	40	20	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	1520	20	1	47	51	59	1	12	57/108
2002	1060	-	6	45	49	38	11	26	68/105
2007	860	60	5	44	51	28	5	81	72/104
2012	620	60	7	74	19	26	19	26	57/88
2017	740	20	3	81	16	14	14	22	60/86
2022	580	-	3	72	24	24	7	35	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	640	-	0	100	0	0	0	0	30/57
2002	820	-	0	98	2	0	0	2	28/45
2007	1200	-	3	88	8	0	0	3	33/56
2012	980	-	0	96	4	0	0	39	28/51
2017	1140	-	7	93	0	2	0	0	32/57
2022	1240	320	7	89	5	0	0	5	- / -

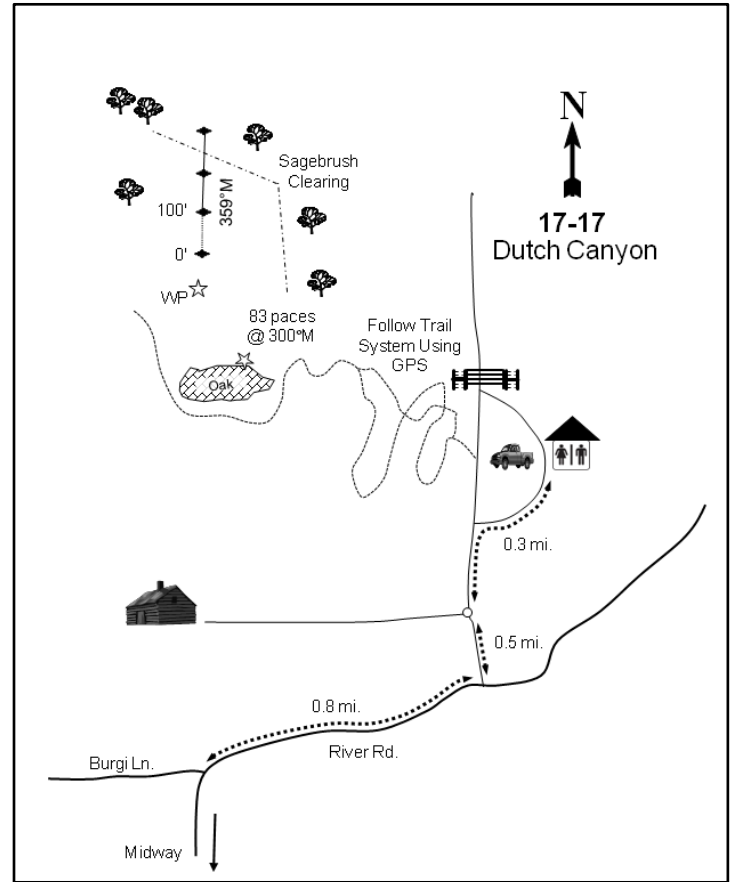
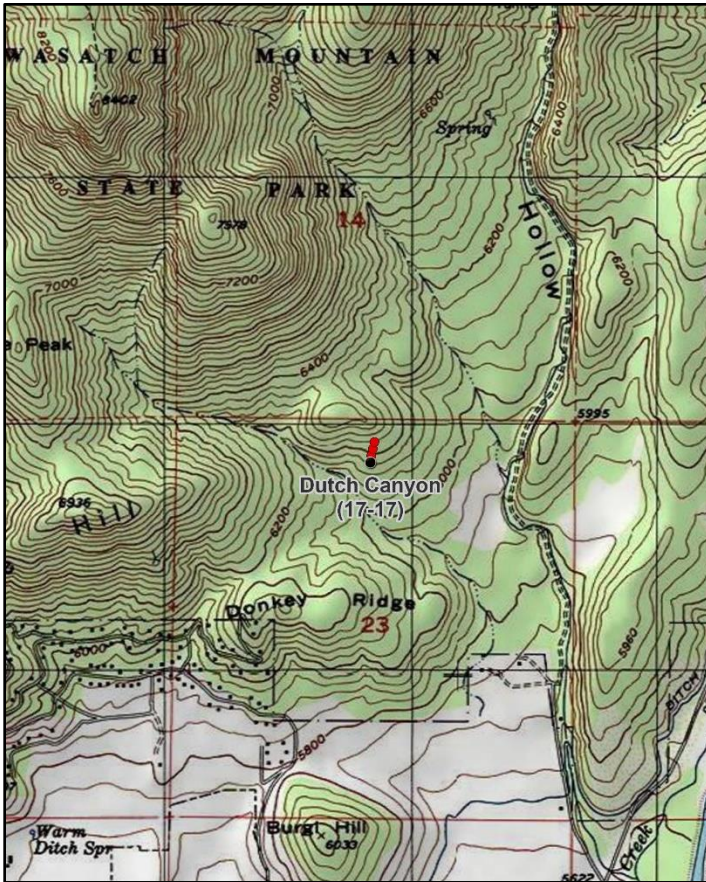
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	88/116
2012	-	-	-	-	-	-	-	-	82/57
2017	-	-	-	-	-	-	-	-	58/103
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1996	14580	17520	31	68	1	0	0	0	18/26
2002	3500	-	0	72	28	0	0	17	18/19
2007	1700	-	5	95	0	0	0	0	22/21
2012	1220	160	10	90	0	0	0	7	22/32
2017	2740	20	37	63	0	0	0	0	25/27
2022	6160	2080	97	3	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
1996	280	-	29	57	14	0	0	7	13/35
2002	300	-	13	67	20	0	0	7	12/30
2007	400	-	5	90	5	0	0	5	17/36
2012	620	-	7	94	0	0	3	16	14/38
2017	1180	-	0	93	7	5	0	10	15/37
2022	500	-	0	92	8	0	0	12	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1996	480	-	17	79	4	21	50	0	61/141
2002	340	-	0	88	12	6	94	0	77/159
2007	360	-	0	89	11	33	11	0	76/140
2012	300	-	0	80	20	27	67	60	75/149
2017	480	-	0	100	0	38	0	0	83/161
2022	440	-	5	55	41	32	41	59	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2002	20	-	100	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	42/25
2022	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	37/59
2002	20	-	0	100	0	0	0	0	37/60
2007	-	20	0	0	0	0	0	0	29/56
2012	20	60	0	100	0	0	0	0	35/81
2017	20	-	0	100	0	0	0	0	36/85
2022	20	-	0	100	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-16.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.2	3.7	2.9	26.4	-2.3	10.0	0.0	57.9	Fair
2002	17.4	6.1	1.6	30.0	-6.0	10.0	-2.0	57.1	Fair
2007	11.3	5.9	1.8	30.0	-6.8	10.0	0.0	52.2	Poor
2012	13.5	9.3	1.4	30.0	-1.1	10.0	-2.0	61.2	Fair
2017	17.2	13.6	0.4	26.6	-20.0	10.0	-2.0	45.8	Poor
2022	17.2	5.5	2.7	30.0	-16.6	10.0	-2.0	46.9	Poor

DUTCH CANYON - STUDY NO. 17-17

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Heber City SW; Township 3S, Range 4E, Section 23
NAD 83 UTM ZONE 12, 460838 East 4488840 North

Transect Information

Browse Tag # (0' Stake)	3952
Transect Bearing	359° magnetic
Length	300ft
Belt Placement	Line 1 (11ft, 59ft, & 95ft), Line 2 (34ft), Line 3 (71ft)
Belt Marker Placement	Belt 3: No Rebar

Directions to Site

Beginning at the intersection of River Road and Burgi Lane (north of Midway), proceed northward on River Road for 0.80 miles to an intersection. Turn left and proceed 0.50 miles to a circular parking area. Take a dirt Forest Service road on the east side of the parking area for 0.3 miles to a dirt parking area with an outhouse. Across from the parking area is the Dutchman Way trailhead: park in the dirt lot and take this trail up to the site. Use the GPS to navigate up the hills to the site (0.44 miles). The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3952, is attached to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	6,150ft (1,875m)
Aspect	South
Slope	15%
Sample Dates	09/30/1996, 06/24/2002, 07/27/2007, 07/31/2012, 07/11/2017, 07/12/2022

Table 17-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial	Saddle Fire Rehabilitation Project	5466	November 2020	527
Fire - Wildfire	Saddle	-	2020	683

Table 17-17.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Saddle Fire			Aerial	Nov 2020	550
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Bromus marginatus	Mountain Brome	Garnet	1.75	1.68
G	Dactylis glomerata	Orchardgrass	Profile	0.38	0.33
G	Elymus trachycaulus	Slender Wheatgrass	Pryor	1.00	0.96
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.91
G	Poa secunda	Sandberg Bluegrass	High Plains	0.50	0.44
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Columbia	2.00	1.73
F	Linum perenne	Blue Flax	Appar	0.50	0.45
F	Medicago sativa	Alfalfa	Ladak 65	1.00	0.94
F	Onobrychis viciifolia	Sainfoin	Shoshone	2.00	1.90
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.86

Wildlife Habitat and Vegetation History**Table 17-17.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	year-long

Table 17-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	NA
1989	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush	NA
2002	Mountain Big Sagebrush	NA
2007	Mountain Big Sagebrush	NA
2012	Mountain Big Sagebrush	NA
2017	Mountain Big Sagebrush/Annual Grass-Forb/Perennial Weed	NA
2022	Annual Grass-Forb/Perennial Weed	NA

Site Notes

Several of the baseline posts were missing in 2002, so the baseline was reset and is now only 300 feet in length. The sample area has therefore changed twice: once in 1996 when the baseline was extended, and then again in 2002 when the baseline was contracted. Changes to the baseline and sample area are likely to have an impact on cover, frequency, and density data. The nearest perennial source of water is a stream flowing down Dutch Hollow located 0.35 miles to the east.

Soils**Table 17-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	48.2	25.4	26.4	2.5	23.9	160.0	0.5	09/30/1996

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the dominant browse species between 1983 to 2017 with Gambel oak (*Quercus gambelii*) patches and antelope bitterbrush (*Purshia tridentata*) scattered throughout the area. However, the community transitioned to one dominated by annual grasses and forbs in 2022 following the 2020 Saddle fire; Gambel oak remained the dominant browse species after the burn (Photos, Table 17-17.1, Table 17-17.7, Table 17-17.12, Table 17-17.13). The noxious weed and perennial forb species leafy spurge (*Euphorbia esula*) and the introduced annual grass species cheatgrass (*Bromus tectorum*) have been the most abundant herbaceous species in most sample years. Cheatgrass has fluctuated from year to year, but cover increased and it became co-dominant with sagebrush in 2017. The introduced annual forb pale madwort (*Alyssum alyssoides*) became the dominant species after the Saddle fire, followed by leafy spurge in 2022. Perennial grass species are rare in comparison, and the introduced species bulbous bluegrass (*Poa bulbosa*) and Kentucky bluegrass (*P. pratensis*) have provided a majority of the perennial grass cover in most sample years since 2002 (Table 17-17.10, Table 17-17.11). Annual forbs have generally been abundant, but cover has fluctuated over the study years (Table 17-17.7).

Trend Summary Tables

Table 17-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.4	2.3	-	-	-	-
2002	27.1	1.2	-	37.9	2.2	-
2007	22.0	0.3	-	39.4	0.4	-
2012	22.7	0.6	-	37.5	1.2	-
2017	22.0	0.4	-	35.6	0.3	-
2022	6.5	0.2	-	9.1	0.5	-

Table 17-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	407	48	328	77	8.1	1.4	6.2	1.3
2002	286	65	260	141	8.9	2.0	3.5	8.6
2007	355	57	347	168	5.6	2.1	7.3	6.6
2012	220	50	323	208	2.3	1.7	2.1	4.2
2017	383	70	143	138	22.7	3.2	2.2	4.2
2022	321	30	418	214	12.8	0.6	32.3	15.9

Table 17-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.2	0.1	70.9	2.7	2.6	34.6
2002	11.3	0.3	58.6	2.9	2.8	50.1
2007	6.5	0.2	65.5	3.3	2.1	43.8
2012	4.6	0.0	63.3	4.0	1.9	39.5
2017	7.4	1.0	51.0	5.4	2.1	52.6
2022	11.8	0.8	39.4	5.6	3.8	61.0

Table 17-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Shiras Moose	Rabbit
	Quadrat Frequency					
1996	-	25	-	-	-	6
2002	1	24	2	-	-	8
2007	-	28	8	1	-	7
2012	-	19	4	-	2	2
2017	-	13	8	-	-	7
2022	-	12	2	-	-	3
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2002	-	64.3 (158.9)	9.4 (23.2)	-	-	-
2007	-	64.3 (158.9)	25.5 (62.9)	-	-	-
2012	-	13.4 (33.1)	1.3 (3.3)	-	-	-
2017	-	23.4 (57.9)	12.8 (31.5)	-	-	-
2022	-	14.1 (34.8)	0.7 (1.7)	-	-	-

Table 17-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
1996	-	-	11	2	407	-	-	35	-	-	-
2002	-	92	-	-	273	-	21	40	7	0	-
2007	-	79	-	-	333	-	25	23	5	4	-
2012	-	117	-	1	131	-	12	30	7	1	-
2017	-	31	-	4	380	-	17	31	15	4	1
2022	0	8	-	-	321	1	2	3	16	2	7
year	Average Cover (%)										
1996	-	-	0.3	0.0	8.1	-	-	1.1	-	-	-
2002	-	0.7	-	-	8.2	-	0.9	0.6	0.6	0.0	-
2007	-	0.9	-	-	4.7	-	1.4	0.6	0.1	0.0	-
2012	-	1.2	-	0.0	1.1	-	0.2	0.7	0.8	0.0	-
2017	-	0.1	-	0.2	22.5	-	1.0	1.5	0.5	0.0	0.0
2022	0.0	0.1	-	-	12.8	0.2	0.0	0.0	0.3	0.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledrop false flax)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1996	-	263	-	9	-	-	-	3	9	-	18	-	-	-	4	19	-
2002	-	227	-	1	1	4	3	5	2	3	38	-	-	2	5	-	-
2007	-	339	-	3	-	2	5	-	4	-	9	-	16	12	3	23	-
2012	-	321	-	4	-	-	-	-	5	2	-	-	4	3	-	36	-
2017	33	81	-	5	-	9	6	-	1	4	46	3	0	-	2	-	-
2022	337	93	3	12	9	-	3	-	1	-	3	4	8	5	-	13	16
year	Average Cover (%)																
1996	-	2.0	-	0.3	-	-	-	0.0	0.0	-	0.0	-	-	-	0.0	0.2	-
2002	-	2.7	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	-	0.0	0.0	-	-
2007	-	6.7	-	0.1	-	0.0	0.0	-	0.2	-	0.0	-	0.1	0.2	0.0	0.3	-
2012	-	2.0	-	0.2	-	-	-	-	0.2	0.0	-	-	0.0	0.0	-	0.4	-
2017	0.2	1.4	-	0.2	-	0.0	0.0	-	0.0	0.0	0.5	0.0	0.0	-	0.0	-	-
2022	25.9	3.9	0.0	0.7	0.0	-	0.0	-	0.2	-	0.0	0.0	0.1	0.0	-	0.3	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Eriogonum brevicale (shortstem buckwheat)																	
Eriogonum racemosum (redroot buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Euphorbia esula ⁿⁱ (leafy spurge)																	
Galium aparine ^a (stickywilly)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
Heliomeris multiflora var. multiflora (showy goldeneye)																	
Heterotheca villosa (hairy false goldenaster)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Linaria dalmatica ⁿⁱ (Dalmatian toadflax)																	
Lupinus argenteus (silvery lupine)																	
Medicago sativa ⁱ (alfalfa)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Sanguisorba minor ⁱ (small burnet)																	
Silene antirrhina ^a (sleepy silene)																	
Sisymbrium altissimum ^{ai} (tall tumblemustard)																	
Symphotrichum ascendens (western aster)																	
year	Nested Frequency																
1996	-	10	-	-	-	-	34	0	37	-	5	-	29	-	-	7	-
2002	1	3	-	129	-	2	3	-	-	-	7	-	9	-	22	3	-
2007	-	1	3	141	2	3	7	-	-	13	4	-	7	-	23	-	0
2012	-	3	6	170	-	2	0	0	-	43	9	-	2	-	9	6	-
2017	9	6	4	119	-	3	-	-	-	-	2	-	9	-	-	-	-
2022	-	8	36	156	-	1	4	-	17	2	3	0	3	14	-	8	-
year	Average Cover (%)																
1996	-	0.0	-	-	-	-	0.4	0.1	0.2	-	0.2	-	0.1	-	-	0.1	-
2002	0.0	0.1	-	7.9	-	0.0	0.0	-	-	-	0.5	-	0.0	-	0.1	0.0	-
2007	-	0.0	0.0	5.7	0.0	0.0	0.1	-	-	0.1	0.2	-	0.0	-	0.1	-	0.0
2012	-	0.0	0.0	2.7	-	0.0	0.0	0.0	-	0.6	0.2	-	0.0	-	0.0	0.0	-
2017	0.0	0.0	0.0	3.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-	-	-
2022	-	0.2	1.5	13.4	-	0.0	0.5	-	0.2	0.1	0.2	0.0	0.0	0.1	-	0.7	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES						
Taraxacum officinale (common dandelion)						
Tragopogon dubius ^{ai} (yellow salsify)						
unknown annual forb ^a (unknown forb)						
Verbascum thapsus ^{ai} (common mullein)						
Vicia americana (American vetch)						
Zigadenus paniculatus (foothill deathcamas)						
year	Nested Frequency					
1996	-	99	104	7	-	0
2002	1	31	-	-	-	-
2007	-	11	-	-	3	1
2012	-	10	-	-	-	6
2017	-	4	-	-	-	-
2022	3	-	-	2	-	5
year	Average Cover (%)					
1996	-	0.8	2.6	0.4	-	0.0
2002	0.0	0.4	-	-	-	-
2007	-	0.1	-	-	0.0	0.0
2012	-	0.0	-	-	-	0.0
2017	-	0.0	-	-	-	-
2022	0.0	-	-	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2002	24.6	0.3	1.9	5.2	8.1
2007	24.6	-	0.4	4.9	9.9
2012	23.6	0.4	0.8	4.1	9.8
2017	27	0.3	0	2.2	6.4
2022	0.7	-	0.5	-	8.4
year	Quadrat Cover (%)				
1996	8.8	-	2.3	0.5	7.1
2002	18.8	0.0	1.2	2.6	5.8
2007	15.1	0.0	0.3	2.1	4.8
2012	14.1	0.0	0.6	2.8	5.9
2017	16.5	0.0	0.4	2.3	3.3
2022	0.3	0.0	0.1	-	6.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	57/70
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	1380	60	16	68	16	0	0	10	59/110
2002	2380	-	3	82	15	15	2	13	71/116
2007	1660	20	0	77	23	62	12	74	77/119
2012	1460	-	1	69	30	19	21	26	75/130
2017	1920	-	1	84	15	29	5	10	74/136
2022	260	-	31	69	0	0	0	0	-/-
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	73/28
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-

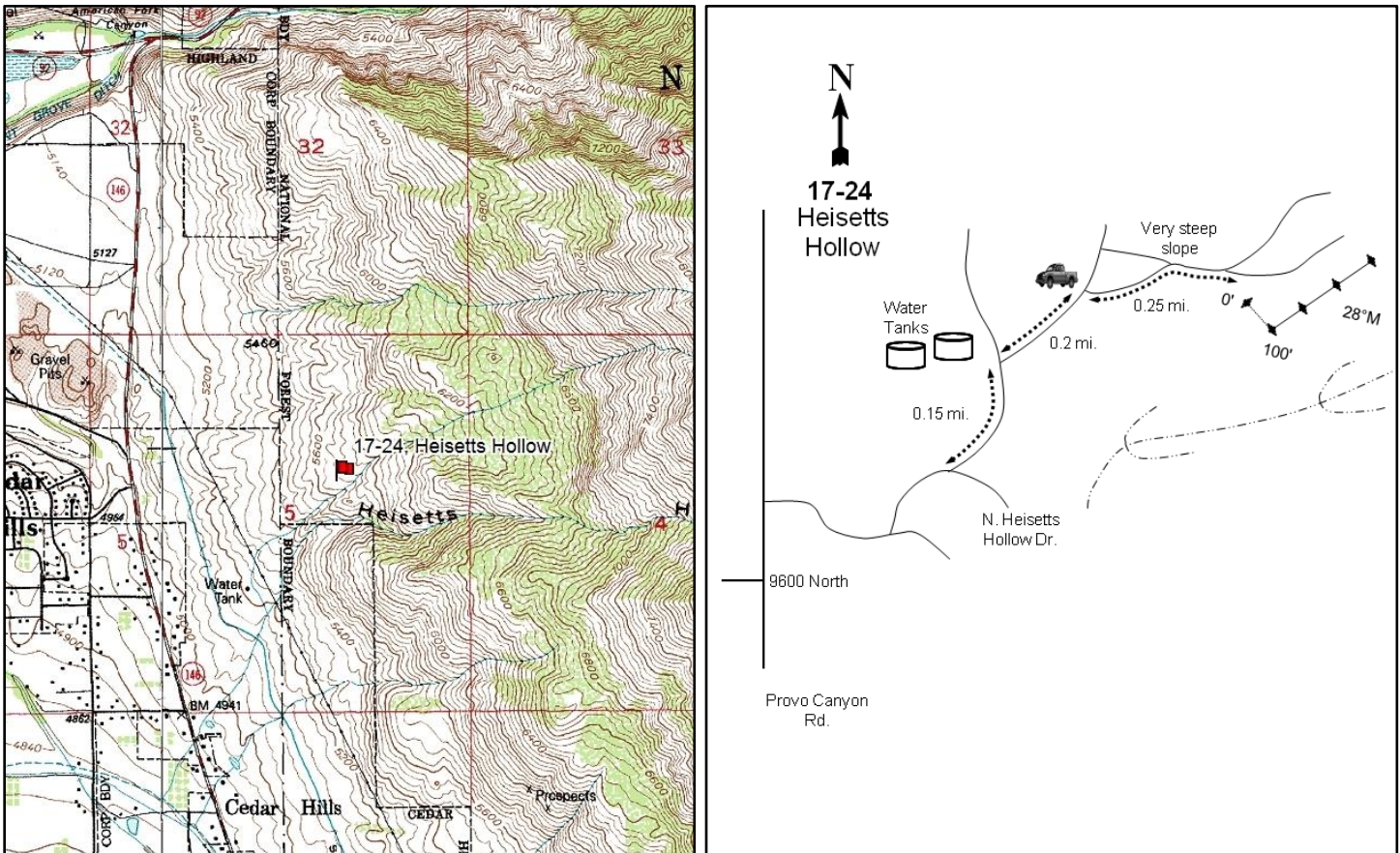
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1996	20	-	0	100	0	0	0	0	51/111
2002	60	-	0	100	0	0	0	0	48/77
2007	60	-	0	100	0	0	0	0	52/95
2012	40	-	0	100	0	0	0	0	36/61
2017	60	-	0	100	0	0	0	0	41/79
2022	100	-	20	80	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	84/70
2017	-	-	-	-	-	-	-	-	85/91
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	2740	-	1	77	23	0	0	2	21/32
2002	1660	-	0	90	10	0	0	6	23/29
2007	300	-	0	93	7	0	0	7	23/28
2012	600	-	40	60	0	0	0	0	24/36
2017	40	-	0	100	0	0	0	0	24/38
2022	20	-	100	0	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	80	-	0	100	0	75	25	0	46/209
2002	220	-	9	91	0	9	73	9	52/198
2007	240	-	8	92	0	8	83	0	53/189
2012	420	-	10	91	0	14	71	14	46/134
2017	340	-	6	59	35	53	24	24	42/81
2022	40	-	0	100	0	0	0	0	- / -
Quercus gambelii^p -- (Gambel oak)									
1996	2200	240	38	58	4	2	0	10	134/122
2002	2600	-	28	59	13	28	9	21	77/60
2007	1800	140	20	69	11	17	6	31	138/89
2012	1900	120	44	54	2	30	0	8	74/65
2017	2260	-	15	77	8	21	4	5	120/91
2022	3300	-	28	68	4	6	0	9	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-17.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	18.8	12.0	12.6	2.9	-6.1	2.6	0.0	42.8	Poor
2002	30.0	11.0	4.2	2.3	-6.7	1.4	-2.0	40.2	Very Poor-Poor
2007	30.0	9.9	3.0	1.3	-4.2	1.8	-4.0	37.8	Very Poor
2012	30.0	9.2	6.7	3.1	-1.8	1.8	-4.0	45.0	Poor
2017	30.0	10.6	1.9	4.5	-17.0	0.6	-2.0	28.6	Very Poor
2022	9.3	13.8	14.1	1.1	-9.6	4.8	-4.0	29.4	Very Poor

HEISSETTS HOLLOW - STUDY NO. 17-24

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Timpanogos Cave SW; Township 5S, Range 2E, Section 05
NAD 83 UTM ZONE 12, 437050 East 4474124 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
136° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belts 1, 4, 5: No Rebar

Directions to Site

North of Pleasant Grove, turn east off Canyon Road (Route 146) onto West Box Elder Drive. Take the next left onto North Heissetts Hollow Drive. Follow this road to a couple of large water tanks (about 0.15 miles -- there may be a closed gate). Continue 0.2 miles to a level parking area; there will be signs indicating that vehicles are not permitted beyond this point. From here, walk up the road 0.25 miles to the 0-foot baseline stake, staying to the right. You will pass numerous forks and trails, and a GPS unit will help you navigate to the study. There is no 0-foot or 400-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,630ft (1,716m)
Aspect	West
Slope	5-22%
Sample Dates	05/13/1997, 05/16/2002, 07/26/2007, 07/26/2012, 07/11/2017, 07/12/2022

Table 17-24.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Cedar Hills	-	2013	5.8

Wildlife Habitat and Vegetation History**Table 17-24.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Mountain Goat	substantial	year-long

Table 17-24.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	Phase I
1989	Mountain Big Sagebrush/Perennial Grass	Phase I
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Perennial Grass/Mountain Big Sagebrush	Phase I
2007	Perennial Grass/Mountain Big Sagebrush	Phase I
2012	Perennial Grass/Mountain Big Sagebrush	Phase I
2017	Perennial Grass	Phase I
2022	Perennial Grass	Phase I

Site Notes

This study is located on the upper Lake Bonneville terrace near the mouth of Heissetts Hollow and uphill from the Salt Lake Aqueduct. The nearest perennial source of water is Heissetts Hollow, which is approximately 550 feet south; some camping occurs in the area of the study.

Soils**Table 17-24.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	32.0	35.4	32.6	3.8	5.7	105.6	0.6	05/13/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2012 sample year, this study site was co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grasses -- mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*). Sagebrush density exhibited a decrease from 1997 to 2012. A 2013 wildfire burned much of the sagebrush and other browse that remained, causing the study site to transition to one dominated by perennial grass. Although they provided less cover, sagebrush and other browse species were still present in 2017. However, sagebrush and Gambel oak (*Quercus gambelii*) were nearly absent in 2022 with few plants only being captured in density measurements (Photos, Pre-1992 Data, Table 17-24.12, Table 17-24.13). The browse community will likely only recover following a long period without a disturbance and/or drought. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed each sample year since 1997, but cover has remained low (Table 17-24.10). Forbs were diverse, but not abundant in most sample years. However, annual forbs provided 10% cover in 2017 and 7.6% in 2022, much of which was contributed by the introduced species redstem stork's bill (*Erodium cicutarium*) (Table 17-24.7, Table 17-24.11).

Trend Summary Tables

Table 17-24.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.5	3.6	-	-	-	-
2002	7.7	0.0	-	-	-	-
2007	6.6	0.3	-	6.0	1.0	-
2012	6.5	2.3	1.0	7.1	1.7	0.5
2017	1.3	4.7	-	1.9	7.2	2.2
2022	0.2	0.7	-	0.4	0.5	-

Table 17-24.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	151	450	192	108	1.5	37.0	1.2	1.6
2002	45	433	183	82	0.2	34.3	1.9	1.0
2007	165	438	195	78	1.6	38.3	1.1	2.6
2012	111	393	97	77	2.5	33.8	0.4	1.4
2017	105	363	323	73	3.1	26.2	10.1	1.7
2022	179	350	310	72	4.0	30.2	7.6	1.4

Table 17-24.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.4	0.6	38.9	6.8	5.0	53.5
2002	14.6	0.2	30.9	8.9	7.6	49.6
2007	11.4	0.1	37.3	7.5	3.5	52.3
2012	17.8	0.1	28.5	7.6	6.2	53.2
2017	23.5	0.0	31.5	9.0	7.1	46.1
2022	25.5	0.1	26.2	18.3	9.9	40.0

Table 17-24.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Rocky Mountain Bighorn Sheep
	Quadrat Frequency				
1997	43	1	-	1	-
2002	46	1	-	3	-
2007	14	41	-	13	-
2012	19	4	-	5	-
2017	16	-	-	12	-
2022	22	-	-	1	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	65.0 (160.6)	3.4 (8.3)	0.6 (1.4)	-	-
2007	77.7 (192.0)	42.9 (105.9)	-	-	0.7 (1.7)
2012	22.1 (54.6)	5.3 (13.2)	-	-	-
2017	8.7 (21.5)	-	-	-	-
2022	46.9 (115.9)	-	-	-	-

Table 17-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
<i>Aegilops cylindrica</i> ⁿⁱ (jointed goatgrass)	-	-	-	151	-	373	-	29	352
<i>Agropyron cristatum</i> ⁱ (crested wheatgrass)	-	-	-	45	2	367	46	36	295
<i>Bromus arvensis</i> ⁿⁱ (field brome)	-	3	17	156	3	375	12	9	297
<i>Bromus tectorum</i> ⁿⁱ (cheatgrass)	2	9	-	109	6	263	-	25	310
<i>Elymus lanceolatus</i> (thickspike wheatgrass)	-	8	8	102	-	287	-	11	254
<i>Poa bulbosa</i> ⁱ (bulbous bluegrass)	9	7	-	172	-	242	-	69	241
<i>Poa pratensis</i> ⁱ (Kentucky bluegrass)	Average Cover (%)								
<i>Poa secunda</i> (Sandberg bluegrass)	-	-	-	1.5	-	16.6	-	0.2	20.2
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	-	-	-	0.2	0.0	19.1	0.6	1.5	13.2
	-	0.0	0.1	1.5	0.1	19.3	0.1	0.1	18.7
	0.0	0.2	-	2.5	0.2	12.2	-	1.0	20.3
	-	0.2	0.0	3.1	-	12.1	-	0.2	13.6
	0.3	0.0	-	3.7	-	15.9	-	0.8	13.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-24.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Agoseris glauca</i> (pale agoseris)	-	3	143	38	2	-	3	-	2	-	12	-	3	-	5	-	-
<i>Allium</i> (onion)	-	-	97	4	-	18	6	4	5	-	12	-	-	-	7	6	-
<i>Alyssum desertorum</i> ⁿⁱ (desert madwort)	-	-	157	11	-	-	6	-	2	-	16	2	-	-	16	-	15
<i>Ambrosia psilostachya</i> (Cuman ragweed)	-	-	57	35	-	3	2	1	-	-	15	14	6	10	1	-	-
<i>Arabis perennans</i> (perennial rockcress)	1	-	264	33	-	-	0	5	-	1	11	-	-	4	2	-	-
<i>Astragalus</i> (milkvetch)	2	-	120	38	-	9	3	-	-	-	1	-	-	8	-	2	1
<i>Astragalus utahensis</i> (Utah milkvetch)	Average Cover (%)																
<i>Calochortus nuttallii</i> (sego lily)	-	0.0	0.5	0.2	0.0	-	0.1	-	0.0	-	0.2	-	0.0	-	0.0	-	-
<i>Castilleja angustifolia</i> (northwestern Indian paintbrush)	-	-	0.2	0.1	-	0.4	0.1	0.0	0.0	-	0.1	-	-	-	0.0	0.0	-
<i>Chaetopappa ericoides</i> (rose heath)	-	-	0.6	0.1	-	-	0.2	-	0.0	-	0.2	0.0	-	-	0.1	-	0.0
<i>Cirsium undulatum</i> ^a (wavyleaf thistle)	-	-	0.2	0.1	-	-	0.2	-	0.0	-	0.2	0.0	0.0	0.1	0.1	-	-
<i>Collinsia parviflora</i> ^a (maiden blue eyed Mary)	-	-	0.2	0.4	-	0.2	0.0	0.0	-	-	0.1	0.0	0.0	0.1	0.1	-	-
<i>Comandra umbellata</i> (bastard toadflax)	0.0	-	1.5	0.5	-	-	0.0	0.0	-	0.0	-	-	-	0.0	0.0	-	-
<i>Convolvulus arvensis</i> ⁿⁱ (field bindweed)	0.0	-	0.6	0.7	-	0.6	0.0	-	-	-	0.3	-	-	0.0	-	0.0	0.0
<i>Crepis acuminata</i> (tapertip hawkbeard)	-	-	0.2	0.1	-	-	0.2	-	0.0	-	0.2	0.0	0.0	0.1	0.1	-	-
<i>Descurainia pinnata</i> ^a (western tansymustard)	-	-	0.6	0.7	-	-	0.6	0.0	-	-	0.3	-	-	0.0	-	0.0	0.0
<i>Draba</i> ^a (draba)	-	-	0.6	0.7	-	-	0.6	0.0	-	-	0.3	-	-	0.0	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES													
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)													
<i>Hedysarum boreale</i> (Utah sweetvetch)													
<i>Helianthus annuus</i> ^{ai} (common sunflower)													
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)													
<i>Lappula occidentalis</i> ^a (flatspine stickseed)													
<i>Lithospermum ruderale</i> (western stone seed)													
<i>Lygodesmia</i> (skeletonplant)													
<i>Oenothera</i> (evening primrose)													
<i>Phlox longifolia</i> (longleaf phlox)													
<i>Sedum lanceolatum</i> (spearleaf stonecrop)													
<i>Sphaeralcea coccinea</i> (scarlet globemallow)													
<i>Stanleya pinnata</i> (desert princesplume)													
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)													
year	Nested Frequency												
1997	48	27	-	1	-	3	-	5	31	-	7	-	33
2002	64	4	17	5	25	-	14	1	21	1	13	-	7
2007	38	17	-	-	-	-	9	-	8	-	10	-	17
2012	12	14	-	-	4	-	2	2	3	-	6	-	6
2017	236	28	1	-	-	-	-	-	1	-	-	-	3
2022	282	1	-	-	-	-	-	2	2	-	9	0	4
year	Average Cover (%)												
1997	0.3	0.7	-	0.0	-	0.0	-	0.3	0.1	-	0.0	-	0.2
2002	1.4	0.2	0.0	0.0	0.1	-	0.1	0.0	0.1	0.0	0.0	-	0.1
2007	0.3	1.9	-	-	-	-	0.2	-	0.0	-	0.1	-	0.1
2012	0.1	0.5	-	-	0.0	-	0.0	0.0	0.0	-	0.0	-	0.0
2017	8.5	1.1	0.0	-	-	-	-	-	0.0	-	-	-	0.0
2022	6.7	0.0	-	-	-	-	-	0.0	0.0	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-24.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES									
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)									
<i>Atriplex confertifolia</i> ^p (shadscale saltbush)									
<i>Cercocarpus montanus</i> ^p (alderleaf mountain mahogany)									
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)									
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)									
<i>Gutierrezia sarothrae</i> (broom snakeweed)									
<i>Juniperus osteosperma</i> ^a (Utah juniper)									
<i>Purshia stansburiana</i> ^p (Stansbury cliffrose)									
<i>Quercus gambelii</i> ^p (Gambel oak)									
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-
2007	4.8	-	1.1	-	-	1	-	0.1	-
2012	6	-	1	-	0	1.7	0.5	0.1	-
2017	0.6	-	0.7	-	-	7.2	2.2	-	0.6
2022	-	-	0.4	-	-	0.5	-	-	-
year	Quadrat Cover (%)								
1997	8.2	0.0	0.1	-	0.1	3.6	-	-	-
2002	7.0	0.1	0.4	-	0.0	0.0	-	0.1	-
2007	6.1	-	0.5	-	-	0.3	-	0.0	-
2012	5.7	-	0.8	-	0.0	2.3	1.0	0.0	-
2017	0.4	-	0.8	-	-	4.7	0.0	0.1	0.0
2022	-	-	0.0	0.0	-	0.7	-	0.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-24.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1120	60	7	70	23	54	30	14	63/120
2002	920	-	7	52	41	11	85	26	55/91
2007	860	-	0	63	37	26	58	30	61/99
2012	800	-	0	78	23	40	33	20	66/97
2017	40	-	0	50	50	0	50	50	69/125
2022	40	-	50	50	0	50	0	0	- / -
Atriplex confertifolia^P -- (shadscale saltbush)									
1997	20	-	0	100	0	100	0	0	32/59
2002	40	-	0	50	50	0	100	0	15/40
2007	40	-	0	100	0	0	0	0	22/41
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	20	20	0	100	0	0	100	0	178/323
2002	40	-	0	100	0	100	0	0	227/287
2007	60	-	33	67	0	67	33	0	211/227
2012	40	-	0	100	0	0	0	0	201/207
2017	60	-	33	0	67	0	67	0	114/145
2022	60	-	33	67	0	0	100	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	60/96
2017	-	-	-	-	-	-	-	-	- / -
2022	100	-	80	20	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	80	-	0	100	0	0	0	25	66/121
2002	40	-	0	50	50	50	50	0	71/116
2007	40	-	0	100	0	0	0	0	86/148
2012	20	-	0	100	0	0	0	0	103/179
2017	-	-	-	-	-	-	-	-	30/37
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	10300	8900	42	58	0	0	0	0	15/19
2002	120	-	33	67	0	0	0	17	18/17
2007	920	-	15	80	4	2	0	4	24/25
2012	1200	20	3	95	2	0	0	8	29/38
2017	4960	-	4	96	0	0	0	0	33/38
2022	1540	40	5	92	3	0	0	10	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	100	0	0	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	97/121
2002	-	-	-	-	-	-	-	-	174/142
2007	-	-	-	-	-	-	-	-	146/176
2012	20	-	0	100	0	100	0	0	109/111
2017	-	-	-	-	-	-	-	-	163/159
2022	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	133/110
2002	-	-	-	-	-	-	-	-	-/-
2007	40	-	0	100	0	0	0	0	96/61
2012	-	-	-	-	-	-	-	-	72/54
2017	200	-	0	100	0	0	100	90	99/90
2022	20	-	0	100	0	0	100	0	-/-
Rosa woodsii^p -- (Woods' rose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	240/260

t - Tree Species; p - Preferred Browse; i - Introduced Species

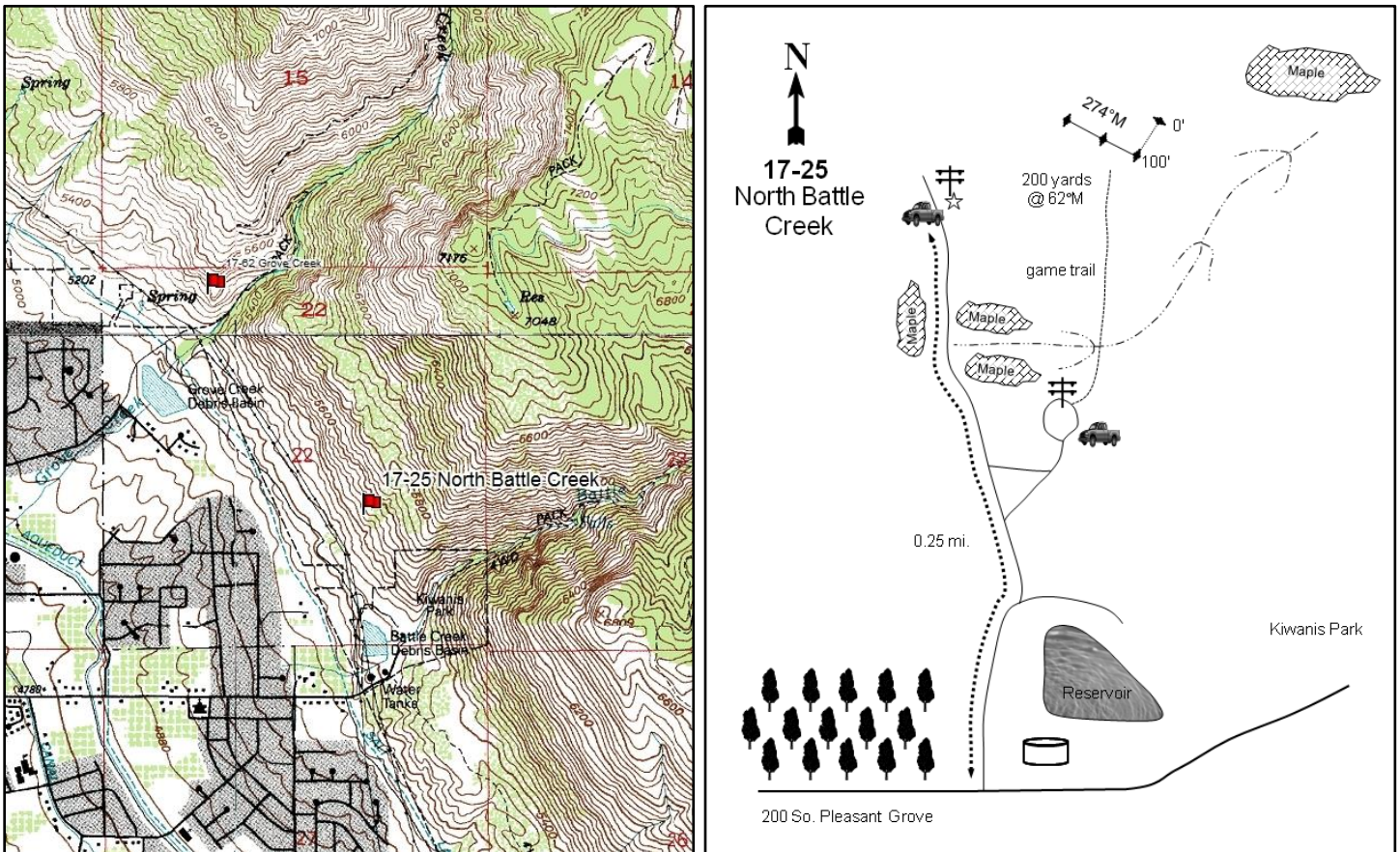
Table 17-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	1	-	-	-	-	100	38.0
2022	1	-	-	-	-	100	35.0

Table 17-24.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.7	8.4	3.4	30.0	-1.1	3.1	0.0	54.5	Poor-Fair
2002	9.7	3.1	2.9	30.0	-0.1	2.0	0.0	47.6	Poor
2007	7.8	5.8	3.1	30.0	-1.2	5.3	0.0	50.8	Poor
2012	9.2	9.3	0.0	30.0	-1.9	2.7	-4.0	45.3	Poor
2017	2.4	0.0	0.0	28.2	-2.4	3.4	-2.0	29.6	Very Poor
2022	0.6	0.0	0.0	28.6	-2.8	2.7	-4.0	25.1	Very Poor

NORTH BATTLE CREEK - STUDY NO. 17-25



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Orem NW; Township 5S, Range 2E, Section 22
NAD 83 UTM ZONE 12, 440346 East 4468842 North

Transect Information

Browse Tag # (0' Stake)	3988
Transect Bearing	192 ° magnetic (Lines 2-3: 274° magnetic)
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft & 71ft)
Belt Marker Placement	No Rebar

Directions to Site

From Pleasant Grove, drive up 200 South towards Battle Creek Canyon; the paved road ends at a water tank. Follow one of the many dirt roads north along the base of the foothill under the powerlines. From the water tank, continue about 1/4 mile to a second reservoir: stop at the south end. From the powerline pole on the south end of the old reservoir, the 0-foot stake is about 200 yards away at 62 degrees magnetic. The study samples the first face or slope below the second terrace in a fairly dense cliffrose type, just north of a small drainage. A red browse tag, #3988, is attached to the 0-foot stake.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	55-65%
Sample Dates	05/13/1997, 05/16/2002, 08/06/2007, 07/27/2012, 07/12/2017, 07/12/2022

Table 17-25.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Battle Creek 2	-	2020	188

Wildlife Habitat and Vegetation History**Table 17-25.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-25.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose	NA
1989	Stansbury Cliffrose	NA
1997	Stansbury Cliffrose	NA
2002	Stansbury Cliffrose	NA
2007	Stansbury Cliffrose	NA
2012	Stansbury Cliffrose/Annual Grass	NA
2017	Stansbury Cliffrose/Annual Grass	NA
2022	Annual Forb-Grass	NA

Site Notes

The Battle Creek and Grove Creek debris basins, which act as small reservoirs in the spring, are located below the site to the north and south. Otherwise, the nearest perennial source of water is Grove Creek, which is located 0.7 miles (1.1km) to the northwest. Residential subdivisions have been constructed up to the base of the foothill just below the site.

Soils**Table 17-25.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	28.0	33.4	38.6	2.9	6.4	38.4	0.6	05/13/1997

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983, but has decreased in both density and cover. Moreover, there was a significant decrease in both measures between 2017 and 2022 following the Battle Creek 2 wildfire in 2020 (Table 17-25.1). Other preferred browse species have included Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*), and Woods' rose (*Rosa woodsii*), but sagebrush was absent in 2022 (photos, Table 17-25.12, Table 17-25.13). Grasses are abundant, but much of the cover is contributed by the introduced annual species cheatgrass (*Bromus tectorum*) and cereal rye (*Secale cereale*). Annual grasses were co-dominant with cliffrose in 2012 and 2017, but the community transitioned to one dominated by annual grass and forbs following the 2020 wildfire (Table 17-25.1, Table 17-25.7). In addition, the introduced and noxious annual grass species jointed goatgrass (*Aegilops cylindrica*) was observed on this study site for the first time in 2017 (Table 17-25.10). Forbs have also remained fairly common (annual more so than perennial) and diverse through the sample years, with the introduced annual species redstem stork's bill (*Erodium cicutarium*) as the most abundant species in most sample years since 1997. Noxious and introduced forbs have also been present in nearly all sample years, including the perennial forb field bindweed (*Convolvulus arvensis*) and annual forb yellow star-thistle (*Centaurea solstitialis*) (Table 17-25.11).

Trend Summary Tables**Table 17-25.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	9.0	0.6	-	-	-	-
2002	9.8	0.4	-	-	-	-
2007	7.3	-	-	14.1	0.2	-
2012	5.6	0.6	-	11.2	0.4	-
2017	6.0	0.8	-	8.4	0.5	-
2022	2.2	0.1	-	3.0	0.3	-

Table 17-25.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	182	85	366	185	2.5	3.7	9.7	5.4
2002	42	91	275	190	0.2	3.9	6.4	4.1
2007	266	46	306	59	8.3	1.4	6.1	0.7
2012	411	36	292	70	30.0	1.6	4.3	0.9
2017	350	24	346	60	23.6	0.8	14.7	1.5
2022	352	49	364	42	13.3	1.2	20.9	0.4

Table 17-25.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.8	0.0	19.8	11.9	28.2	30.6
2002	26.9	0.0	15.7	9.8	32.0	26.0
2007	19.9	-	25.1	19.0	22.7	26.5
2012	11.0	-	23.4	10.3	26.7	46.0
2017	14.7	-	29.7	17.3	24.0	42.0
2022	14.4	0.0	10.6	24.9	39.7	31.9

Table 17-25.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	47	-	-
2002	18	1	-
2007	22	3	2
2012	10	-	-
2017	7	-	1
2022	24	1	1
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	44.2 (109.2)	0.7 (1.7)	-
2007	82.4 (203.6)	-	-
2012	28.1 (69.5)	-	-
2017	17.4 (43.0)	-	-
2022	41.5 (102.6)	0.7 (1.7)	-

Table 17-25.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Aegilops cylindrica ^{ai} (jointed goatgrass)										
Agropyron cristatum ⁱ (crested wheatgrass)										
Bromus arvensis ^{ai} (field brome)										
Bromus briziformis ^{ai} (rattlesnake brome)										
Bromus tectorum ^{ai} (cheatgrass)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Secale cereale ^{ai} (cereal rye)										
unknown perennial grass (unknown grass)										
year	Average Cover (%)									
1997	-	1	-	-	182	-	7	74	2	4
2002	-	9	-	-	42	2	-	80	-	-
2007	-	-	3	-	259	-	-	46	39	-
2012	-	1	6	5	373	-	8	28	228	-
2017	20	-	-	8	208	-	-	24	282	-
2022	31	7	1	-	262	2	23	26	222	-
year	Average Cover (%)									
1997	-	0.0	-	-	2.5	-	0.2	3.5	0.0	0.0
2002	-	0.2	-	-	0.2	0.0	-	3.7	-	-
2007	-	-	0.0	-	7.4	-	-	1.4	0.9	-
2012	-	0.0	0.2	0.0	18.5	-	0.1	1.5	11.4	-
2017	0.4	-	-	0.0	7.3	-	-	0.8	15.8	-
2022	0.9	0.0	0.0	-	4.9	0.0	0.3	0.8	7.5	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-25.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Allium (onion)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus (milkvetch)																	
Buglossoides arvensis ^{ai} (corn gromwell)																	
Camelina microcarpa ^{ai} (tittlepod false flax)																	
Centaurea solstitialis ^{ai} (yellow star-thistle)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Cirsium undulatum ^a (wavyleaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Convolvulus arvensis ^{ai} (field bindweed)																	
Descurainia pinnata ^a (western tansymustard)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Galium aparine ^a (stickywilly)																	
Grindelia squarrosa (curlycup gumweed)																	
year	Average Cover (%)																
1997	17	88	15	5	-	-	-	1	190	1	-	12	-	4	250	65	-
2002	131	61	1	-	1	-	-	48	138	2	-	15	-	7	99	113	-
2007	2	154	4	-	-	-	8	13	99	-	-	20	2	-	221	33	0
2012	-	265	19	1	-	-	2	-	3	-	4	23	-	3	153	2	-
2017	-	71	16	5	-	27	1	15	60	-	-	15	-	-	319	4	-
2022	-	91	12	4	-	6	-	11	98	-	-	22	-	-	341	-	-
1997	0.1	0.3	0.2	0.3	-	-	-	0.1	1.6	0.0	-	0.4	-	0.0	6.4	0.8	-
2002	0.9	0.3	0.0	-	0.0	-	-	1.3	0.9	0.0	-	0.5	-	0.0	1.0	2.6	-
2007	0.0	0.8	0.2	-	-	-	0.0	0.1	0.7	-	-	0.2	0.0	-	3.8	0.6	0.0
2012	-	1.9	0.2	0.1	-	-	0.0	-	0.0	-	0.0	0.2	-	0.0	2.1	0.0	-
2017	-	0.2	0.3	0.2	-	0.2	0.0	0.2	0.4	-	-	0.2	-	-	13.6	0.1	-
2022	-	0.5	0.2	0.0	-	0.0	-	0.2	0.4	-	-	0.1	-	-	19.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^{ai} (slender phlox)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Silene antirrhina ^{ai} (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)
year	Nested Frequency														
1997	15	-	18	-	126	-	4	-	11	-	-	3	6	20	-
2002	10	7	1	-	64	-	-	-	9	-	-	4	2	17	-
2007	7	3	8	-	30	0	-	-	-	-	-	1	-	11	-
2012	-	-	11	17	25	-	-	2	4	2	1	2	-	1	1
2017	2	-	0	3	23	-	-	6	-	-	-	-	-	-	-
2022	-	-	-	42	5	-	-	23	-	5	3	-	-	-	-
year	Average Cover (%)														
1997	0.1	-	0.2	-	4.2	-	0.0	-	0.1	-	-	0.0	0.1	0.1	-
2002	0.1	0.0	0.0	-	2.5	-	-	-	0.1	-	-	0.0	0.0	0.1	-
2007	0.0	0.0	0.0	-	0.3	0.0	-	-	-	-	-	0.0	-	0.0	-
2012	-	-	0.1	0.1	0.4	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
2017	0.0	-	0.0	0.0	0.8	-	-	0.0	-	-	-	-	-	-	-
2022	-	-	-	0.6	0.0	-	-	0.1	-	0.0	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-25.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Celtis laevigata var. reticulata (netleaf hackberry)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	1.4	-	0	0.2	12.7	-
2012	0.6	0.4	-	0	10.6	-
2017	0.1	-	0.1	0.5	8.2	-
2022	-	0.3	-	-	3	-
year	Quadrat Cover (%)					
1997	0.8	-	0.8	0.6	7.3	-
2002	0.4	-	0.4	0.4	8.7	0.3
2007	0.6	-	0.0	0.0	6.7	-
2012	0.3	0.0	0.0	0.6	5.3	-
2017	0.3	0.1	0.4	0.6	5.3	-
2022	-	0.1	-	-	2.2	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-25.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
1997	220	-	0	82	18	36	55	18	67/101
2002	120	-	0	83	17	100	0	0	77/122
2007	120	-	0	100	0	67	0	17	86/139
2012	140	-	0	57	43	43	57	71	73/126
2017	120	-	0	50	50	0	100	50	74/122
2022	-	-	-	-	-	-	-	-	-/-
Celtis laevigata var. reticulata -- (netleaf hackberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	69/99
2017	-	-	-	-	-	-	-	-	11/142
2022	20	-	100	0	0	0	0	0	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	60	-	0	33	67	0	0	67	55/91
2002	40	-	50	0	50	0	0	50	38/85
2007	20	-	0	0	100	0	0	100	64/93
2012	20	-	0	100	0	0	0	0	73/116
2017	20	-	0	100	0	0	0	0	79/128
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	860	-	14	86	0	0	0	0	23/28
2002	140	-	0	43	57	0	0	43	19/44
2007	80	-	0	100	0	0	0	0	37/37
2012	200	-	0	100	0	0	0	0	28/38
2017	100	-	0	100	0	0	0	0	41/60
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	800	-	0	90	10	10	90	3	121/145
2002	720	20	0	69	31	11	58	11	134/157
2007	640	-	3	91	6	56	13	9	143/164
2012	580	-	0	83	17	24	28	28	138/151
2017	500	-	0	80	20	56	40	20	146/178
2022	240	-	0	92	8	58	0	8	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	80	40	25	75	0	25	50	0	32/43
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	-/-
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	157/361
2017	-	-	-	-	-	-	-	-	169/295
2022	-	-	-	-	-	-	-	-	-/-

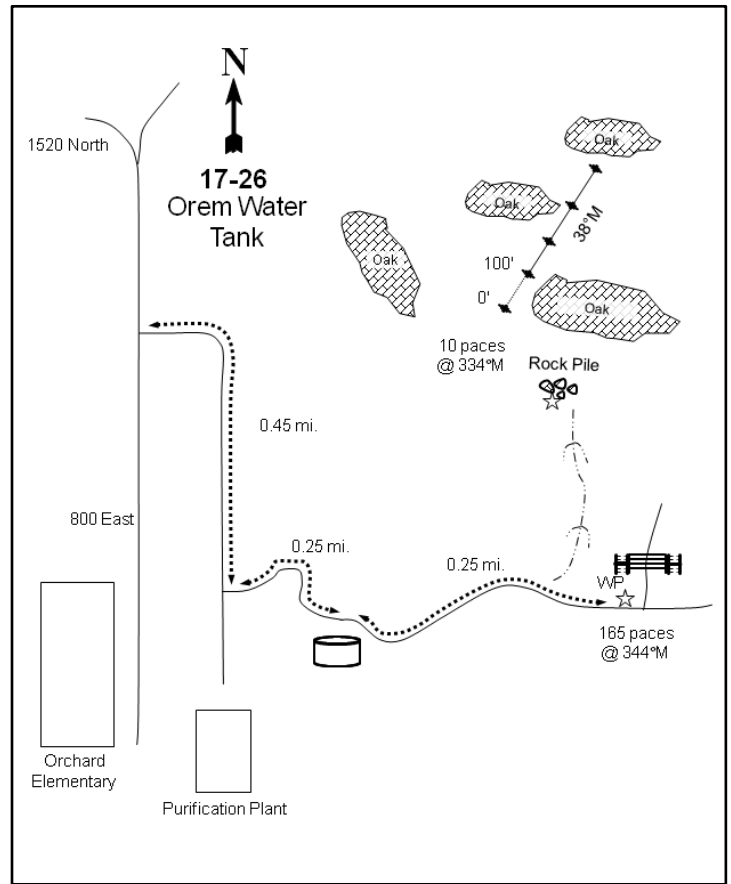
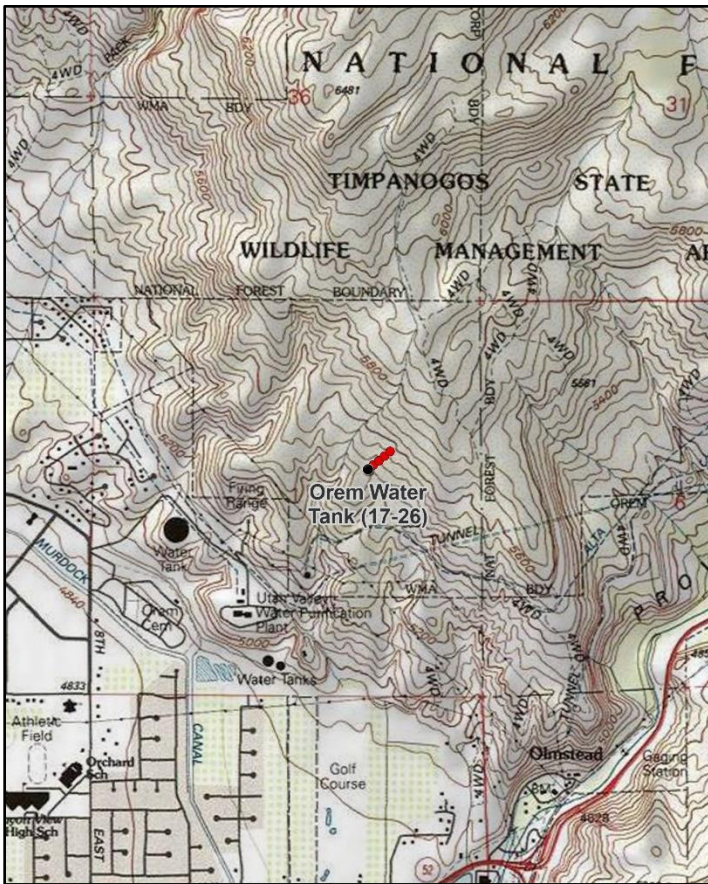
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rosa woodsii ^p -- (Woods' rose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	117/210
2017	-	-	-	-	-	-	-	-	156/153

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-25.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	13.0	10.2	0.0	7.4	-1.9	10.0	-4.0	34.8	Very Poor-Poor
2002	14.5	6.0	1.3	7.8	-0.2	7.2	-4.0	32.6	Very Poor
2007	20.8	13.3	1.4	2.9	-6.2	1.1	-4.0	29.2	Very Poor
2012	16.7	9.4	0.0	3.2	-20.0	1.6	-2.0	8.8	Very Poor
2017	12.6	9.0	0.0	1.7	-17.4	2.4	-6.0	2.2	Very Poor
2022	4.5	0.0	0.0	2.3	-9.3	0.5	-6.0	-8.0	Very Poor

OREM WATER TANK - STUDY NO. 17-26



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Orem NE; Township 6S, Range 2E, Section 01
NAD 83 UTM ZONE 12, 443623 East 4464321 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3913
38° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: No Rebar

Directions to Site

You may need a key from Orem City to access this site. On the north side of Orem, travel east up 1600 North (which turns into 1520 North) to 800 East. Just south of this intersection on 800 East, turn up the road towards the water purification plant. Go 0.45 miles, turn left, and continue for 0.25 miles to a water tank. Travel on this road for 0.25 miles and park. The old road towards the study site is closed, but a witness post should mark the junction. From there, walk about 165 paces (275 yards) to a rock pile at the head of a small drainage or gully. From the rockpile, walk north 10 paces at 334 degrees magnetic to the 0-foot baseline stake at the edge of the oakbrush which is marked by a red browse tag #3913.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	8-30%
Sample Dates	06/05/1997, 07/25/2002, 05/14/2007, 08/02/2012, 07/10/2017, 07/05/2022

Table 17-26.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Range	-	2020	3496
Seeding - Aerial	Range Fire Rehabilitation Project	5542	November 2020	1966
Seeding - Broadcast	Timpanogos WMA Fire Rehabilitation and Access Management Project (Proposed)	5956	2022	145
Mechanical - Scalper	Timpanogos WMA Fire Rehabilitation and Access Management Project (Proposed)	5956	2022	145
Seeding - Seed Unknown	-	-	Historic	-
Fire - Wildfire	Orem Park	-	1960	604
Fire - Wildfire	Tank	-	1996	3032

Table 17-26.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Range Fire Low			Aerial	Nov 2020	1295
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Bromus marginatus	Mountain Brome	Bromar	1.00	0.93
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.47
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.90
G	Psathyrostachys juncea	Russian Wildrye	'Bozoisky' NC	0.50	0.44
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Columbia	2.01	1.76
F	Achillea millefolium	Western Yarrow	Eagle	0.10	0.09
F	Helianthus annuus	Annual Sunflower		0.23	0.17
F	Linum perenne	Blue Flax	Appar	0.50	0.35
F	Medicago sativa	Alfalfa	Ladak	0.50	0.46
F	Medicago sativa ssp. falcata	Yellow Alfalfa	Don	0.21	0.21
F	Medicago sativa ssp. falcata	Yellow Alfalfa	Don	0.29	0.28
F	Onobrychis viciifolia	Sainfoin	'Shoshone' NC	2.01	1.80
F	Penstemon palmeri	Palmer Penstemon	White Pine NV	0.08	0.06
F	Sanguisorba minor	Small Burnet	Delar	2.01	1.72
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Beaver UT	0.40	0.13
S	Bassia prostrata	Forage Kochia	Snowstorm	0.10	0.06
S	Bassia prostrata	Forage Kochia	Snowstorm	0.41	0.31
S	Bassia prostrata	Forage Kochia	Elko, NV	0.50	0.34

Wildlife Habitat and Vegetation History

Table 17-26.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 17-26.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Gambel Oak	NA
1989	Gambel Oak	NA
1997	Perennial Grass	NA
2002	Gambel Oak/Perennial Grass	NA
2007	Gambel Oak/Perennial-Annual Grass	NA
2012	Gambel Oak/Perennial Grass	NA
2017	Gambel Oak/Perennial Grass	NA
2022	Annual-Perennial Grass	NA

Site Notes

The nearest source of perennial water is found in the residential area located 0.5 miles to the southwest.

Soils

Table 17-26.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.7	33.8	38.4	27.8	2.9	15.9	198.4	0.7	06/05/1997

Site Potential

1981 - 2010 Average Annual Precipitation 22 inches
 NRCS Ecological Site Mountain Loam (Oak)
 NRCS Ecological Site # R047XA432UT
 States and Transitions No state and transition model is available for this ecological site.

Gambel oak (*Quercus gambelii*) has been the dominant browse species on this site in most sample years since study establishment in 1983. A wildfire removed a large portion of the browse component in 1997, but much of the oak cover and density returned. However, the Range wildfire burned the site in 2020 and oak decreased from 28% cover in 2017 to just under 6% in 2022. Density for young oak was high in 2022 at 15,560 plants per acre, which indicates there is a potential for this major community component to recover and provide forage for wildlife (Photos, Table 17-26.1, Table 17-26.12, Table 17-26.13). Perennial grasses have been a dominant/co-dominant site component since 1997, with the introduced species smooth brome (*Bromus inermis*) contributing a majority of the cover; annual grasses -- namely the introduced species cheatgrass (*B. tectorum*) -- were also co-dominant in 2007 and 2022. In addition, the noxious annual grass species jointed goatgrass (*Aegilops cylindrica*) was observed in the 2017 and 2022 sample years in low abundance (Table 17-26.10). Forb cover has fluctuated from year to year, but the 2017 was the most notable year where perennial forbs provided 19.9% cover; most of this was due to the introduced species alfalfa (*Medicago sativa*) (Table 17-26.7, Table 17-26.11). Barring a major disturbance, this study site is expected to recover and transition back to a state dominated by oak.

Trend Summary Tables

Table 17-26.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	7.6	-	-	-	-	-
2002	16.5	-	-	24.9	-	-
2007	23.0	-	-	38.3	-	-
2012	19.7	-	-	32.5	-	-
2017	21.9	-	-	28.6	-	-
2022	5.4	-	-	5.7	-	-

Table 17-26.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	132	370	149	130	3.3	20.1	1.3	12.2
2002	205	358	98	155	10.3	25.6	1.1	7.6
2007	316	374	147	142	16.2	17.7	2.5	5.9
2012	189	458	94	176	4.1	45.0	0.3	3.1
2017	188	379	248	191	6.3	24.6	8.8	19.9
2022	345	295	247	245	21.4	21.3	9.3	10.7

Table 17-26.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	23.4	0.0	34.2	2.0	3.9	42.5
2002	1.1	0.0	72.4	0.1	0.7	59.4
2007	0.5	0.0	60.6	0.1	0.9	65.0
2012	0.1	-	46.8	0.0	0.7	70.8
2017	0.8	-	91.4	0.3	0.8	70.1
2022	25.3	0.1	25.6	2.8	7.4	54.3

Table 17-26.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
1997	36	7
2002	11	15
2007	5	14
2012	1	-
2017	4	2
2022	12	1
Year	Days Use Per Acre (ha)	
1997	-	-
2002	48.9 (120.8)	59.6 (147.3)
2007	8.1 (19.9)	87.8 (216.8)
2012	12.1 (29.8)	-
2017	6.0 (14.9)	1.3 (3.3)
2022	48.3 (119.2)	2.0 (5.0)

Table 17-26.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency										
Aegilops cylindrica ^{ai} (jointed goatgrass)											
Agropyron cristatum ⁱ (crested wheatgrass)											
Bromus arvensis ^{ai} (field brome)											
Bromus inermis ⁱ (smooth brome)											
Bromus tectorum ^{ai} (cheatgrass)											
Poa bulbosa ⁱ (bulbous bluegrass)											
Poa pratensis ⁱ (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
Thinopyrum intermedium ⁱ (intermediate wheatgrass)											
Vulpia octoflora ^a (sixweeks fescue)											
year	Average Cover (%)										
1997	-	46	44	274	121	-	-	12	-	120	2
2002	-	21	63	273	191	3	1	6	-	138	4
2007	-	21	-	251	316	19	-	18	-	134	13
2012	-	7	29	285	179	19	-	14	1	270	-
2017	1	14	70	248	164	26	-	1	-	180	-
2022	3	13	41	203	331	72	-	18	16	54	3
year	Average Cover (%)										
1997	-	1.7	0.9	13.4	2.5	-	-	0.1	-	4.9	0.0
2002	-	0.5	1.0	18.0	9.3	0.2	0.0	0.0	-	7.0	0.0
2007	-	1.4	-	11.1	16.0	0.2	-	0.2	-	4.7	0.2
2012	-	0.2	0.2	22.9	3.9	0.7	-	0.1	0.0	21.1	-
2017	0.0	0.5	1.3	15.8	5.0	0.4	-	0.0	-	7.9	-
2022	0.1	0.2	0.5	15.2	20.7	2.8	-	0.5	0.4	2.2	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-26.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum ^{ai} (desert madwort)																	
Calochortus nuttallii (sego lily)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Descurainia pinnata ^a (western tansymustard)																	
Draba ^a (draba)																	
Epipactis gigantea (stream orchid)																	
Eriogonum racemosum (redroot buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Galium aparine ^a (stickywilly)																	
Holosteum umbellatum ^{ai} (jagged chickweed)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Lamium purpureum ^{ai} (purple deadnettle)																	
Lappula occidentalis ^a (flatspine stickseed)																	
Linaria dalmatica ^{ai} (Dalmatian toadflax)																	
year	Average Cover (%)																
1997	109	14	-	-	-	-	10	-	2	6	31	6	2	2	-	7	3
2002	87	1	-	-	1	-	5	-	-	-	20	4	14	-	-	-	4
2007	61	-	-	-	-	4	11	7	-	-	36	46	18	-	-	-	14
2012	70	-	-	2	-	-	-	-	-	2	6	13	5	1	-	3	44
2017	144	3	-	-	16	5	2	-	-	-	99	53	-	2	-	10	21
2022	65	2	5	1	16	4	105	2	-	-	139	3	12	-	6	-	47
year	Average Cover (%)																
1997	0.7	0.0	-	-	-	-	0.0	-	0.0	0.0	0.2	0.0	0.0	0.2	-	0.0	0.0
2002	0.5	0.0	-	-	0.0	-	0.0	-	-	-	0.5	0.0	0.0	-	-	-	0.0
2007	0.2	-	-	-	-	0.0	0.0	0.0	-	-	1.2	1.0	0.0	-	-	-	0.3
2012	0.2	-	-	0.0	-	-	-	-	-	0.0	0.0	0.1	0.0	0.0	-	0.0	0.4
2017	1.7	0.0	-	-	0.1	0.0	0.0	-	-	-	5.2	1.5	-	0.0	-	0.1	0.3
2022	0.2	0.0	0.0	0.0	0.2	0.0	0.9	0.0	-	-	5.8	0.0	0.1	-	0.0	-	1.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum perenne ⁱ (blue flax)	Medicago sativa ⁱ (alfalfa)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{at} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius ^{at} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1997	-	111	-	2	-	-	7	5	-
2002	-	154	-	-	-	-	0	-	-
2007	-	125	1	-	-	-	5	-	1
2012	-	143	2	-	-	-	2	4	-
2017	-	167	5	-	-	9	1	1	-
2022	55	161	5	3	44	39	8	-	1
year	Average Cover (%)								
1997	-	12.1	-	0.0	-	-	0.0	0.1	-
2002	-	7.6	-	-	-	-	0.0	-	-
2007	-	5.5	0.0	-	-	-	0.0	-	0.0
2012	-	2.7	0.0	-	-	-	0.0	0.0	-
2017	-	19.5	0.0	-	-	0.1	0.0	0.0	-
2022	0.4	7.9	0.0	0.0	0.4	2.0	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-26.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Bassia prostrata ^p (forage kochia)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)	
1997	-	-
2002	-	24.9
2007	-	38.3
2012	-	32.5
2017	-	28.6
2022	-	5.7
year	Quadrat Cover (%)	
1997	-	7.6
2002	-	16.5
2007	-	23.0
2012	0.0	19.6
2017	-	21.9
2022	-	5.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-26.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

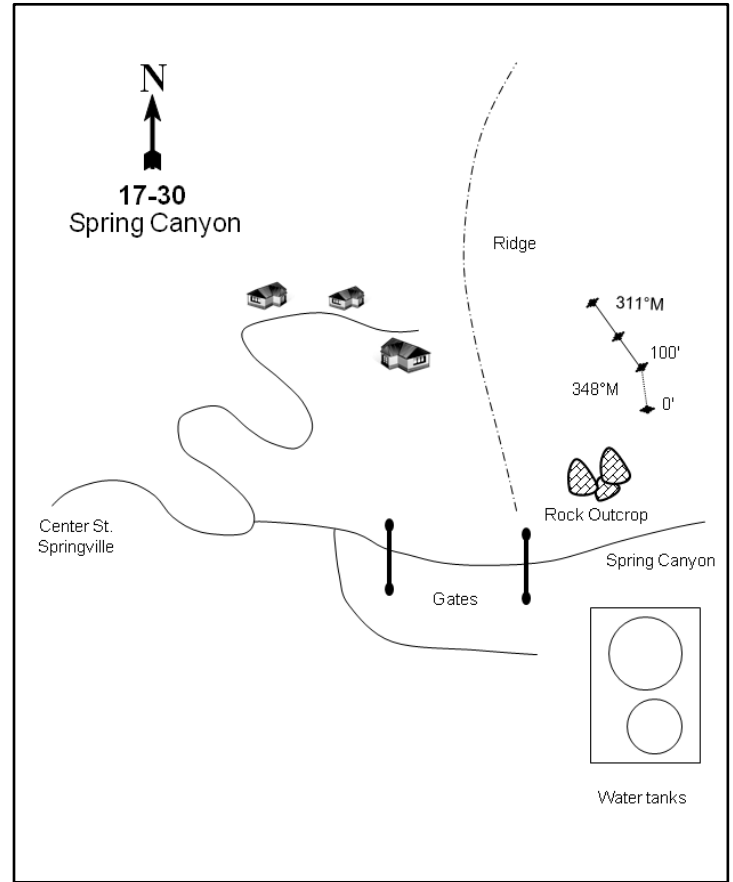
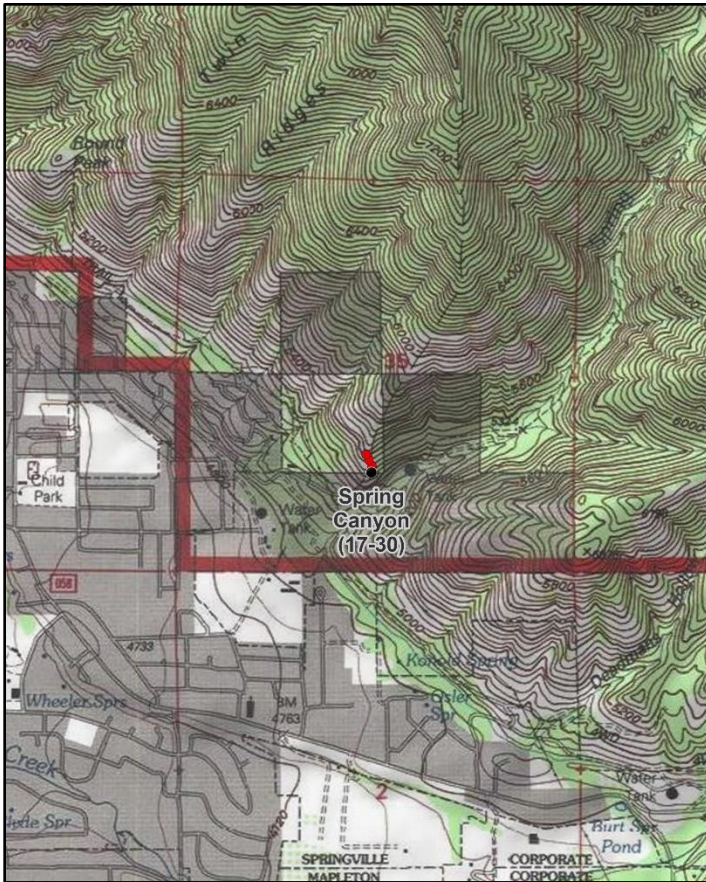
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Atriplex canescens^p -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	40/33
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Bassia prostrata^{pi} -- (forage kochia)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	0	100	0	0	100	33/25
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	20	-	100	0	0	0	100	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	27/43
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	52/37
2022	300	-	100	0	0	0	0	0	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	10560	4580	77	23	0	0	0	19	33/24
2002	18820	-	16	84	0	6	0	0	79/39
2007	19340	20	23	76	1	6	0	2	103/54
2012	16140	-	45	52	3	16	3	12	97/53
2017	17500	260	45	47	8	12	1	6	100/59
2022	15560	340	100	0	0	1	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-26.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	7.6	15.0	15.0	30.0	-2.5	10.0	-2.0	73.1	Good
2002	16.5	15.0	7.8	30.0	-7.7	10.0	-2.0	69.5	Fair-Good
2007	30.0	14.6	11.6	30.0	-12.2	10.0	-2.0	81.9	Good
2012	30.0	14.1	15.0	30.0	-3.0	5.5	-2.0	89.5	Good-Excellent
2017	28.6	12.8	15.0	30.0	-4.7	10.0	-4.0	87.6	Good
2022	5.7	15.0	15.0	30.0	-15.9	10.0	-4.0	55.8	Poor-Fair

SPRING CANYON - STUDY NO. 17-30



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Springville SW; Township 7S, Range 3E, Section 35
NAD 83 UTM ZONE 12, 451466 East 4446005 North

Transect Information

Browse Tag # (0' Stake)	177
Transect Bearing	348° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	Belts 1-4: No Rebar

Directions to Site

Follow Center Street in Springville going east toward the mountain. From the first switchback (where the main road continues up to houses on the bench north of Spring Canyon), continue towards the canyon mouth to the first gate. Continued development may alter the approach to the canyon, but in 1989, it was possible to walk 1/2 mile from the first locked gate to another gate further in the canyon. From this gate, continue 119 paces east into Spring Canyon. Uphill to the northwest (azimuth of 271 degrees magnetic) there is a conspicuous group of rock outcroppings. Walk up the side hill to the uppermost rock near the top of the ridge. The 0-foot stake, marked with a red browse tag #177, is north of the rock.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,200ft (1,585m)
Aspect	Southeast
Slope	65%
Sample Dates	05/15/1997, 05/14/2002, 05/18/2007, 07/03/2012, 07/05/2017, 05/25/2022

Wildlife Habitat and Vegetation History

Table 17-30.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 17-30.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose/Perennial Grass	NA
1989	Stansbury Cliffrose/Perennial Grass	NA
1997	Stansbury Cliffrose/Bulbous Bluegrass	NA
2002	Stansbury Cliffrose/Bulbous Bluegrass	NA
2007	Stansbury Cliffrose/Annual Grass/Bulbous Bluegrass	NA
2012	Stansbury Cliffrose/Annual Grass	NA
2017	Stansbury Cliffrose/Annual Grass	NA
2022	Stansbury Cliffrose/Annual Grass/Bulbous Bluegrass	NA

Site Notes

A water tank is located below the study site; this area is a watershed for the city of Springville.

Soils

Table 17-30.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.0	61.8	22.4	15.8	2.0	5.9	57.6	0.6	05/15/1997

Site Potential

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has dominated the shrub overstory on this study site since 1983; other preferred browse includes rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*) and Gambel oak (*Quercus gambelii*) (Table 17-30.12, Table 17-30.13). The herbaceous understory has remained fairly diverse and abundant through the study period. Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*), were most abundant in the herbaceous understory. The introduced annual grass species cheatgrass (*Bromus tectorum*) has increased in abundance and cover since 1997, and became a co-dominant site component in 2007 (Table 17-30.10). Forbs have generally remained rare in most sample years. The exception to this are the 2017 and 2022 sample years in which annual forbs provided nearly 12% and 17% cover, respectively, with nearly all of that being contributed by the introduced annual species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 17-30.7, Table 17-30.11).

Trend Summary Tables

Table 17-30.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	3.7	1.9	-	-	-	-
2002	5.0	0.6	-	-	-	-
2007	4.3	0.6	-	8.9	1.1	-
2012	4.6	2.1	-	7.1	4.7	-
2017	2.6	1.8	-	7.6	2.7	-
2022	4.4	1.7	-	7.7	1.9	-

Table 17-30.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	344	450	76	90	3.5	28.5	0.8	2.4
2002	362	440	75	117	6.0	32.0	0.3	2.8
2007	427	408	199	108	14.1	23.2	3.1	4.1
2012	424	300	254	99	22.6	19.6	2.2	2.2
2017	431	306	353	60	25.1	13.8	11.7	2.0
2022	406	328	381	64	15.7	17.7	16.7	3.0

Table 17-30.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.9	0.4	16.9	28.5	13.1	38.7
2002	2.6	-	15.5	28.7	16.6	47.6
2007	9.0	0.3	22.7	18.3	17.4	47.7
2012	10.1	0.7	24.6	17.6	17.6	49.7
2017	17.8	0.1	10.4	36.4	13.9	45.8
2022	15.8	0.3	20.8	31.1	19.5	44.5

Table 17-30.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	38	22	-
2002	32	2	1
2007	47	17	-
2012	17	2	2
2017	15	10	-
2022	14	4	-
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	42.2 (104.3)	3.4 (8.3)	-
2007	8.7 (21.5)	59.6 (147.3)	-
2012	20.8 (51.3)	0.7 (1.7)	-
2017	21.5 (53.0)	14.1 (34.8)	-
2022	18.7 (46.3)	6.7 (16.6)	-

Table 17-30.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES							
Aristida purpurea (purple threeawn)							
Bromus tectorum ^{ai} (cheatgrass)							
Poa bulbosa ⁱ (bulbous bluegrass)							
Poa secunda (Sandberg bluegrass)							
Pseudoroegneria spicata (bluebunch wheatgrass)							
Secale cereale ^{ai} (cereal rye)							
Sporobolus cryptandrus (sand dropseed)							
year	Nested Frequency						
1997	-	344	434	7	177	-	-
2002	-	362	433	1	156	-	-
2007	2	427	386	9	150	-	-
2012	4	424	224	36	117	2	-
2017	-	431	224	67	111	-	1
2022	42	406	296	11	91	-	1
year	Average Cover (%)						
1997	-	3.5	24.5	0.2	3.9	-	-
2002	-	6.0	26.3	0.0	5.7	-	-
2007	0.1	14.1	17.1	0.2	5.8	-	-
2012	0.2	22.5	13.7	0.6	5.2	0.1	-
2017	-	25.1	8.1	1.5	4.1	-	0.0
2022	0.8	15.7	12.8	0.0	4.1	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-30.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Alyssum desertorum ^{ai} (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Amsinckia tessellata ^a (bristly fiddleneck)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus utahensis (Utah milkvetch)																	
Camelina microcarpa ^{ai} (littledrop false flax)																	
Cirsium undulatum ^a (wavyleaf thistle)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Descurainia pinnata ^a (western tansymustard)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erigeron pumilus (shaggy fleabane)																	
Eriogonum brevicaulis (shortstem buckwheat)																	
Eriogonum racemosum (redroot buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Galium aparine ^a (stickywilly)																	
Gilia inconspicua ^a (shy gilia)																	
year	Nested Frequency																
1997	56	-	-	30	6	-	16	-	-	-	-	-	57	-	4	-	-
2002	17	-	-	34	2	-	-	-	3	-	-	-	79	1	33	-	14
2007	138	19	2	38	4	-	4	-	1	8	5	0	37	-	96	0	-
2012	166	41	-	44	-	-	2	-	-	-	-	-	10	-	148	-	-
2017	218	2	-	50	0	4	5	1	-	1	-	-	11	-	283	-	-
2022	85	12	-	43	-	-	-	-	1	-	1	-	5	-	348	17	-
year	Average Cover (%)																
1997	0.1	-	-	0.3	0.1	-	0.6	-	-	-	-	-	1.9	-	0.0	-	-
2002	0.0	-	-	0.4	0.0	-	-	-	0.0	-	-	-	2.3	0.0	0.2	-	0.0
2007	0.5	0.4	0.0	1.1	0.0	-	0.1	-	0.0	0.0	0.0	0.0	2.3	-	2.4	0.0	-
2012	0.6	0.7	-	1.1	-	-	0.0	-	-	-	-	-	0.2	-	1.6	-	-
2017	2.6	0.0	-	1.5	0.0	0.0	0.0	0.0	-	0.0	-	-	0.4	-	8.7	-	-
2022	0.5	1.1	-	1.6	-	-	-	-	0.0	-	0.0	-	0.1	-	15.4	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency												
year	Average Cover (%)												
Grindelia squarrosa (curlycup gumweed)	-	-	2	-	-	2	3	-	3	-	-	-	1
Helianthus annuus ^{at} (common sunflower)	-	-	0	-	17	-	-	-	-	-	-	3	2
Heterotheca villosa (hairy false goldenaster)	-	-	6	7	2	-	-	0	1	8	4	-	8
Lactuca serriola ^{at} (prickly lettuce)	5	-	3	3	-	-	-	-	1	-	2	-	1
Lappula occidentalis ^{at} (flatspine stickseed)	-	-	0	2	-	-	-	-	-	-	-	-	2
Lomatium (desertparsley)	-	2	3	48	1	-	-	0	-	-	1	-	12
Machaeranthera canescens (hoary tansyaster)	-	-	-	-	-	-	-	-	-	-	-	-	-
Oenothera caespitosa (tufted evening primrose)	-	-	-	-	-	-	-	-	-	-	-	-	-
Penstemon (beardtongue)	-	-	-	-	-	-	-	-	-	-	-	-	-
Phlox longifolia (longleaf phlox)	-	-	-	-	-	-	-	-	-	-	-	-	-
Sisymbrium altissimum ^{at} (tall tumblemustard)	-	-	-	-	-	-	-	-	-	-	-	-	-
Symphotrichum (aster)	-	-	-	-	-	-	-	-	-	-	-	-	-
Tragopogon dubius ^{at} (yellow salsify)	-	-	-	-	-	-	-	-	-	-	-	-	-
year	Line Intercept Cover (%)												
year	Quadrat Cover (%)												
1997	-	-	0.0	-	-	0.0	0.0	-	0.0	-	-	-	0.0
2002	-	-	0.0	-	0.0	-	-	-	-	-	-	0.0	0.0
2007	-	-	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	-	0.0
2012	0.1	-	0.0	0.0	-	-	-	-	0.0	-	0.0	-	0.0
2017	-	-	0.0	0.0	-	-	-	-	-	-	-	-	0.3
2022	-	0.0	0.1	0.3	0.0	-	-	0.0	-	-	0.0	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-30.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
Celtis laevigata var. reticulata (netleaf hackberry)	-	-	-	-	-
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	-	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	0.3	-	0.8	6.4	2.5
Purshia stansburiana ^p (Stansbury cliffrose)	3.7	-	1	3.8	3.3
Quercus gambelii ^p (Gambel oak)	1.4	-	1.3	4.8	2.8
2022	1	-	0.9	3.6	4.1
year	Quadrat Cover (%)				
1997	0.0	0.0	1.9	2.6	1.0
2002	0.5	0.4	0.1	3.4	1.2
2007	0.4	-	0.2	3.6	0.8
2012	1.7	-	0.5	1.6	2.9
2017	1.3	-	0.5	1.6	1.0
2022	1.0	-	0.7	2.9	1.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-30.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

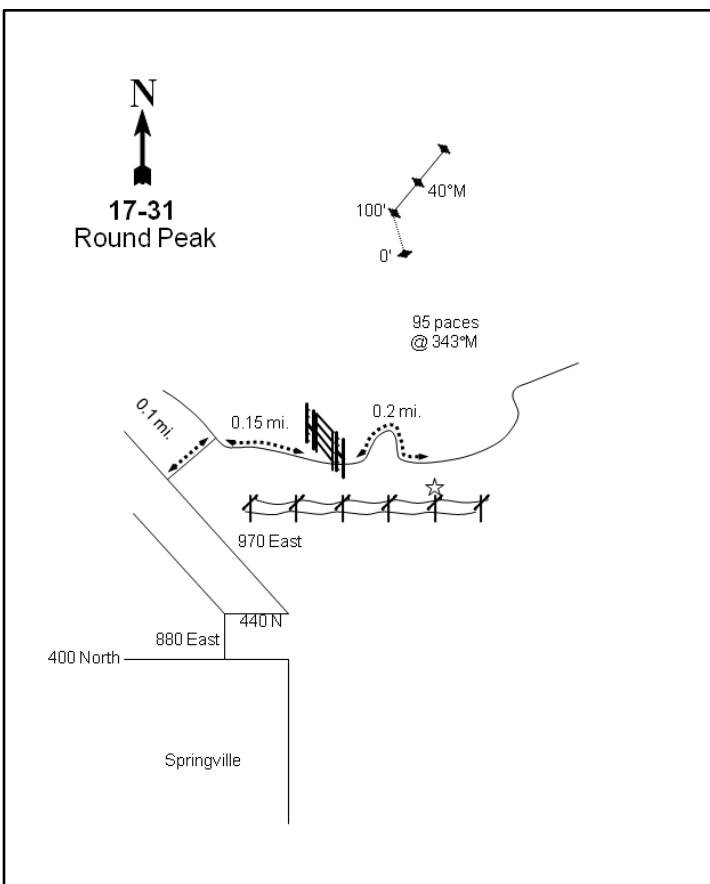
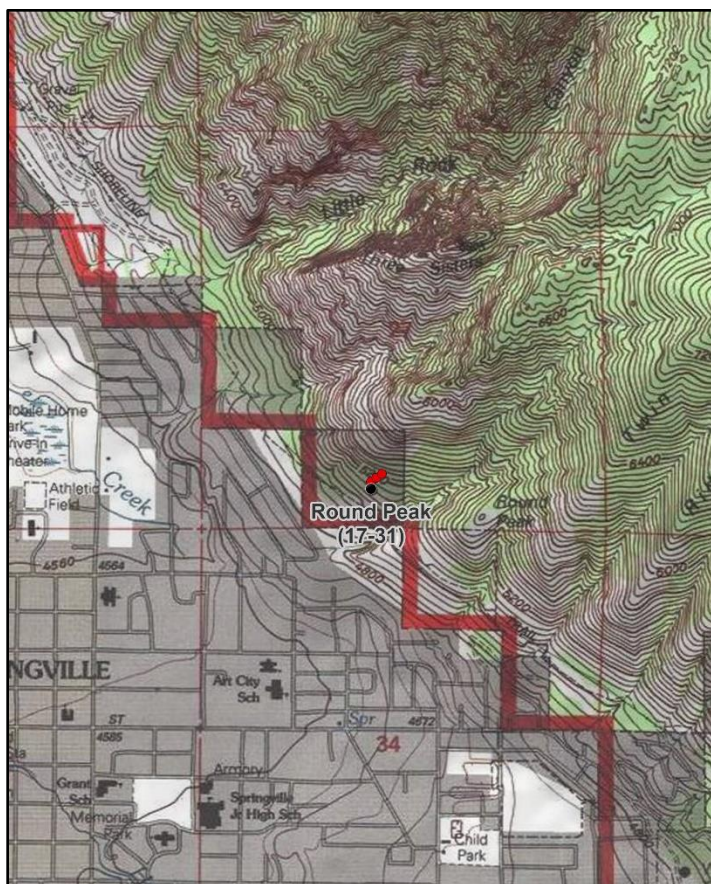
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Celtis laevigata var. reticulata -- (netleaf hackberry)									
1997	-	-	-	-	-	-	-	-	60/264
2002	-	-	-	-	-	-	-	-	66/262
2007	-	-	-	-	-	-	-	-	116/256
2012	-	-	-	-	-	-	-	-	137/308
2017	80	-	0	100	0	100	0	0	- / -
2022	40	-	0	100	0	100	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	100	0	42/103
2002	20	-	0	0	100	100	0	100	32/79
2007	-	-	-	-	-	-	-	-	71/77
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	77/119
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	2760	300	29	71	0	0	0	0	20/27
2002	580	20	28	41	31	3	0	14	13/19
2007	1140	-	12	86	2	2	4	2	21/27
2012	580	20	24	72	3	0	0	39	25/45
2017	460	-	4	96	0	0	0	0	29/45
2022	360	720	0	100	0	0	0	0	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	180	80	0	78	22	0	100	0	184/203
2002	340	-	12	82	6	18	59	0	158/192
2007	400	-	0	80	20	0	90	15	149/187
2012	140	20	14	86	0	14	57	0	174/205
2017	420	-	38	57	5	24	57	19	180/215
2022	180	-	0	78	22	44	22	22	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	20	-	0	100	0	0	0	0	240/290
2002	60	20	0	100	0	0	0	0	166/193
2007	40	140	0	100	0	0	0	0	302/376
2012	20	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	325/468
2022	420	-	81	19	0	19	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-30.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	5.0	0.0	0.0	8.1	-2.6	4.7	0.0	15.2	Very Poor
2002	6.7	0.0	0.0	11.5	-4.5	5.6	0.0	19.3	Very Poor
2007	12.1	10.7	0.0	12.2	-10.6	8.1	0.0	32.5	Very Poor
2012	9.0	15.0	3.8	11.9	-16.9	4.4	0.0	27.2	Very Poor
2017	10.0	8.6	12.0	11.3	-18.9	3.9	0.0	27.0	Very Poor
2022	9.5	11.9	15.0	9.8	-11.8	6.0	0.0	40.4	Poor

ROUND PEAK - STUDY NO. 17-31



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Springville SW; Township 7S, Range 3E, Section 27
NAD 83 UTM ZONE 12, 449748 East 4447392 North

Transect Information

Browse Tag # (0' Stake)	419
Transect Bearing	349° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft & 71ft)
Belt Marker Placement	Standard

Directions to Site

From the town of Springville, proceed on 440 North and 970 East to an intersection at the end of the paved road. Turn right and continue for 0.1 miles to an intersection. Turn right again and proceed southeast along the foothills for 0.15 miles to a locked gate: park here. Walk 0.2 miles along the road and stop when parallel to two power poles, which are 50 yards south of the road. From the power poles, the 0-foot baseline stake is 95 paces north at 343 degrees magnetic and marked with browse tag #419.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	South
Slope	25-45%
Sample Dates	05/14/1997, 05/14/2002, 07/05/2007, 07/03/2012, 07/05/2017, 07/05/2022

Wildlife Habitat and Vegetation History**Table 17-31.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-31.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Netleaf Hackberry/Smooth Sumac	NA
1989	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
1997	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2002	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2007	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2012	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2017	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2022	Netleaf Hackberry/Smooth Sumac/Annual Grass	NA

Site Notes

The nearest source of perennial water is the Spring Creek wetland 0.8 miles to the northwest. In the summer of 1989, several fawn carcasses were found which were most likely winter-killed by the deep snows of the 1988-89 winter. In 2007, a deer skeleton was found on the baseline and there were several game trails traversing the study.

Soils**Table 17-31.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	39.5	30.7	29.8	4.3	6.3	160.0	0.6	05/14/1997
Loam	7.3	36.9	38.4	24.7	1.9	14.2	256.0	1.0	05/14/2002

Site Potential

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Stony Loam (Hackberry)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained in a stable state as a netleaf hackberry (*Celtis laevigata* var. *reticulata*) and smooth sumac (*Rhus glabra*) plant community type since 1983. Additional preferred browse species, such as skunkbush sumac (*R. trilobata*) and Gambel oak (*Quercus gambelii*), are also present (Photos, Table 17-31.12, Table 17-31.13). The native perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) is common in the herbaceous understory, but the introduced species bulbous bluegrass (*Poa bulbosa*) has been the most abundant perennial grass every study year since 1989. Annual grasses -- namely cheatgrass (*Bromus tectorum*) -- are a notable component in the understory and increased significantly in both cover and abundance in 2022. In addition, the noxious and introduced annual species jointed goatgrass (*Aegilops cylindrica*) was observed in 2012, 2017, and 2022; the noxious perennial forb Dalmatian toadflax (*Linaria dalmatica*) was sampled for the first time in 2022 (Table 17-31.7, Table 17-31.10). Cover of forbs has fluctuated from sample year to sample year, but the introduced annual species redstem stork's bill (*Erodium cicutarium*) and native perennial species Cuman ragweed (*Ambrosia psilostachya*) contributed the most forb cover in 2022 (Table 17-31.11).

Trend Summary Tables

Table 17-31.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	2.2	3.5	-	-	-	-
2002	1.8	3.9	-	-	-	-
2007	2.3	4.1	-	6.1	7.4	-
2012	3.9	10.6	-	4.4	12.6	-
2017	2.4	10.8	-	5.6	17.5	-
2022	2.7	9.8	-	3.9	13.7	-

Table 17-31.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	151	392	194	213	0.8	24.3	1.3	7.6
2002	209	423	151	126	1.6	31.6	0.8	6.2
2007	272	330	188	211	4.4	19.4	1.3	6.2
2012	295	348	101	156	9.3	20.1	0.9	5.1
2017	253	326	281	128	9.3	21.2	10.3	6.3
2022	378	274	266	153	18.3	10.7	7.7	8.4

Table 17-31.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	3.4	0.4	28.9	12.7	21.9	38.9
2002	0.7	0.0	24.8	12.2	24.7	47.9
2007	3.3	0.0	28.8	16.4	20.7	43.0
2012	3.1	-	29.9	10.3	27.0	46.5
2017	2.6	0.0	16.1	24.8	28.7	49.7
2022	2.0	1.1	29.9	14.5	32.9	47.4

Table 17-31.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Coyote	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Other	Rabbit
	Quadrat Frequency					
1997	-	19	22	-	-	3
2002	-	24	11	-	-	-
2007	-	11	24	-	-	-
2012	-	11	1	1	-	2
2017	-	19	16	-	-	5
2022	-	16	7	-	-	1
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	44.2 (109.2)	9.4 (23.2)	-	-	-
2007	-	74.4 (183.7)	36.2 (89.4)	-	17.4 (43.0)*	-
2012	-	30.2 (74.5)	7.4 (18.2)	-	-	-
2017	8.7 (21.5)*	38.9 (96.0)	22.1 (54.6)	-	-	-
2022	-	4.0 (9.9)	5.3 (13.2)	-	-	-

*Pellets per acre (ha)

Table 17-31.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
<i>Aegilops cylindrica</i> ^{ai} (jointed goatgrass)	-	-	21	26	137	306	279	-
<i>Avena fatua</i> ^{ai} (wild oat)	-	111	9	-	157	373	216	-
<i>Bromus arvensis</i> ^{ai} (field brome)	-	81	6	0	249	265	171	-
<i>Bromus briziformis</i> ^{ai} (rattlesnake brome)	4	40	14	-	287	260	174	-
<i>Bromus tectorum</i> ^{ai} (cheatgrass)	5	109	7	1	185	290	143	-
<i>Poa bulbosa</i> ⁱ (bulbous bluegrass)	8	88	15	8	362	214	119	1
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)								
<i>Secale cereale</i> ^{ai} (cereal rye)								
year	Average Cover (%)							
1997	-	-	0.1	0.1	0.6	12.7	11.6	-
2002	-	0.6	0.0	-	1.0	19.0	12.6	-
2007	-	0.7	0.0	0.0	3.7	10.8	8.7	-
2012	0.1	0.2	0.0	-	9.0	10.8	9.3	-
2017	0.0	2.6	0.1	0.0	6.6	13.1	8.1	-
2022	0.2	1.1	0.3	0.1	16.7	6.4	4.4	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-31.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
<i>Allium</i> (onion)	5	146	134	20	2	-	-	29	-	-	18	-	5	0	-	-	14	
<i>Alyssum desertorum</i> ^{ai} (desert madwort)	1	48	1	13	2	-	2	5	-	-	9	-	-	-	-	2	68	
<i>Ambrosia psilostachya</i> (Cuman ragweed)	-	124	114	41	39	-	-	-	-	6	2	1	-	2	2	-	72	
<i>Artemisia ludoviciana</i> (white sagebrush)	-	73	105	16	-	-	-	-	3	-	2	-	-	8	-	-	24	
<i>Astragalus beckwithii</i> (Beckwith's milkvetch)	-	131	23	35	-	1	-	7	13	-	-	2	-	2	-	-	224	
<i>Buglossoides arvensis</i> ^{ai} (corn gromwell)	-	77	61	32	42	0	-	-	13	-	-	-	2	3	8	-	211	
<i>Calochortus nuttallii</i> (sego lily)																		
<i>Cirsium undulatum</i> ^a (wavyleaf thistle)																		
<i>Collinsia parviflora</i> ^a (maiden blue eyed Mary)																		
<i>Cryptantha</i> (cryptantha)																		
<i>Cymopterus longipes</i> (longstalk springparsley)																		
<i>Draba</i> ^a (draba)																		
<i>Epilobium brachycarpum</i> ^a (tall annual willowherb)																		
<i>Erigeron divergens</i> ^a (spreading fleabane)																		
<i>Eriogonum brevicaulis</i> (shortstem buckwheat)																		
<i>Eriogonum racemosum</i> (redroot buckwheat)																		
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)																		
year	Average Cover (%)																	
1997	0.0	0.4	3.0	0.2	0.1	-	-	0.6	-	-	0.5	-	0.0	0.0	-	-	0.1	
2002	0.0	0.1	0.0	0.1	0.4	-	0.0	0.0	-	-	0.4	-	-	-	-	0.0	0.4	
2007	-	0.5	3.4	0.5	0.7	-	-	-	-	0.2	0.0	0.0	-	0.0	0.0	-	0.4	
2012	-	0.2	2.7	0.3	-	-	-	-	0.0	-	0.0	-	-	0.2	-	-	0.5	
2017	-	2.0	0.6	0.9	-	0.0	-	0.0	0.1	-	-	0.0	-	0.0	-	-	7.2	
2022	-	0.2	3.5	0.9	1.7	0.0	-	-	0.0	-	-	-	0.0	0.0	0.1	-	7.0	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Galium aparine ^a (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^{ai} (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Linaria dalmatica ^{ai} (Dalmatian toadflax)	Lithospermum incisum (narrowleaf stone seed)	Lithospermum ruderale (western stone seed)	Phlox longifolia (longleaf phlox)	Silene antirrhina ^a (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumbleweed)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency															
1997	39	-	3	-	-	1	68	-	8	13	13	33	-	3	-	5
2002	23	13	-	-	-	24	84	-	10	-	3	22	-	4	4	5
2007	16	-	-	3	-	-	25	-	31	7	8	-	-	-	-	19
2012	-	12	5	2	-	-	51	-	-	3	1	15	-	-	-	1
2017	4	7	13	3	7	-	87	-	-	-	-	-	5	-	-	4
2022	20	-	4	3	5	2	23	14	-	3	14	9	5	-	-	-
year	Average Cover (%)															
1997	0.2	-	0.0	-	-	0.0	3.2	-	0.2	0.0	0.0	0.1	-	0.4	-	0.0
2002	0.1	0.4	-	-	-	0.0	4.8	-	0.0	-	0.1	0.0	-	0.0	0.0	0.0
2007	0.1	-	-	0.0	-	-	0.3	-	0.2	0.9	0.0	-	-	-	-	0.2
2012	-	0.2	0.0	0.0	-	-	1.8	-	-	0.0	0.0	0.0	-	-	-	0.0
2017	0.0	0.2	0.2	0.1	0.0	-	4.5	-	-	-	-	-	0.5	-	-	0.0
2022	0.3	-	0.0	0.0	0.0	0.0	1.4	0.6	-	0.2	0.1	0.0	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-31.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Celtis laevigata var. reticulata (netleaf hackberry)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii ^p (Gambel oak)	Rhus glabra ^p (smooth sumac)	Rhus trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	6.6	0.8	-	6.1	-
2012	6.8	5.8	0.2	4.2	-
2017	6.9	10.6	0.3	5.3	-
2022	6.4	7.3	0.4	3.4	0.1
year	Quadrat Cover (%)				
1997	1.9	1.6	-	2.2	-
2002	2.4	1.6	-	1.8	-
2007	3.4	0.8	-	2.3	-
2012	5.4	5.2	0.0	3.9	-
2017	5.0	5.8	0.0	2.3	0.0
2022	5.1	4.7	0.0	2.7	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-31.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

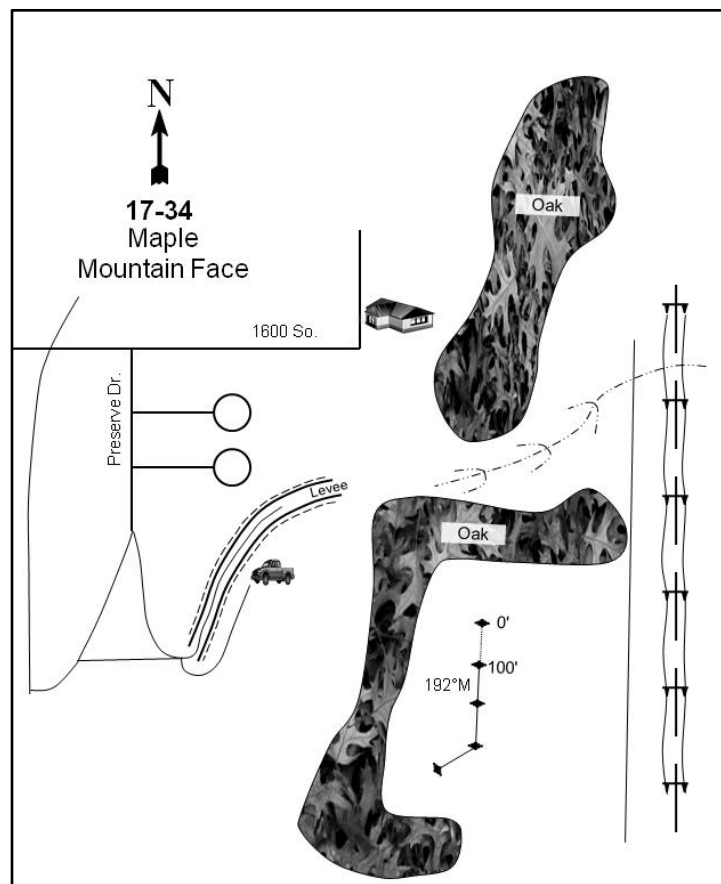
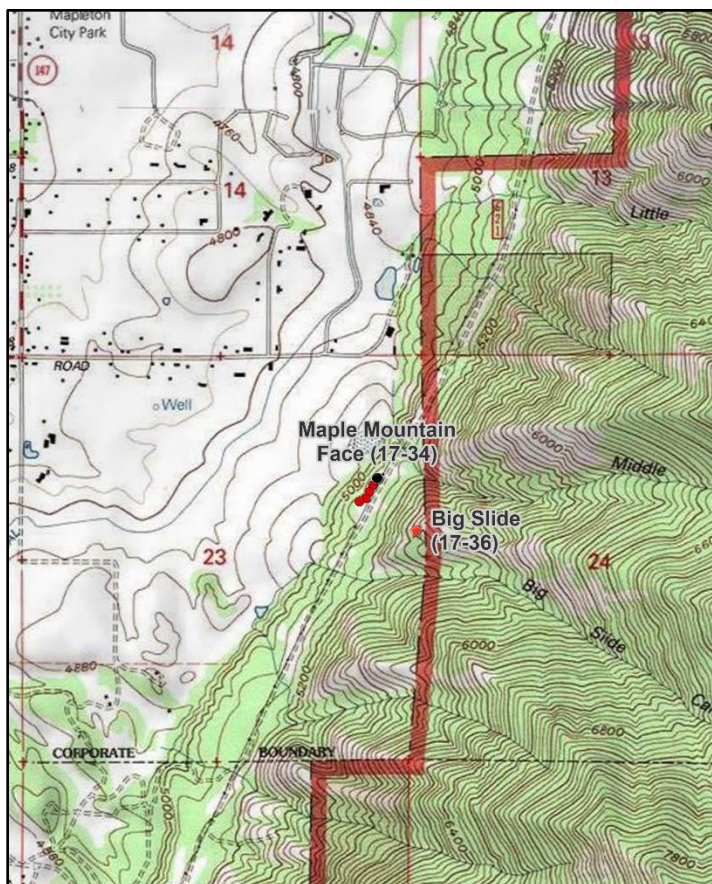
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Celtis laevigata var. reticulata -- (netleaf hackberry)									
1997	60	140	33	67	0	0	0	33	190/447
2002	40	40	0	50	50	0	0	50	89/149
2007	300	-	0	93	7	0	0	60	91/96
2012	180	-	0	100	0	0	0	22	193/315
2017	80	-	0	100	0	25	0	25	152/226
2022	160	-	25	75	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	63/138
2017	-	-	-	-	-	-	-	-	48/128
2022	20	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	3280	880	41	59	0	0	0	8	21/33
2002	1100	-	2	93	6	0	0	0	21/27
2007	3820	-	5	95	0	0	0	1	20/21
2012	4020	640	41	57	3	2	0	55	29/48
2017	3640	20	5	92	3	0	0	4	35/50
2022	2620	380	11	89	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	8/10
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	10/17
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	40	0	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	100	0	0	0	0	0	37/42
2017	20	-	100	0	0	0	100	0	61/74
2022	40	-	0	100	0	0	0	0	- / -
Rhus glabra^p -- (smooth sumac)									
1997	1100	-	14	62	24	60	29	4	122/90
2002	1320	-	12	64	24	9	49	14	80/55
2007	740	20	22	73	5	3	11	0	116/104
2012	740	-	3	97	0	5	0	0	69/65
2017	460	-	22	74	4	52	17	0	69/66
2022	580	-	35	59	7	0	3	7	- / -
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	97/186
2012	-	-	-	-	-	-	-	-	75/109
2017	60	-	0	100	0	0	0	0	78/99
2022	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-31.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	2.2	0.0	0.0	23.3	-0.6	10.0	0.0	34.9	Very Poor
2002	1.8	0.0	0.0	25.2	-1.2	10.0	0.0	35.8	Very Poor
2007	6.1	13.4	10.8	17.3	-3.3	10.0	0.0	54.3	Poor-Fair
2012	4.4	0.0	0.0	18.6	-6.9	10.0	-2.0	24.1	Very Poor
2017	5.6	13.8	12.9	16.2	-6.9	10.0	-2.0	49.6	Poor
2022	3.9	0.0	0.0	8.7	-13.6	10.0	-4.0	5.1	Very Poor

MAPLE MOUNTAIN FACE - STUDY NO. 17-34



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Spanish Fork Peak NE; Township 8S, Range 3E, Section 23
NAD 83 UTM ZONE 12, 452136 East 4440286 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

442
198° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (87ft)
No Rebar

Directions to Site

Drive on 1600 South in Mapleton to the end of road. Park and hike east for 0.4 miles to an old road that runs parallel to power lines. A small sagebrush clearing west of the road is where the site is located. The 0-foot baseline stake is in the north end of the clearing, 33 paces from power pole #349 at an azimuth of 342 degrees magnetic. The 0-foot stake has browse tag #442 attached, and the study stakes are 12-18" tall green fenceposts.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	Northwest
Slope	2-10%
Sample Dates	05/15/1997, 06/07/2002, 07/25/2007, 05/31/2012, 06/01/2017, 05/25/2022

Table 17-34.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Trojan II	-	1994	2975
Seeding - Seed Unknown	-	-	After 1994	-

Wildlife Habitat and Vegetation History

Table 17-34.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-34.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Bulbous Bluegrass	NA
1989	Mountain Big Sagebrush/Bulbous Bluegrass	NA
1997	Bulbous Bluegrass/Perennial Forb	NA
2002	Bulbous Bluegrass/Perennial Forb	NA
2007	Bulbous Bluegrass/Mountain Big Sagebrush	NA
2012	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2022	Mountain Big Sagebrush/Bulbous Bluegrass	NA

Site Notes

This study is located on one of the few remaining crucial winter ranges on the Lake Bonneville terrace southeast of Mapleton. An old road north of the trail was used by ATVs and horses in 2007, and there was a housing development being constructed 0.5 miles west of the study in the same year. The nearest source of perennial water is a canal located 0.4 miles to the west.

Soils

Table 17-34.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.3	45.8	30.4	23.8	2.2	13.6	188.8	0.5	05/15/1997

Site Potential

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 to 1989, this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bulbous bluegrass (*Poa bulbosa*) plant community. A wildfire sometime between 1989 and 1997 (Table 17-34.1) removed much of the shrub overstory; bulbous bluegrass and perennial forbs -- namely arrowleaf balsamroot (*Balsamorhiza sagittata*) -- were dominant in 1997 and 2002. Mountain big sagebrush exhibited an increase in cover and the site returned to and has remained as a mountain big sagebrush and bulbous bluegrass community type since the 2007 sample year. Other perennial grasses are very diverse, but not as abundant as bulbous bluegrass. Annual grasses are also present, and the noxious and introduced species jointed goatgrass (*Aegilops cylindrica*) was observed in 2012, 2017, and 2022. Annual forbs have remained relatively rare, but contributed 20% cover in 2017 and 2022: a majority of this cover is provided by the introduced species redstem stork's bill (*Erodium cicutarium*) (Photos, Table 17-34.7, Table 17-34.10, Table 17-34.11, Table 17-34.12, Table 17-34.13). This study site is expected to remain in similar state in the future unless a major disturbance occurs.

Trend Summary Tables

Table 17-34.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	1.7	-	-	-	-	-
2002	4.2	-	-	-	-	-
2007	7.3	0.0	-	14.4	-	-
2012	18.1	0.3	-	19.3	0.4	-
2017	12.8	0.4	-	18.5	0.4	-
2022	11.7	0.0	-	12.8	-	-

Table 17-34.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	93	485	93	314	0.6	45.7	1.9	37.5
2002	61	489	36	200	0.2	59.9	0.2	29.6
2007	131	488	179	224	1.4	48.7	9.5	9.8
2012	247	426	174	179	3.8	44.0	2.7	15.6
2017	291	451	322	190	9.1	57.1	20.1	17.8
2022	314	442	314	188	11.8	45.4	20.7	12.9

Table 17-34.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	9.9	3.2	18.7	6.5	1.3	67.8
2002	2.8	1.6	24.0	2.9	0.6	80.1
2007	3.3	0.6	29.3	1.9	0.5	73.8
2012	0.7	0.0	50.2	0.1	0.2	77.6
2017	8.5	2.2	49.5	2.1	0.6	77.9
2022	7.8	0.5	39.4	1.4	0.4	77.0

Table 17-34.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	9	1	4	-	-
2002	12	2	-	-	-
2007	-	16	10	3	-
2012	-	17	-	-	-
2017	3	1	-	-	1
2022	-	4	4	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	18.9 (46.6)	4.0 (9.9)	2.0 (5.0)	-	-
2007	0.7 (1.8)	40.9 (101.0)	28.1 (69.5)	9.9 (24.4)	-
2012	-	57.7 (142.4)	-	-	-
2017	-	3.4 (8.3)	0.7 (1.7)	-	-
2022	-	14.7 (36.4)	12.8 (31.5)	-	-

Table 17-34.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica ^{ani} (jointed goatgrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{aii} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus glaucus (blue wildrye)	Elymus trachycaulus (slender wheatgrass)	Eremopyrum triticeum ^{ai} (annual wheatgrass)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)
year	Nested Frequency																
1997	-	-	-	-	-	-	93	68	-	-	-	-	-	-	463	-	-
2002	-	16	0	12	3	-	48	24	2	-	-	-	20	-	484	-	5
2007	-	12	5	36	55	-	66	25	-	-	-	-	22	-	472	1	1
2012	35	14	9	201	-	-	88	15	-	-	14	-	-	-	386	4	3
2017	30	22	20	229	76	-	107	12	-	-	-	-	-	10	397	-	1
2022	23	20	15	143	52	0	202	11	-	1	1	3	3	23	397	4	-
year	Average Cover (%)																
1997	-	-	-	-	-	-	0.6	0.8	-	-	-	-	-	-	41.3	-	-
2002	-	0.1	0.0	0.1	0.0	-	0.2	0.6	0.0	-	-	-	0.1	-	57.8	-	0.0
2007	-	0.6	0.1	0.2	0.3	-	0.9	1.0	-	-	-	-	0.4	-	43.8	0.0	0.0
2012	0.5	0.5	0.4	0.9	-	-	2.4	1.7	-	-	0.0	-	-	-	35.6	0.0	0.0
2017	0.5	1.9	0.8	5.6	1.1	-	1.8	0.2	-	-	-	-	-	0.6	39.6	-	0.0
2022	0.6	0.9	0.7	1.3	0.5	0.0	9.4	0.2	-	0.1	0.0	0.1	0.0	1.8	29.5	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

GRASS SPECIES	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency			
1997	143	-	-	5
2002	66	23	14	-
2007	130	1	16	9
2012	65	9	10	26
2017	204	10	45	37
2022	141	10	28	68
year	Average Cover (%)			
1997	3.7	-	-	0.0
2002	0.8	0.2	0.2	-
2007	1.5	0.0	0.4	0.8
2012	1.6	0.6	0.8	2.9
2017	8.6	0.9	1.6	3.1
2022	4.9	0.8	0.7	5.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-34.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Anthriscus caucalis ^{ai} (bur chervil)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Brassicaceae ^a (mustard family)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Convolvulus arvensis ^{mi} (field bindweed)	Crepis acuminata (tapertip hawksbeard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Erodium cicutarium ^{mi} (redstem stork's bill)	Galium aparine ^a (stickywilly)
year	Nested Frequency																
1997	-	1	-	5	271	3	15	4	3	-	3	-	-	3	66	3	3
2002	-	-	-	0	167	-	2	2	-	-	7	-	-	1	-	9	5
2007	-	1	-	-	85	-	4	1	-	-	3	-	-	3	129	51	1
2012	-	-	-	-	108	-	-	-	-	-	22	1	-	-	94	52	-
2017	3	-	-	-	103	-	43	-	-	4	23	0	-	-	32	218	25
2022	5	0	7	-	92	-	31	-	10	2	38	0	9	5	25	212	40
year	Average Cover (%)																
1997	-	0.0	-	0.0	34.1	0.0	0.0	0.0	0.0	-	0.2	-	-	0.0	1.5	0.0	0.0
2002	-	-	-	0.0	28.3	-	0.0	0.0	-	-	0.1	-	-	0.0	-	0.0	0.0
2007	-	0.0	-	-	4.3	-	0.0	0.2	-	-	0.0	-	-	0.0	8.2	1.2	0.0
2012	-	-	-	-	13.7	-	-	-	-	-	0.2	0.0	-	-	1.9	0.2	-
2017	0.0	-	-	-	14.2	-	0.4	-	-	0.0	1.5	0.0	-	-	0.3	17.2	0.6
2022	0.0	0.0	1.0	-	9.9	-	0.1	-	0.0	0.0	0.9	0.0	0.0	0.4	0.3	15.9	1.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Medicago sativa ^a (alfalfa)	Phlox longifolia (longleaf phlox)	Plantago patagonica ^a (woolly plantain)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sanguisorba minor ^a (small burnet)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)
year	Nested Frequency																
1997	-	-	-	10	9	9	30	9	-	-	107	15	-	-	3	4	1
2002	-	7	-	0	1	-	29	14	-	4	22	-	0	-	-	12	-
2007	106	-	-	-	4	-	38	27	12	-	30	-	-	-	-	12	-
2012	27	3	0	6	7	-	20	27	16	-	7	-	-	-	1	49	-
2017	1	32	2	21	5	-	20	30	34	-	-	15	-	-	-	10	-
2022	-	16	4	5	14	1	10	28	41	-	-	3	-	0	1	11	-
year	Average Cover (%)																
1997	-	-	-	0.0	0.1	0.0	0.7	0.0	-	-	2.2	0.1	-	-	0.0	0.1	0.1
2002	-	0.0	-	0.0	0.0	-	0.6	0.1	-	0.0	0.5	-	0.0	-	-	0.1	-
2007	3.3	-	-	-	0.0	-	1.4	0.2	0.0	-	0.5	-	-	-	-	0.1	-
2012	0.3	0.0	0.0	0.0	0.1	-	1.2	0.1	0.4	-	0.1	-	-	-	0.0	0.2	-
2017	0.0	0.1	0.0	0.1	0.3	-	1.0	0.4	1.5	-	-	0.1	-	-	-	0.2	-
2022	-	0.1	0.0	0.0	0.7	0.0	0.6	0.3	1.1	-	-	0.3	-	0.0	0.0	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES		
Veronica biloba ⁱⁱ (two-lobed speedwell)		
Zigadenus paniculatus (foothill deathcamas)		
year	Nested Frequency	
1997	-	-
2002	-	-
2007	-	1
2012	-	-
2017	2	1
2022	14	2
year	Average Cover (%)	
1997	-	-
2002	-	-
2007	-	0.0
2012	-	-
2017	0.0	0.0
2022	0.1	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-34.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)					
Gutierrezia sarothrae (broom snakeweed)					
Purshia tridentata ^p (antelope bitterbrush)					
Quercus gambelii ^p (Gambel oak)					
Rhus trilobata ^p (skunkbush sumac)					
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	9	-	3.6	1.8	-
2012	12.8	0.4	4.1	2.4	-
2017	9.8	0.4	6.1	2.6	-
2022	8.3	-	2.4	2.1	-
year	Quadrat Cover (%)				
1997	0.2	-	0.0	1.5	0.1
2002	1.7	-	0.9	1.5	0.1
2007	5.4	0.0	1.1	0.9	0.0
2012	12.1	0.3	3.0	2.9	-
2017	10.1	0.4	2.7	0.0	-
2022	10.1	0.0	1.4	0.2	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-34.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

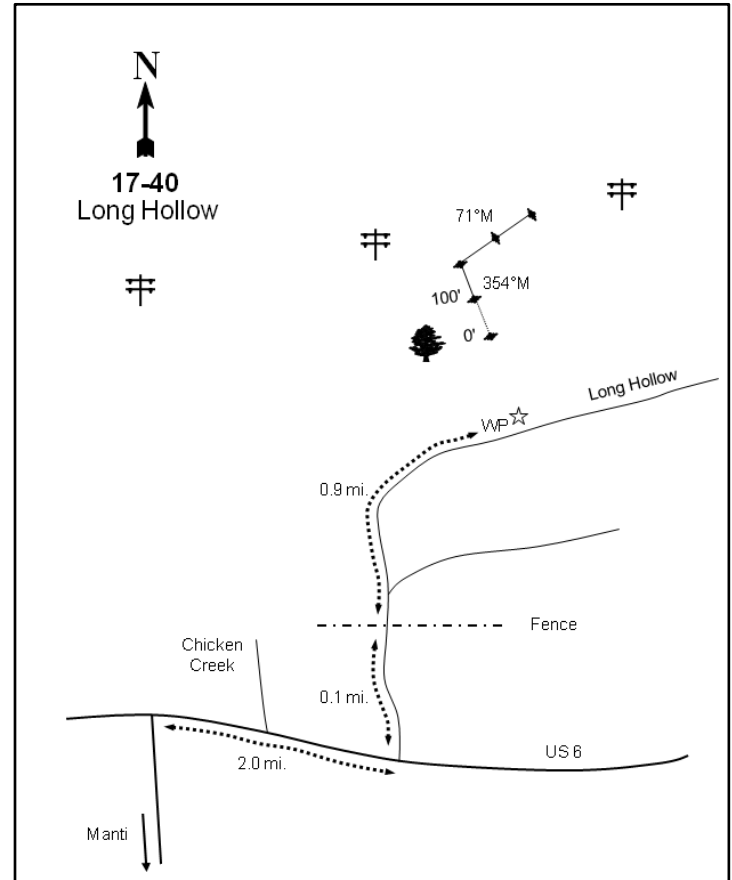
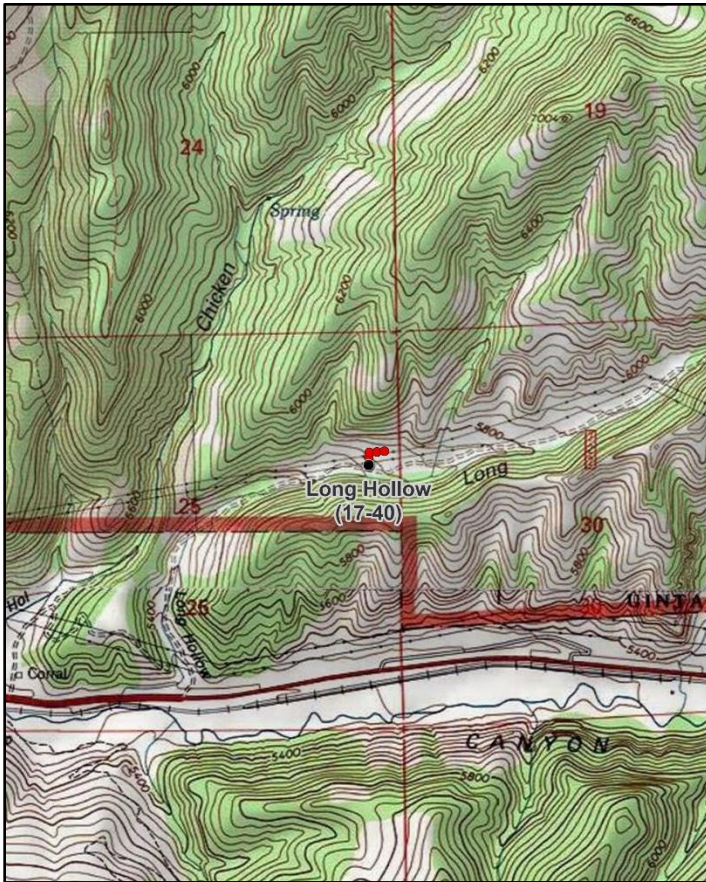
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	220	200	100	0	0	0	0	0	32/46
2002	440	20	0	100	0	5	0	0	52/72
2007	580	1600	24	72	3	0	0	0	77/134
2012	2000	1620	13	86	1	1	0	1	61/91
2017	2940	-	22	69	8	2	0	8	55/79
2022	2200	2540	10	63	27	30	39	27	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	26/41
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	35/58
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	34/48
2007	40	20	50	50	0	0	0	0	29/35
2012	200	-	0	100	0	0	0	0	23/39
2017	320	120	25	75	0	0	0	0	29/31
2022	20	160	0	100	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	120	-	83	17	0	83	0	0	25/29
2002	140	-	0	100	0	57	43	0	42/98
2007	140	-	0	86	14	29	29	14	96/178
2012	160	-	13	88	0	0	0	13	83/160
2017	520	-	8	92	0	35	35	0	77/141
2022	180	-	0	89	11	67	22	11	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	280	-	100	0	0	0	0	0	- / -
2002	360	-	33	67	0	0	0	0	118/97
2007	180	340	0	100	0	56	0	0	130/93
2012	260	-	46	54	0	0	0	0	172/145
2017	80	-	0	100	0	0	0	0	158/140
2022	-	-	-	-	-	-	-	-	- / -
Rhus trilobata^p -- (skunkbush sumac)									
1997	40	-	0	100	0	0	0	0	- / -
2002	40	-	50	50	0	50	50	0	37/77
2007	20	-	0	100	0	0	100	0	74/172
2012	-	-	-	-	-	-	-	-	106/270
2017	20	-	0	100	0	0	0	0	75/96
2022	20	-	0	0	100	0	100	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-34.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	1.8	0.0	0.0	8.9	-0.4	10.0	-2.0	18.3	Very Poor
2002	5.1	0.0	0.0	4.2	-0.2	10.0	-2.0	17.2	Very Poor
2007	18.5	13.3	7.5	9.7	-1.1	10.0	-2.0	55.9	Poor-Fair
2012	24.6	14.8	8.5	16.7	-2.5	10.0	-4.0	68.1	Fair-Good
2017	24.0	13.7	7.2	30.0	-6.4	10.0	-4.0	74.5	Good
2022	16.1	6.6	3.2	30.0	-8.4	10.0	-4.0	53.5	Poor-Fair

LONG HOLLOW - STUDY NO. 17-40

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Billies Mountain SE; Township 9S, Range 4E, Section 25
NAD 83 UTM ZONE 12, 463842 East 4428341 North

Transect Information

Browse Tag # (0' Stake)	3946
Transect Bearing	354° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Beginning at the intersection of Highway 6 and Long Hollow Road, proceed northerly up Long Hollow for 0.10 miles to a fork. At the fork, stay to the left and proceed an additional 0.90 miles up Long Hollow to a green steel "T" fencepost on the left (north) side of the road. From the stake, the 0-foot marker of the baseline is 15 feet to the north. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3946, is attached to the 0-foot baseline stake. High tension power lines run above the study site.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	5,700ft (1,737m)
Aspect	South
Slope	5-15%
Sample Dates	06/09/1997, 06/05/2002, 06/26/2007, 07/12/2012, 07/07/2017, 07/07/2022

Table 17-40.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Other - Powerline	-	-	Prior to 1997	-

Wildlife Habitat and Vegetation History**Table 17-40.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-40.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Mountain Big Sagebrush/Bulbous Bluegrass/Annual Grass	Phase I
2022	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I

Site Notes

Long Hollow is a narrow canyon that drains directly into the Spanish Fork River; the nearest perennial source of water is Soldier Creek which is approximately one mile south of the study site. A portion of the baseline passes beneath a high-tension powerline.

Soils**Table 17-40.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	51.5	26.7	21.8	2.8	10.6	166.4	0.7	06/09/1997

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1983. However, density and cover of mountain big sagebrush have steadily decreased since 2002 (Photos, Table 17-40.12, Table 17-40.13). The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) is the most abundant herbaceous species in the understory and has been a co-dominant vegetation component since 1997; other perennial species are diverse, but not as common. The introduced annual grass cheatgrass (*Bromus tectorum*) have been observed in fluctuating amounts, and was another co-dominant component in the 2017 sample year (Table 17-40.10). Although diverse, forbs have generally not been very abundant (Table 17-40.7). The noxious and introduced annual forb species gypsyflower (*Cynoglossum officinale*) and perennial species whitetop (*Cardaria draba*) were present in the past, but were not observed in 2017 or 2022 (Table 17-40.11). Utah juniper (*Juniperus osteosperma*) trees were observed with low density in 2022 and the site has been considered to be to within Phase I of woodland succession since 1983. Photos show that trees are more prevalent in the immediate surrounding area, indicating that this site may become infilled in the future (Photos, Table 17-40.4, Table 17-40.14).

Trend Summary Tables**Table 17-40.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.3	1.0	1.0	-	-	-
2002	10.6	2.0	2.7	-	-	-
2007	8.0	3.4	-	8.7	1.7	-
2012	9.9	3.0	-	12.0	3.7	-
2017	6.6	5.6	-	8.5	8.1	-
2022	5.1	0.1	-	5.0	0.3	-

Table 17-40.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	340	376	191	273	7.9	22.7	1.9	12.1
2002	110	440	16	246	0.7	32.0	0.2	8.3
2007	152	454	38	221	0.8	36.2	0.5	8.2
2012	91	461	47	241	0.5	41.2	0.7	6.2
2017	287	408	191	161	12.1	29.7	9.9	6.4
2022	258	441	216	206	5.1	32.7	9.6	14.9

Table 17-40.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	1.5	3.5	49.6	2.4	17.0	48.4
2002	2.1	2.2	37.4	1.4	17.5	57.3
2007	2.7	0.5	30.9	1.6	19.3	54.9
2012	0.2	0.2	49.2	0.8	18.5	64.2
2017	2.6	0.1	54.3	1.0	17.8	59.2
2022	2.1	0.7	48.0	2.5	16.1	56.7

Table 17-40.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	32	63	-	-
2002	2	51	15	-	-
2007	10	38	15	-	1
2012	2	6	-	11	-
2017	11	17	21	-	-
2022	3	31	5	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	10.2 (25.1)	87.1 (215.2)	23.4 (57.9)	-	-
2007	5.8 (14.3)	30.8 (76.1)	48.9 (120.8)	-	-
2012	-	-	-	13.4 (33.0)	-
2017	-	17.4 (43.0)	12.8 (31.5)	-	-
2022	0.7 (1.8)	30.2 (74.5)	8.7 (21.5)	-	-

Table 17-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca (fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency												
1997	-	31	-	-	340	-	13	280	19	6	38	73	42
2002	-	41	7	-	108	3	-	375	22	39	41	89	60
2007	1	55	11	-	143	6	-	362	-	21	74	56	88
2012	-	57	6	22	87	1	-	448	-	5	67	65	74
2017	-	38	3	4	284	3	-	379	-	9	51	23	68
2022	-	52	16	0	252	16	-	361	-	-	88	17	96
year	Average Cover (%)												
1997	-	2.0	-	-	7.9	-	0.0	14.1	0.3	0.0	1.7	1.9	2.8
2002	-	1.4	0.0	-	0.7	0.1	-	23.2	0.1	0.4	2.2	0.9	3.6
2007	0.0	3.1	0.0	-	0.8	0.1	-	19.0	-	0.5	2.7	1.0	9.7
2012	-	1.6	0.0	0.4	0.5	0.0	-	33.8	-	0.1	1.9	1.2	2.1
2017	-	0.9	0.0	0.4	12.1	0.4	-	22.8	-	0.2	2.0	0.2	2.8
2022	-	1.3	0.1	0.1	5.1	0.7	-	18.8	-	-	3.7	1.0	7.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-40.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cardaria draba ^{ai} (whitetop)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cymopterus (springparsley)	Cynoglossum officinale ^{ai} (gypsy flower)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)
year	Nested Frequency																
1997	11	75	-	3	93	4	3	19	30	1	6	10	-	2	1	-	2
2002	-	-	2	4	84	-	-	1	37	1	3	15	-	2	-	-	-
2007	3	1	1	3	140	-	1	8	10	-	-	5	5	2	0	2	-
2012	-	-	-	-	153	-	4	-	16	-	-	12	-	1	-	-	-
2017	-	-	-	4	109	-	-	6	-	-	-	2	-	5	-	-	-
2022	-	-	-	4	179	-	-	-	-	-	-	5	2	2	-	3	-
year	Average Cover (%)																
1997	0.0	0.2	-	0.0	2.8	0.0	0.1	0.1	2.3	0.0	0.0	0.5	-	0.0	0.1	-	0.0
2002	-	-	0.0	0.0	2.4	-	-	0.0	1.0	0.0	0.0	0.5	-	0.0	-	-	-
2007	0.0	0.0	0.0	0.1	4.4	-	0.0	0.6	0.0	-	-	0.1	0.0	0.0	0.0	0.0	-
2012	-	-	-	-	3.5	-	0.1	-	0.3	-	-	0.3	-	0.0	-	-	-
2017	-	-	-	0.1	3.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-	-
2022	-	-	-	0.2	12.6	-	-	-	-	-	-	0.5	0.0	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Erigeron divergens ^a (spreading fleabane)	Erigeron flagellaris (trailing fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Helianthus annuus ^{ai} (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)	Lactuca tatarica var. pulchella ^a (blue lettuce)	Lithospermum incisum (narrowleaf stone seed)	Lithospermum ruderale (western stone seed)	Medicago sativa ⁱ (alfalfa)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
1997	1	-	19	-	2	74	-	116	2	-	21	0	-	2	0	10	10
2002	-	-	2	-	3	7	-	45	1	-	-	0	-	6	-	8	-
2007	-	3	11	-	4	16	-	29	-	-	-	-	0	5	-	1	-
2012	-	-	27	-	5	12	-	11	-	-	5	3	-	18	1	7	-
2017	-	-	-	-	3	188	2	7	-	1	-	8	-	12	-	10	-
2022	-	-	1	4	3	206	-	-	-	11	-	-	1	3	-	12	-
year	Average Cover (%)																
1997	0.0	-	0.4	-	0.0	0.6	-	2.5	0.0	-	0.1	0.0	-	0.5	0.0	0.0	0.0
2002	-	-	0.0	-	0.0	0.0	-	0.8	0.0	-	-	0.0	-	0.8	-	0.0	-
2007	-	0.0	0.4	-	0.2	0.1	-	1.3	-	-	-	-	0.1	0.4	-	0.0	-
2012	-	-	0.5	-	0.2	0.1	-	0.4	-	-	0.0	0.0	-	0.5	0.0	0.0	-
2017	-	-	-	-	0.2	9.4	0.0	0.1	-	0.0	-	0.0	-	1.7	-	0.0	-
2022	-	-	0.0	0.0	0.1	8.9	-	-	-	0.3	-	-	0.0	0.4	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency				
1997	3	118	-	44	-
2002	-	122	-	3	1
2007	-	96	1	3	1
2012	-	84	-	5	-
2017	7	43	-	4	-
2022	3	42	-	1	-
year	Average Cover (%)				
1997	0.0	3.1	-	0.4	-
2002	-	2.7	-	0.2	0.0
2007	-	0.7	0.0	0.0	0.0
2012	-	1.0	-	0.0	-
2017	0.4	0.8	-	0.0	-
2022	0.2	1.0	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-40.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. tridentata ^p (basin big sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	-	4.9	0.7	-	3.1	1.7	-	-
2012	-	6.5	0.8	0.2	4.7	3.4	-	0.1
2017	-	5	0.9	0.3	2.6	7.7	-	0.1
2022	-	2.6	0.4	0.3	2	-	-	-
year	Quadrat Cover (%)							
1997	3.1	4.1	0.2	-	3.8	1.0	1.0	0.0
2002	1.2	7.3	0.2	-	1.9	1.9	2.7	0.1
2007	1.0	3.9	0.1	-	3.0	3.4	-	-
2012	0.0	7.4	0.7	0.0	1.8	3.0	-	0.0
2017	-	4.7	0.2	0.0	1.6	5.5	-	0.1
2022	-	3.6	0.4	0.0	1.2	-	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-40.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. tridentata^p -- (basin big sagebrush)									
1997	460	-	9	74	17	13	0	9	84/106
2002	180	-	0	0	100	44	0	89	151/115
2007	40	-	0	100	0	50	0	50	158/169
2012	60	-	0	100	0	0	0	0	73/109
2017	20	-	0	0	100	0	100	0	118/142
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	880	80	9	84	7	59	0	0	68/105
2002	1240	-	13	40	47	34	16	14	66/82
2007	940	20	2	70	28	30	6	35	70/98
2012	800	20	8	68	25	18	0	18	83/108
2017	740	-	3	70	27	32	24	27	63/88
2022	660	-	0	61	39	55	3	46	-/-
Atriplex canescens^p -- (fourwing saltbush)									
1997	200	-	10	90	0	0	90	0	76/81
2002	280	-	0	50	50	29	7	21	46/57
2007	140	-	0	86	14	43	0	0	77/110
2012	180	-	11	67	22	67	0	22	59/70
2017	140	-	0	100	0	0	14	0	68/72
2022	120	-	0	83	17	67	0	50	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	0	100	0	0	0	0	35/47
2002	40	-	0	50	50	0	0	50	35/46
2007	20	-	0	100	0	0	0	100	40/54
2012	60	-	0	100	0	0	0	0	47/70
2017	40	-	0	100	0	0	0	0	48/70
2022	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	1060	-	9	77	13	36	17	11	84/91
2002	900	-	9	36	56	38	2	33	53/58
2007	680	-	3	79	18	3	0	12	65/78
2012	640	-	3	94	3	0	0	25	77/107
2017	480	-	0	83	17	0	0	13	65/79
2022	200	-	0	50	50	0	0	50	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	3840	200	54	43	3	0	0	1	27/26
2002	4620	-	2	81	17	0	0	8	21/23
2007	4720	-	10	86	3	0	0	4	26/31
2012	5000	700	46	53	2	0	0	0	28/38
2017	4000	-	2	98	0	0	0	0	32/39
2022	20	-	0	100	0	0	0	0	- / -
Juniperus osteosperma^t -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	- / -
2002	40	-	50	50	0	50	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
1997	180	-	22	78	0	0	0	0	16/21
2002	240	-	8	92	0	0	0	0	12/26
2007	180	20	22	78	0	0	0	22	16/33
2012	240	-	0	100	0	0	0	0	16/39
2017	340	-	0	94	6	0	0	24	13/29
2022	200	-	10	90	0	0	0	0	- / -
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	128/194
2012	-	-	-	-	-	-	-	-	167/249
2017	-	-	-	-	-	-	-	-	100/141

t - Tree Species; p - Preferred Browse; i - Introduced Species

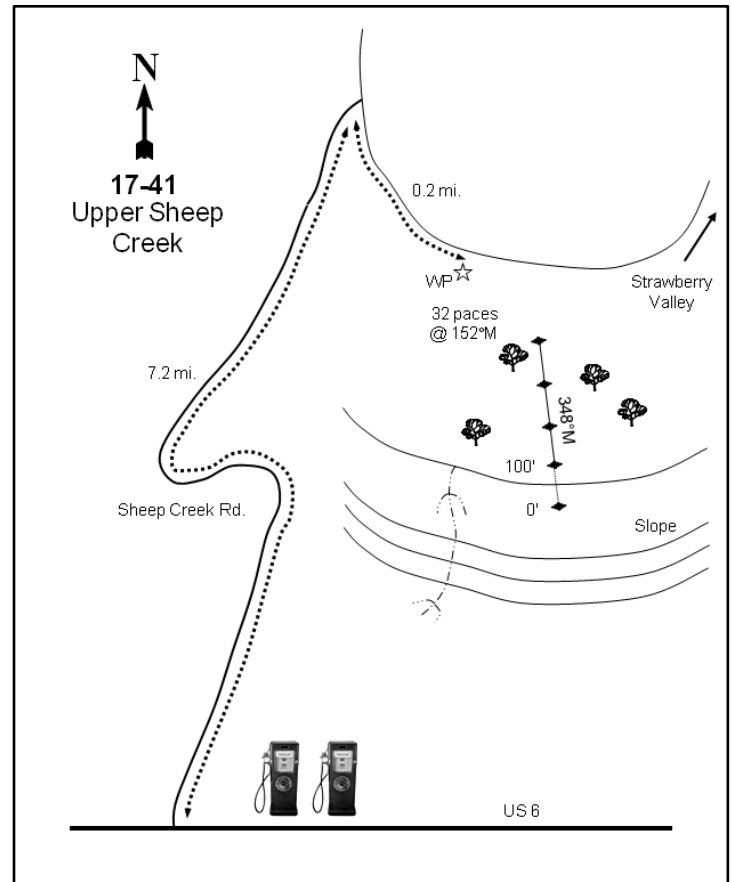
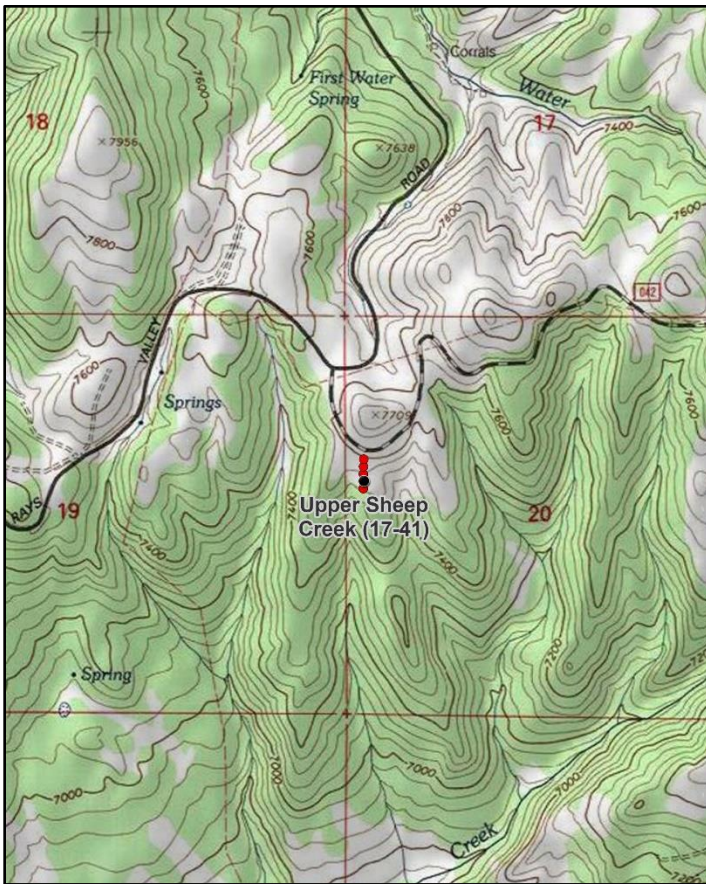
Table 17-40.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2022	1	-	-	100	-	-	5.0

Table 17-40.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	14.1	11.4	4.5	17.3	-5.9	10.0	-4.0	47.3	Poor
2002	13.3	-1.3	5.2	17.6	-0.5	10.0	-2.0	42.3	Poor
2007	10.9	8.1	1.1	30.0	-0.6	10.0	-4.0	55.5	Poor-Fair
2012	15.0	10.1	3.0	14.7	-0.4	10.0	-2.0	50.4	Poor
2017	10.6	8.7	0.8	13.8	-9.0	10.0	0.0	34.9	Very Poor
2022	6.3	0.0	0.0	27.9	-3.9	10.0	0.0	40.3	Very Poor-Poor

UPPER SHEEP CREEK - STUDY NO. 17-41

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Rays Valley SE; Township 9S, Range 6E, Section 20
NAD 83 UTM ZONE 12, 476139 East 4430595 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

178
168° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

Beginning at the intersection of Sheep Creek Road and Rays Valley Road, proceed northerly up Rays Valley Road for 7.2 miles to an intersection (0.20 miles past a cattle guard). Turn right at the intersection and proceed easterly for 0.60 miles to another intersection. Turn right at the intersection and continue for 0.10 miles to a "Y" in the road. Take the left side of the "Y" and proceed another 0.10 miles to a faint road to the right. Turn right onto the faint road and continue 0.10 miles to a green steel "T" fencepost on the left-hand (south) side of the road. From the stake, the 0-foot stake of the baseline is 32 paces away at an azimuth of 152 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	7,550ft (2,301m)
Aspect	South
Slope	12-40%
Sample Dates	06/11/1997, 06/17/2002, 06/28/2007, 07/11/2012, 07/05/2017, 07/06/2022

Table 17-41.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Tank Hollow	-	2017	11067

Wildlife Habitat and Vegetation History**Table 17-41.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	substantial	spring/fall
Shiras Moose	substantial	winter

Table 17-41.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Bitterbrush	Phase I
2007	Mountain Big Sagebrush/Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Bitterbrush	Phase I
2017	Mountain Big Sagebrush/Bitterbrush	Phase I
2022	Yellow Rabbitbrush/Perennial Grass	No Encroachment

Site Notes

The study area drains into Sheep Creek, but is near the divide with First Water Creek; both creeks are located within 1.1 miles of the study.

Soils**Table 17-41.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	6.6	31.4	22.7	45.9	4.3	17.6	384.0	0.5	06/11/1997

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Clay (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA403UT
States and Transitions	No state and transition model is available for this ecological site.

This site remained in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) plant community type from study establishment in 1983 until the Tank Hollow wildfire removed much of the preferred browse component in 2017 (Table 17-41.1). Other preferred browse species that contributed to the sites diversity included Utah serviceberry (*Amelanchier utahensis*), longflower rabbitbrush (*Chrysothamnus depressus*), and Woods' rose (*Rosa woodsii*). Utah juniper (*Juniperus osteosperma*) was also present in 2017 (mainly on line 1), placing the site in Phase I of woodland succession, but the wildfire removed the trees (Photos, Table 17-41.4, Table 17-41.12, Table 17-41.13, Table 17-41.14). Despite the 2017 wildfire, the herbaceous understory has remained diverse and abundant, with perennial grasses and forbs contributing the most cover (Table 17-41.7, Table 17-41.10, Table 17-41.11).

Trend Summary Tables

Table 17-41.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	33.1	9.7	0.0	-	-	-
2002	42.1	10.8	1.6	46.5	11.8	2.3
2007	31.5	8.0	1.3	40.1	12.5	3.9
2012	27.6	7.4	2.1	49.1	9.9	4.1
2017	30.4	6.8	2.8	40.9	8.8	3.8
2022	10.1	14.4	0.1	14.5	10.7	-

Table 17-41.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	7	306	207	283	0.0	11.8	2.3	9.2
2002	3	306	171	247	0.0	10.6	1.1	7.6
2007	10	319	145	250	0.1	10.6	0.8	8.2
2012	-	302	38	174	-	12.1	0.2	4.1
2017	-	335	148	248	-	9.3	3.1	6.9
2022	55	275	164	267	0.5	15.9	2.1	9.5

Table 17-41.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.1	0.2	54.5	4.9	2.8	54.8
2002	13.5	0.0	47.8	2.0	4.4	60.1
2007	16.7	0.0	36.1	3.3	3.2	54.1
2012	17.0	-	54.5	0.8	5.2	48.9
2017	13.3	0.1	56.9	5.9	4.5	53.1
2022	36.7	-	21.0	12.9	8.7	45.0

Table 17-41.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	6	33	5	-
2002	2	23	3	2
2007	1	23	2	6
2012	2	12	7	-
2017	1	32	3	4
2022	4	15	12	2
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	13.1 (32.3)	46.2 (114.2)	2.7 (6.6)	-
2007	11.6 (28.7)	65.7 (162.2)	11.4 (28.1)	-
2012	3.6 (9.0)	40.9 (101.0)	10.7 (26.5)	-
2017	9.4 (23.3)	14.1 (34.8)	-	-
2022	11.6 (28.7)	30.8 (76.1)	10.7 (26.5)	-

Table 17-41.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achatherum hymenoides (Indian ricegrass)	Achatherum lettermanii (Letterman's needlegrass)	Achatherum nelsonii (Columbia needlegrass)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Phleum pratense ⁱ (timothy)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency															
1997	4	16	-	57	7	1	-	10	2	14	-	10	119	14	1	186
2002	4	27	-	63	3	-	-	-	5	-	-	-	57	30	3	212
2007	17	15	-	62	10	5	0	1	19	3	-	-	71	30	14	172
2012	7	8	-	69	-	7	-	-	-	1	-	-	20	-	20	229
2017	20	59	-	70	-	5	4	-	12	2	-	-	71	48	28	173
2022	16	8	4	98	55	5	4	-	5	2	2	-	21	2	9	150
year	Average Cover (%)															
1997	0.2	0.2	-	1.7	0.0	0.0	-	0.4	0.0	0.2	-	0.2	3.5	0.4	0.0	5.0
2002	0.1	0.6	-	2.3	0.0	-	-	-	0.0	-	-	-	0.9	0.8	0.0	6.0
2007	0.5	0.1	-	2.2	0.1	0.0	0.0	0.0	0.4	0.0	-	-	2.1	1.0	0.8	3.5
2012	0.3	0.1	-	2.1	-	0.2	-	-	-	0.0	-	-	0.4	-	0.8	8.3
2017	0.2	0.9	-	1.6	-	0.1	0.0	-	0.3	0.0	-	-	1.3	1.3	0.4	3.2
2022	1.0	0.5	0.3	3.9	0.5	0.0	0.0	-	0.3	0.0	0.0	-	1.0	0.0	0.2	8.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-41.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Amaranthus ^{ai} (pigweed)	Androsace septentrionalis ^{ai} (pygmyflower rockjasmine)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Cirsium (thistle)	Cirsium vulgare ^{ai} (bull thistle)
year	Nested Frequency																
1997	5	36	117	-	-	2	-	-	61	-	15	20	2	-	-	9	-
2002	6	6	57	11	-	-	3	-	37	1	8	-	-	4	-	4	-
2007	3	15	121	-	-	-	-	5	22	2	18	-	1	-	-	2	-
2012	-	2	-	-	-	-	-	-	-	-	20	1	-	-	-	3	-
2017	-	-	60	1	-	-	5	-	23	3	13	8	-	3	-	2	-
2022	-	35	121	-	3	-	5	-	-	-	8	3	-	3	5	2	0
year	Average Cover (%)																
1997	0.0	0.2	1.1	-	-	0.0	-	-	1.6	-	1.1	0.1	0.1	-	-	0.2	-
2002	0.0	0.0	0.1	0.0	-	-	0.1	-	0.6	0.0	1.1	-	-	0.0	-	0.0	-
2007	0.0	0.2	0.5	-	-	-	-	0.0	0.7	0.0	1.5	-	0.0	-	-	0.0	-
2012	-	0.0	-	-	-	-	-	-	-	-	1.4	0.0	-	-	-	0.0	-
2017	-	-	0.3	0.0	-	-	0.1	-	0.3	0.1	0.8	0.0	-	0.0	-	0.0	-
2022	-	0.2	2.4	-	0.0	-	0.0	-	-	-	1.4	0.0	-	0.2	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cynoglossum officinale ^{ami} (gypsyflower)	Descurainia pinnata ^a (western tansymustard)	Dracocephalum (dragonhead)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Madia glomerata ^a (mountain tarweed)
year	Nested Frequency																
1997	94	40	-	-	-	-	-	28	-	3	18	14	-	-	-	4	-
2002	107	16	-	1	-	-	-	40	8	1	7	6	-	6	4	2	-
2007	137	52	-	-	-	-	-	19	2	8	2	5	-	3	-	14	-
2012	13	41	-	2	4	-	-	12	-	26	-	4	-	16	-	1	-
2017	25	65	2	2	-	-	-	49	-	2	1	12	-	-	-	1	-
2022	120	24	5	-	24	4	2	12	-	-	-	-	8	-	-	4	1
year	Average Cover (%)																
1997	0.3	0.2	-	-	-	-	-	1.2	-	0.1	0.1	0.4	-	-	-	0.0	-
2002	0.4	0.1	-	0.0	-	-	-	1.1	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-
2007	0.7	0.8	-	-	-	-	-	0.9	0.0	0.1	0.0	0.0	-	0.0	-	0.1	-
2012	0.0	0.5	-	0.0	0.1	-	-	0.4	-	0.4	-	0.0	-	0.1	-	0.0	-
2017	0.1	1.0	0.0	0.0	-	-	-	1.9	-	0.0	0.0	0.1	-	-	-	0.0	-
2022	1.4	0.1	0.1	-	0.2	0.0	0.0	0.4	-	-	-	-	0.1	-	-	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Orobancha fasciculata (clustered broomrape)	Orthocarpus tolmiei ^a (Tolmie's owl's-clover)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Stanleya pinnata (desert princesplume)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow safsify)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1997	34	60	45	7	43	56	62	-	-	1	-	29	-	46	15
2002	-	57	68	28	64	-	23	4	-	-	4	40	-	7	2
2007	-	4	57	26	36	-	8	-	-	2	1	36	-	-	-
2012	-	4	12	34	32	-	-	-	-	-	2	30	-	-	-
2017	3	94	52	18	50	7	44	-	-	-	5	44	-	-	-
2022	-	-	3	0	105	50	6	8	10	-	8	63	2	1	-
year	Average Cover (%)														
1997	0.6	1.3	1.0	0.1	0.2	0.2	0.5	-	-	0.0	-	0.7	-	0.1	0.1
2002	-	0.4	1.8	0.6	0.3	-	0.3	0.1	-	-	0.1	1.2	-	0.0	0.0
2007	-	0.0	1.9	0.4	0.3	-	0.1	-	-	0.0	0.0	0.6	-	-	-
2012	-	0.0	0.2	0.5	0.2	-	-	-	-	-	0.0	0.4	-	-	-
2017	0.0	2.4	1.3	0.1	0.3	0.0	0.5	-	-	-	0.0	0.4	-	-	-
2022	-	-	0.0	0.0	1.4	0.3	0.0	0.0	0.6	-	0.2	2.3	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-41.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	2.4	17.3	-	9.5	0.6	2.3	1.7	18.8	0.6	7.4
2007	0.8	12.2	-	10.2	1	3.9	1.3	13.2	1.1	12.8
2012	1.6	15.2	-	8.9	0.1	4.1	0.9	18.2	1.1	13
2017	2.5	12.6	-	8.2	-	3.8	0.6	18.2	1.4	6.2
2022	0.4	-	-	8.9	-	-	1.8	0.2	1.4	12.5
year	Quadrat Cover (%)									
1997	1.7	12.1	-	7.7	-	0.0	1.9	11.7	1.0	6.6
2002	2.0	17.1	-	9.4	0.0	1.6	1.4	14.7	0.7	7.5
2007	1.1	11.1	-	7.0	0.0	1.3	0.9	10.1	0.8	8.4
2012	1.2	8.2	-	6.8	0.0	2.1	0.6	11.2	0.6	6.4
2017	1.4	9.6	0.0	5.9	-	2.8	0.9	13.0	1.0	5.5
2022	0.5	-	-	12.4	-	0.1	2.0	0.1	1.0	8.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-41.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	540	140	15	85	0	30	4	0	77/91
2002	800	-	35	55	10	43	13	5	84/83
2007	600	40	7	90	3	37	23	0	80/69
2012	640	-	25	75	0	34	0	6	75/72
2017	700	-	17	83	0	29	14	0	78/72
2022	60	20	33	67	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2160	-	10	77	13	22	5	7	78/105
2002	2200	20	3	67	30	21	4	10	80/94
2007	1940	20	2	66	32	40	12	25	77/96
2012	1920	-	4	69	27	47	32	52	98/102
2017	2120	-	3	74	24	31	7	18	80/98
2022	20	-	0	100	0	0	0	0	- / -
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	16/39
2007	20	-	0	100	0	0	0	0	13/33
2012	-	-	-	-	-	-	-	-	21/39
2017	60	-	0	100	0	0	0	0	15/35
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	5000	-	2	98	0	0	0	0	32/47
2002	8720	20	2	93	5	1	0	2	29/38
2007	7220	-	3	97	0	0	0	0	27/42
2012	4720	-	0	97	3	0	0	35	27/40
2017	7260	-	3	97	0	0	0	0	27/38
2022	5060	-	8	83	9	1	0	12	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1997	840	20	7	93	0	0	0	0	16/24
2002	1620	-	5	95	0	0	0	0	22/27
2007	1020	-	0	100	0	28	0	0	15/30
2012	260	-	8	92	0	85	0	8	8/27
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	20	-	100	0	0	0	0	0	291/266
2002	60	-	33	67	0	0	0	0	- / -
2007	40	-	50	50	0	0	0	0	- / -
2012	80	-	25	75	0	0	0	0	- / -
2017	60	-	33	67	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
1997	3640	20	16	84	0	0	0	0	10/14
2002	5480	-	2	97	2	0	0	10	7/11
2007	4640	-	9	91	1	0	0	1	8/9
2012	3940	-	5	95	0	0	0	4	8/12
2017	4520	-	2	98	0	0	0	0	8/10
2022	6480	-	11	89	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1997	1600	100	4	94	3	34	30	3	52/110
2002	1640	-	11	89	0	55	28	0	58/133
2007	1700	20	0	92	8	38	55	5	54/103
2012	2020	-	13	74	13	40	43	21	51/99
2017	1700	-	4	97	0	49	24	2	49/106
2022	20	-	0	100	0	0	0	0	- / -
Rosa woodsii^P -- (Woods' rose)									
1997	840	20	33	64	2	0	0	5	31/34
2002	700	-	17	83	0	0	0	0	33/34
2007	1180	-	0	100	0	0	0	0	24/22
2012	540	40	19	82	0	4	0	0	39/19
2017	1660	-	4	96	0	0	0	0	23/23
2022	1080	-	0	100	0	0	0	0	- / -
Sambucus nigra ssp. cerulea^P -- (blue elderberry)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	179/66
2017	-	-	-	-	-	-	-	-	149/121
2022	40	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
1997	4380	60	13	87	1	0	1	1	39/58
2002	5420	-	13	86	2	1	0	0	36/51
2007	4280	-	11	89	0	1	0	0	40/62
2012	8660	20	11	89	0	2	0	54	37/45
2017	8080	-	13	87	0	0	0	0	28/35
2022	3020	40	13	83	3	1	9	3	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

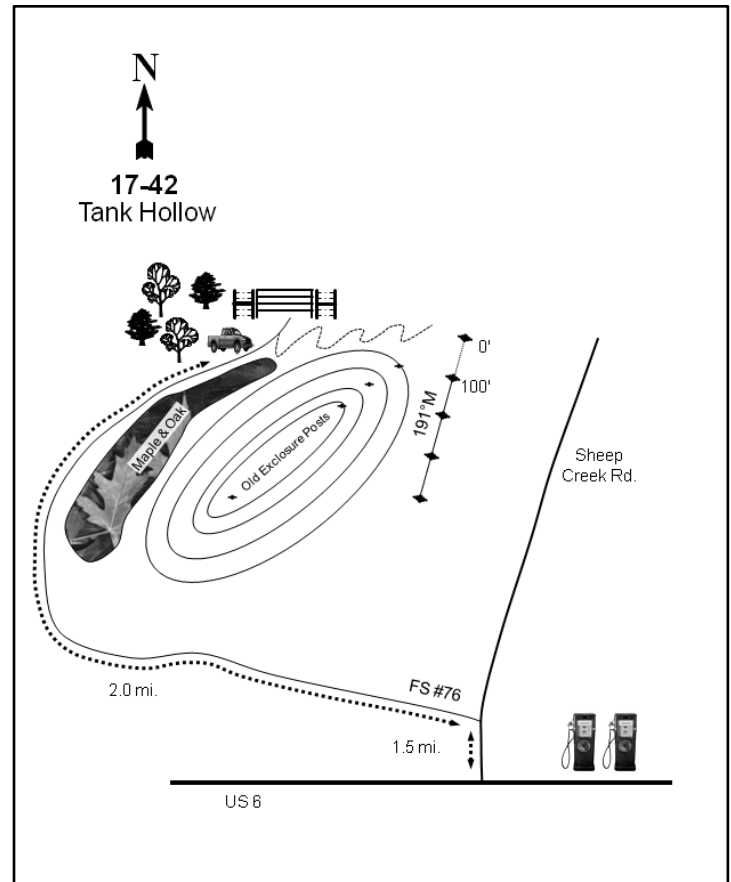
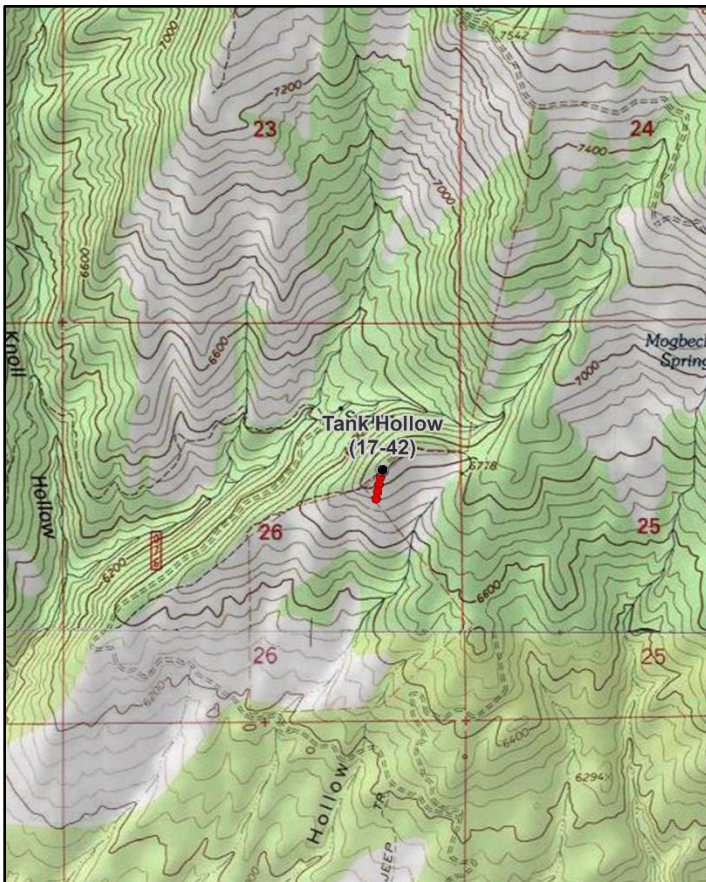
Table 17-41.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	17	-	-	20	30	50	21.8

Table 17-41.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	13.2	4.7	23.6	0.0	10.0	0.0	81.5	Good
2002	30.0	11.1	4.6	21.3	0.0	10.0	-2.0	75.0	Good
2007	30.0	11.2	2.1	21.2	-0.1	10.0	0.0	74.5	Good
2012	30.0	11.0	5.1	24.3	0.0	8.1	-2.0	76.5	Good
2017	30.0	12.8	2.8	18.7	0.0	10.0	-2.0	72.3	Good
2022	15.2	14.1	6.1	30.0	-0.4	10.0	-2.0	73.1	Good

TANK HOLLOW - STUDY NO. 17-42

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Rays Valley SW; Township 9S, Range 5E, Section 26
NAD 83 UTM ZONE 12, 471773 East 4428457 North

Transect Information

Browse Tag # (0' Stake)	719
Transect Bearing	191° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 5: 3ft

Directions to Site

Turn north off of Highway US-6 (near milepost 195) onto the new Sheep Creek Road. Continue 1.5 miles on the paved road to an intersection with Forest Service road #076. From the intersection with the FS road, drive approximately 2 miles to a large gate. Park near the gate and hike up the steep hill for about 900 feet to the site location. The 0-foot stake is marked with browse tag #719.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	6,840ft (2,085m)
Aspect	South
Slope	20%
Sample Dates	06/12/1997, 06/21/2002, 06/25/2007, 07/12/2012, 07/06/2017, 07/06/2022

Table 17-42.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Tank Hollow Habitat Improvement Project	658	July 2007-December 2008	1117
Seeding - Broadcast	Sheepcreek (Wasatch Mtns Unit) Big Game Winter Habitat Improvement FY 23 (Proposed)	5967	Spring-Fall 2023	2981
Seeding - Transplant	Sheepcreek (Wasatch Mtns Unit) Big Game Winter Habitat Improvement FY 23 (Proposed)	5967	Fall 2023	2981

Wildlife Habitat and Vegetation History**Table 17-42.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-42.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Bitterbrush	Phase I
1989	Mountain Big Sagebrush/Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Bitterbrush	Phase I
2007	Mountain Big Sagebrush/Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	Phase I
2017	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	Phase I
2022	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	Phase I

Site Notes

The nearest perennial water source is a spring located 1000 feet northwest of the site on the opposite side of the ridge.

Soils**Table 17-42.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	25.5	34.7	39.8	3.4	6.9	64.0	0.7	06/12/1997

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been the dominant shrub species on this site since 1983, although a number of other species are also present. Despite this, sagebrush cover has remained relatively stable over the sample period, density of sagebrush has decreased steadily since 2002. Utah juniper (*Juniperus osteosperma*) has been observed in all sample years, and increased in cover from study establishment through 2007; a lop and scatter treatment then removed many of the trees and cover decreased in 2012 (Photos, Table 17-42.1, Table 17-42.12, Table 17-42.13, Table 17-42.14). This site has been considered to be in Phase I of woodland succession throughout the study period (Table 17-42.4). Herbaceous species are diverse and the understory is abundant overall (Table 17-42.7). Perennial grasses, particularly crested wheatgrass (*Agropyron cristatum*), contribute the most herbaceous cover and became a co-dominant site component in 2012 (Table 17-42.10). Forbs have remained rare since 2002 (Table 17-42.11).

Trend Summary Tables**Table 17-42.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	27.2	4.0	2.5	-	-	-
2002	17.3	4.1	3.0	11.6	2.5	0.8
2007	8.7	4.2	3.6	11.5	3.3	3.6
2012	13.3	2.9	0.1	18.3	2.9	0.8
2017	12.7	3.7	0.4	18.2	3.9	-
2022	13.8	1.9	1.0	15.9	1.6	2.7

Table 17-42.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	79	211	234	320	0.9	11.0	1.7	16.1
2002	43	247	66	177	0.2	11.9	0.5	2.9
2007	94	355	102	130	1.5	15.8	0.4	3.1
2012	24	378	55	72	0.3	33.9	0.2	1.1
2017	10	397	165	119	0.4	28.9	1.3	2.1
2022	15	397	192	49	0.1	33.3	3.3	1.1

Table 17-42.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	11.9	0.3	53.1	1.7	4.2	52.6
2002	23.4	0.7	50.3	0.9	3.3	38.6
2007	24.4	0.3	41.0	1.6	3.5	42.4
2012	11.9	0.5	59.3	0.9	3.7	56.1
2017	13.5	0.9	63.4	3.1	4.6	50.5
2022	24.7	0.8	56.2	1.7	3.3	46.6

Table 17-42.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	38	36	1
2002	4	52	21	6
2007	3	31	33	4
2012	1	23	4	3
2017	-	36	1	12
2022	2	34	1	1
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	5.1 (12.6)	155.5 (384.0)	48.9 (120.8)	-
2007	2.2 (5.4)	21.5 (53.0)	46.2 (114.2)	-
2012	6.5 (16.1)	45.6 (112.6)	14.1 (34.8)	-
2017	2.2 (5.4)	43.6 (107.6)	5.3 (13.2)	-
2022	6.5 (16.1)	156.8 (387.3)	1.3 (3.3)	-

Table 17-42.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Achnatherum hymenoides (Indian ricegrass)	6	95	-	6	79	-	3	6	52	28	61	
Agropyron cristatum ⁱ (crested wheatgrass)	9	148	-	6	43	12	11	13	32	25	52	
Bromus inermis ⁱ (smooth brome)	3	241	8	-	94	6	15	7	65	104	41	
Bromus marginatus (mountain brome)	8	275	-	8	24	2	1	-	50	77	87	
Bromus tectorum ^{ai} (cheatgrass)	1	328	8	-	10	46	-	-	30	46	108	
Poa bulbosa ⁱ (bulbous bluegrass)	5	347	7	-	15	31	19	-	3	34	96	
Poa fendleriana (muttongrass)	Average Cover (%)											
Poa pratensis ⁱ (Kentucky bluegrass)	1997	0.1	5.4	-	0.1	0.9	-	0.0	0.7	1.4	1.0	2.5
Poa secunda (Sandberg bluegrass)	2002	0.2	7.1	-	0.5	0.2	0.1	0.1	0.1	0.6	1.7	1.4
Pseudoroegneria spicata (bluebunch wheatgrass)	2007	0.1	9.6	0.5	-	1.5	0.0	0.1	0.3	1.4	2.8	0.9
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	2012	0.2	22.9	-	0.8	0.3	0.0	0.0	-	1.9	4.0	4.0
	2017	0.0	20.7	0.3	-	0.4	0.9	-	-	0.4	2.1	4.4
	2022	0.4	25.1	0.1	-	0.1	1.3	0.1	-	0.0	1.9	4.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-42.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	0	19	-	8	2	4	11	1	15	4	-	2	53	27	9	3	58
Allium (onion)	13	19	3	3	-	-	-	4	18	-	-	-	2	12	-	-	11
Alyssum desertorum ^{ai} (desert madwort)	2	3	35	-	-	-	-	3	55	-	7	-	2	1	-	-	1
Arabis (rockcress)	-	-	47	-	-	-	-	2	-	-	3	-	4	6	1	2	-
Astragalus (milkvetch)	3	11	140	-	-	-	-	3	5	1	9	-	1	7	-	1	2
Astragalus beckwithii (Beckwith's milkvetch)	5	0	180	1	-	-	-	4	2	-	6	-	-	11	5	-	4
Astragalus convallarius (lesser rushy milkvetch)	Average Cover (%)																
Balsamorhiza sagittata (arrowleaf balsamroot)	1997	0.0	0.1	-	0.0	0.0	0.2	0.0	0.1	0.1	0.0	-	0.0	1.8	0.0	0.0	0.6
Camelina microcarpa ^{ai} (littledrop false flax)	2002	0.0	0.1	0.0	0.0	-	-	-	0.1	0.3	-	-	-	0.0	0.0	-	0.2
Castilleja linariifolia (Wyoming Indian paintbrush)	2007	0.0	0.0	0.1	-	-	-	-	0.1	0.2	-	0.0	-	0.4	0.0	-	0.0
Ceratocephala testiculata ^{ai} (curvseed butterwort)	2012	-	-	0.1	-	-	-	-	0.0	-	-	0.0	-	0.0	0.1	0.0	-
Chenopodium album ^a (lambsquarters)	2017	0.0	0.1	1.0	-	-	-	-	0.1	0.0	0.0	0.1	-	0.2	0.0	-	0.0
Cirsium (thistle)	2022	0.0	0.0	3.0	0.0	-	-	-	0.1	0.0	-	0.2	-	-	0.0	0.0	0.2
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Hackelia patens (spotted stickseed)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Orobancha fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
1997	35	7	1	-	-	87	5	182	5	-	7	5	-	7	9	49	1
2002	-	9	0	3	-	59	-	2	6	-	1	41	-	-	3	45	-
2007	21	7	-	4	-	53	-	12	7	3	1	14	-	-	-	28	-
2012	9	-	-	0	-	15	-	12	2	-	-	-	-	-	-	9	-
2017	12	15	-	-	3	9	1	5	7	-	-	-	-	2	3	32	-
2022	-	16	-	1	-	-	-	-	3	4	-	-	1	-	-	12	-
year	Average Cover (%)																
1997	0.2	0.0	0.0	-	-	3.0	0.0	6.3	0.3	-	0.1	0.0	-	0.1	0.1	0.3	0.0
2002	-	0.1	0.0	0.1	-	0.8	-	0.1	0.6	-	0.0	0.1	-	-	0.0	0.1	-
2007	0.1	0.0	-	0.1	-	1.1	-	0.2	0.2	0.0	0.0	0.0	-	-	-	0.3	-
2012	0.0	-	-	0.0	-	0.3	-	0.1	0.2	-	-	-	-	-	-	0.0	-
2017	0.0	0.1	-	-	0.0	0.2	0.0	0.0	0.6	-	-	-	-	0.0	0.0	0.1	-
2022	-	0.1	-	0.0	-	-	-	-	0.4	0.1	-	-	0.0	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Senecio integerrimus ^a (lambstongue ragwort)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum ascendens (western aster)	Thalictrum (meadow-rue)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency								
1997	-	9	28	-	18	-	189	78	3
2002	-	9	14	-	5	2	-	58	-
2007	-	2	10	1	12	-	9	30	-
2012	-	5	14	-	-	-	-	13	-
2017	3	3	17	-	1	-	36	41	-
2022	-	2	8	-	1	-	-	5	-
year	Average Cover (%)								
1997	-	0.2	0.9	-	0.1	-	1.4	1.6	0.0
2002	-	0.0	0.1	-	0.0	0.0	-	0.4	-
2007	-	0.0	0.1	0.1	0.1	-	0.0	0.2	-
2012	-	0.0	0.3	-	-	-	-	0.2	-
2017	0.0	0.0	0.2	-	0.0	-	0.1	0.4	-
2022	-	0.0	0.1	-	0.0	-	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-42.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	0.2	5.9	0.8	1.9	0.6	0.8	-	-	2.6	0.2	1.9
2007	0.1	5.6	1.2	2	1.2	3.6	-	0.1	3.2	0.2	1.2
2012	-	5.7	2.9	2.4	0.5	0.8	-	0	7.5	0.7	1.5
2017	0	5.3	2.3	3.2	0.6	-	-	0.1	8.6	1.1	0.9
2022	0.1	4.7	2.6	1.3	0.2	2.7	-	0.1	7.5	0.6	0.4
year	Quadrat Cover (%)										
1997	0.6	13.2	1.1	2.0	2.0	2.5	0.0	-	9.8	0.4	2.1
2002	0.6	8.4	1.6	2.0	2.0	3.0	-	0.0	5.0	0.2	1.6
2007	0.2	4.2	0.5	1.9	2.2	3.6	0.0	0.1	2.7	0.1	1.1
2012	0.2	4.2	2.1	2.6	0.3	0.1	-	0.1	5.0	0.3	1.6
2017	0.3	4.5	2.3	2.6	1.0	0.4	-	0.1	4.4	0.1	1.1
2022	0.2	5.5	3.5	1.8	0.1	1.0	-	0.0	3.7	0.1	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-42.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	200	40	40	60	0	20	20	0	88/89
2002	180	-	44	0	56	11	78	22	53/47
2007	160	-	25	50	25	50	0	13	69/66
2012	100	40	0	100	0	80	20	0	83/73
2017	100	-	20	80	0	20	40	0	71/70
2022	60	-	33	67	0	33	33	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	1720	-	5	64	31	57	13	23	76/118
2002	1780	-	2	33	65	16	80	44	66/84
2007	1080	60	2	48	50	37	46	37	70/92
2012	900	-	2	56	42	47	27	40	63/73
2017	840	-	2	62	36	50	31	26	61/74
2022	780	20	5	62	33	8	54	33	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1997	320	-	6	94	0	19	75	6	83/103
2002	380	-	11	21	68	0	95	58	97/88
2007	180	20	0	89	11	44	56	11	72/74
2012	220	-	0	100	0	46	55	9	90/89
2017	300	-	20	73	7	27	53	7	100/98
2022	240	-	0	92	8	58	17	8	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	1460	20	7	93	0	0	0	0	30/43
2002	1700	-	4	95	1	4	1	0	22/37
2007	1340	-	2	97	2	0	0	0	22/42
2012	1360	-	2	96	3	0	0	3	27/47
2017	1980	20	4	95	1	0	0	1	29/40
2022	1380	20	25	75	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	5420	400	22	78	0	0	0	0	25/26
2002	3840	20	1	73	27	0	0	10	19/20
2007	3460	20	3	92	5	0	0	2	21/25
2012	600	20	3	97	0	0	0	3	21/29
2017	1120	-	0	100	0	0	0	0	26/27
2022	60	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	80	-	0	100	0	0	0	0	179/157
2002	60	-	0	100	0	0	33	33	- / -
2007	40	-	50	50	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1997	80	-	25	75	0	0	0	0	8/14
2002	-	-	-	-	-	-	-	-	- / -
2007	120	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	7/11
2017	-	-	-	-	-	-	-	-	11/12
2022	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	20	-	0	100	0	0	0	0	9/14
2002	60	-	33	33	33	0	0	67	7/18
2007	100	-	20	80	0	0	0	0	16/21
2012	20	-	0	100	0	0	0	0	15/18
2017	300	-	0	100	0	0	0	0	13/15
2022	400	-	0	100	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1997	1960	20	14	86	0	52	36	0	68/123
2002	2140	-	1	14	85	8	88	48	35/73
2007	1020	-	16	67	18	43	33	6	40/84
2012	1040	-	2	98	0	69	27	0	53/88
2017	1180	-	0	97	3	39	15	0	53/94
2022	1780	-	27	67	6	12	79	3	- / -
Quercus gambelii^P -- (Gambel oak)									
1997	140	20	71	29	0	0	0	0	138/86
2002	160	-	50	0	50	0	38	50	66/68
2007	120	-	33	67	0	0	0	50	229/144
2012	180	-	89	11	0	0	0	0	86/82
2017	180	-	0	100	0	0	0	0	103/95
2022	120	-	33	67	0	0	100	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes^p -- (currant)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	48/179
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	1000	-	10	90	0	0	0	0	46/92
2002	960	-	21	65	15	21	8	2	33/68
2007	900	-	69	31	0	0	0	7	33/47
2012	840	-	26	74	0	21	0	2	41/48
2017	940	-	21	79	0	0	0	0	41/54
2022	500	-	24	64	12	32	28	12	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

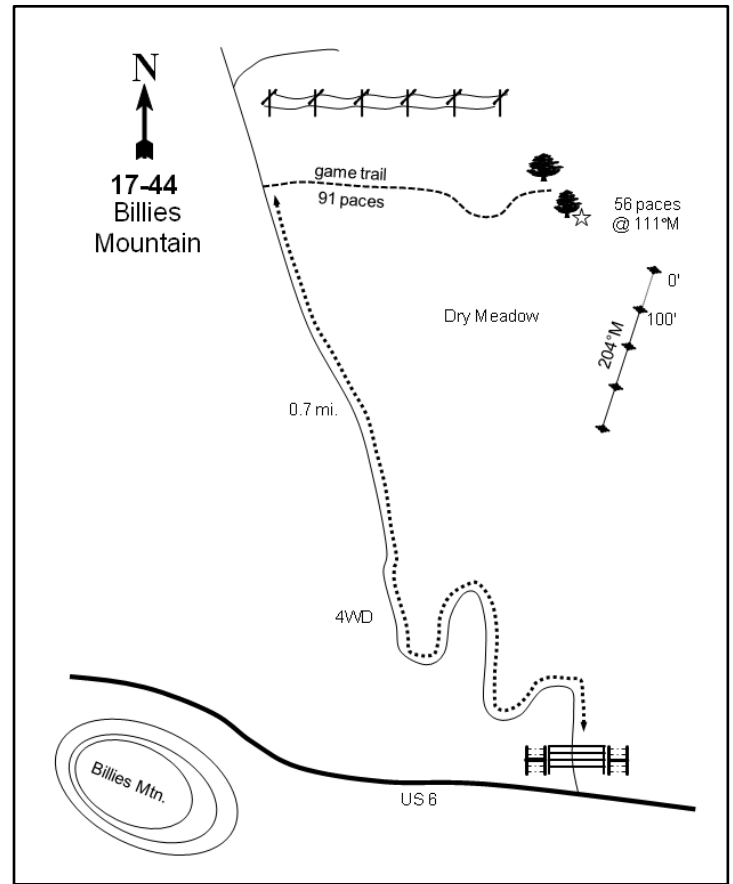
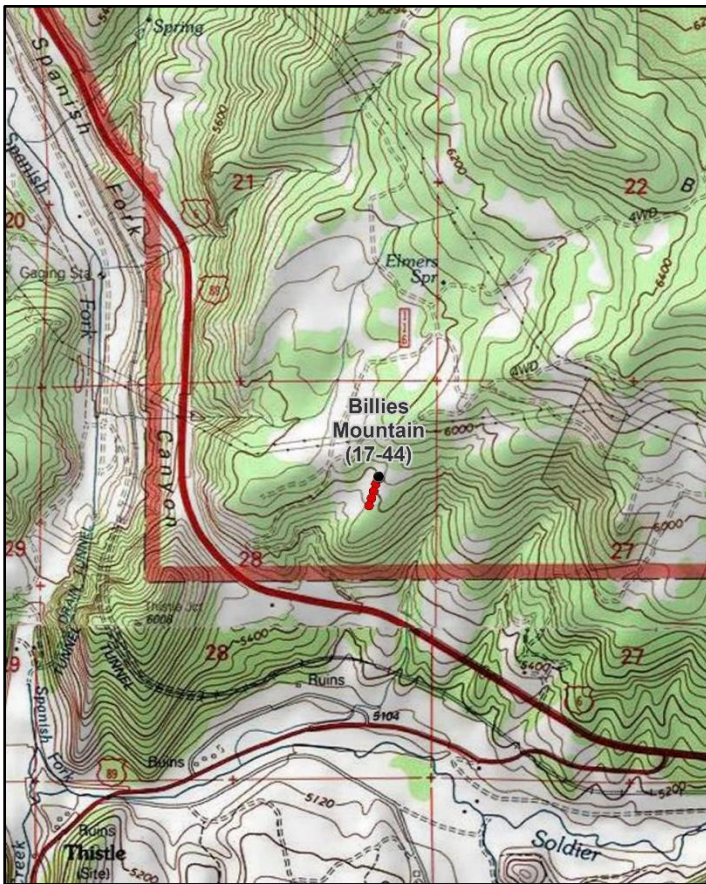
Table 17-42.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	44	-	-	-	-	-	13.1
2007	63	-	31	6	44	19	12.3
2012	32	-	45	45	-	9	8.6
2017	21	-	11	67	11	11	11.3
2022	33	8	8	54	15	15	18.1
Pinus edulis (twoneedle pinyon)							
2002	2	-	-	-	-	-	6.0

Table 17-42.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	10.4	5.2	22.0	-0.7	10.0	0.0	76.9	Good
2002	23.0	-4.8	3.1	23.6	-0.2	5.8	0.0	50.5	Poor
2007	15.2	5.8	6.6	30.0	-1.1	6.1	0.0	62.6	Fair
2012	24.9	11.1	3.5	30.0	-0.2	2.3	0.0	71.5	Fair-Good
2017	25.0	11.1	2.1	30.0	-0.3	4.3	0.0	72.2	Good
2022	22.2	10.8	8.2	30.0	-0.1	2.2	0.0	73.2	Good

BILLIES MOUNTAIN - STUDY NO. 17-44



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Billies Mountain SW; Township 9S, Range 4E, Section 28
NAD 83 UTM ZONE 12, 458809 East 4428475 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
204° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

On Highways 6 and 89 in Spanish Fork Canyon, east of the new road cut through Billies Mountain and 0.9 miles west of the junction of Route 89 south to Manti and US-6, turn north onto a dirt road. Cross a cattle guard and follow the road for 0.7 miles to where it breaks out into a sagebrush/grass flat. On the right-hand (west) side of the road at the head of a small drainage, a game trail leads east towards a small meadow. Follow this trail approximately 150 yards to two large junipers at the edge of the meadow. From the junipers, walk up the near slope for 56 paces at a bearing of 111 degrees to the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BILLIES MOUNTAIN
Elevation	5,800ft (1,768m)
Aspect	Southwest
Slope	5-20%
Sample Dates	06/12/1997, 06/05/2002, 06/21/2007, 07/04/2012, 07/06/2017, 05/23/2022

Table 17-44.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Spanish Fork River Watershed Post Fire Restoration Phase III (Proposed)	5969	2023	2843

Wildlife Habitat and Vegetation History

Table 17-44.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-44.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2012	Perennial Grass/Mountain Big Sagebrush	Phase I
2017	Perennial Grass/Mountain Big Sagebrush	Phase I
2022	Perennial Grass-Forb/Mountain Big Sagebrush	Phase I

Site Notes

The nearest perennial source of water is the Spanish Fork River located 0.7 miles west on the far side of US-6.

Soils

Table 17-44.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	23.5	20.7	55.8	2.2	4.6	323.2	0.7	06/12/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Clay (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA403UT
States and Transitions	No state and transition model is available for this ecological site.

A number of browse species have been present on this study site since its establishment in 1983, but mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant species in all sample years. However, both cover and density of sagebrush have decreased overall since 1997. Utah juniper trees (*Juniperus osteosperma*) were first observed on site in 1997, and cover has increased since 2002: this study site is therefore considered to be within Phase I of woodland succession (Photos, Table 17-44.4, Table 17-44.12, Table 17-44.13, Table 17-44.14). The herbaceous understory is abundant and particularly diverse (Table 17-44.7), with a mixture of native and introduced perennial grasses being co-dominant with sagebrush from 1997 on. It should be noted that there was a seven-fold increase in cover of the introduced species bulbous bluegrass (*Poa bulbosa*) between 2012 and 2022, and over a four-fold increase in crested wheatgrass (*Agropyron cristatum*) cover over the same period (Table 17-44.10). This increase implies that this study site has the potential to transition into one dominated by introduced perennial grasses if sagebrush cover continues to decrease. A majority of the cover contributed by forbs can be attributed to perennial species, particularly western aster (*Symphyotrichum ascendens*) (Table 17-44.11).

Trend Summary Tables**Table 17-44.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.5	2.3	1.8	-	-	-
2002	9.3	1.4	1.8	-	-	-
2007	7.7	1.7	2.1	11.5	1.7	7.2
2012	7.2	0.5	6.6	7.6	1.6	7.2
2017	7.2	2.1	0.6	9.7	1.7	9.6
2022	8.9	1.6	3.0	8.3	1.2	11.1

Table 17-44.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	70	415	173	367	0.9	23.5	1.6	18.6
2002	4	400	66	361	0.0	19.1	0.3	17.6
2007	84	397	87	378	0.6	23.3	0.5	17.8
2012	39	437	39	359	0.3	25.4	0.3	11.2
2017	50	425	68	326	0.9	38.1	0.8	16.2
2022	63	432	218	362	0.9	35.3	8.7	18.7

Table 17-44.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.8	1.7	54.5	1.1	0.7	46.4
2002	19.6	0.4	38.4	1.3	0.4	54.1
2007	16.5	0.2	38.6	2.7	0.3	56.2
2012	17.2	0.2	32.4	0.8	0.8	61.1
2017	24.4	0.0	29.5	3.2	0.4	54.3
2022	22.4	-	36.9	3.2	0.7	60.0

Table 17-44.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	2	37	25	-	-
2002	9	16	18	-	1
2007	7	33	12	-	2
2012	7	7	2	2	-
2017	13	11	2	1	3
2022	9	23	1	2	1
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	15.3 (37.7)	36.2 (89.4)	11.4 (28.1)	-	-
2007	1.5 (3.6)	29.5 (72.8)	50.9 (125.8)	-	-
2012	11.6 (28.7)	7.4 (18.2)	0.7 (1.7)	3.5 (8.6)	-
2017	18.9 (46.6)	36.2 (89.4)	2.0 (5.0)	4.0 (10.0)	-
2022	19.6 (48.4)	53.0 (130.8)	18.1 (44.7)	1.7 (4.3)	-

Table 17-44.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus glaucus (blue wildrye)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)
year	Nested Frequency																
1997	-	10	12	-	9	70	-	8	4	-	31	-	45	14	66	15	151
2002	-	9	64	-	13	4	-	-	-	14	8	-	15	24	94	35	112
2007	2	5	55	66	15	22	2	4	-	32	35	-	3	58	100	18	74
2012	15	4	56	1	23	36	14	5	-	5	12	3	3	98	97	24	60
2017	-	5	114	33	15	19	-	3	-	5	7	-	9	76	274	21	18
2022	-	-	199	40	26	36	-	-	-	-	15	4	1	55	330	-	46
year	Average Cover (%)																
1997	-	0.3	0.5	-	0.3	0.9	-	0.1	0.6	-	0.7	-	1.5	0.1	1.6	0.7	6.7
2002	-	0.1	2.0	-	0.8	0.0	-	-	-	0.2	0.1	-	0.1	0.6	2.8	0.7	1.5
2007	0.0	0.0	2.6	0.2	1.1	0.4	0.0	0.0	-	0.8	1.2	-	0.0	1.0	2.1	0.5	1.8
2012	0.2	0.0	2.7	0.0	0.8	0.3	0.1	0.0	-	0.0	0.0	0.4	0.0	2.6	2.5	0.3	2.1
2017	-	0.1	6.8	0.5	0.9	0.4	-	0.0	-	0.1	0.0	-	0.1	3.3	15.2	0.1	0.4
2022	-	-	11.3	0.1	1.7	0.8	-	-	-	-	0.3	0.6	0.0	1.2	16.9	-	1.1

a - Annual; n - Noxious Weed; i - Introduced Species

GRASS SPECIES	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency				
1997	75	-	238	-	-
2002	37	5	212	-	-
2007	79	5	190	-	26
2012	136	4	192	2	9
2017	15	5	173	-	33
2022	19	-	40	-	-
year	Average Cover (%)				
1997	1.6	-	8.9	-	-
2002	0.4	0.6	9.4	-	-
2007	1.9	0.4	8.4	-	1.3
2012	6.6	0.0	6.8	0.0	0.0
2017	0.1	0.8	8.0	-	2.2
2022	0.4	-	1.7	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-44.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Alyssum desertorum ⁿⁱ (desert madwort)	Antennaria dimorpha (low pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ⁿⁱ (littletop false flax)	Cardaria draba ⁿⁱ (whitetop)	Ceratocephala testiculata ⁿⁱ (curveseed butterwort)	Chorispora tenella ⁿⁱ (crossflower)	Cirsium (thistle)	Cirsium undulatum ^a (wavy/leaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)
year	Nested Frequency																
1997	38	24	2	-	46	-	-	61	15	21	16	-	-	-	47	-	-
2002	44	13	-	-	49	-	-	25	10	19	1	-	-	-	36	-	-
2007	53	6	1	-	64	-	-	42	14	17	14	-	-	-	32	-	-
2012	61	1	-	1	33	-	-	33	5	-	-	-	-	-	40	-	-
2017	44	26	-	4	28	-	1	39	6	61	7	13	-	-	23	-	3
2022	43	6	-	-	39	2	-	38	12	111	18	23	25	26	-	18	12
year	Average Cover (%)																
1997	1.1	0.1	0.0	-	1.5	-	-	0.8	0.3	0.1	0.1	-	-	-	1.5	-	-
2002	0.9	0.4	-	-	1.1	-	-	0.3	0.3	0.1	0.0	-	-	-	0.4	-	-
2007	1.4	0.0	0.0	-	1.9	-	-	0.6	0.2	0.1	0.1	-	-	-	0.6	-	-
2012	0.9	0.0	-	0.0	0.3	-	-	0.1	0.0	-	-	-	-	-	0.2	-	-
2017	1.4	0.1	-	0.1	0.8	-	0.1	0.7	0.2	0.2	0.0	0.3	-	-	0.4	-	0.0
2022	1.1	0.0	-	-	1.8	0.1	-	0.3	0.4	0.9	0.2	0.7	0.1	1.0	-	0.7	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Crepis ariobarba (slender hawkbeard)	Cymopterus (springparsley)	Cynoglossum officinale ⁿⁱ (gypsiflower)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium aparine ^a (stickywillow)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola ⁿⁱ (prickly lettuce)
year	Nested Frequency																
1997	7	11	6	-	9	5	-	-	88	11	-	-	5	33	12	31	36
2002	-	1	9	-	14	2	-	-	35	3	1	1	3	24	5	10	-
2007	1	-	12	-	16	-	24	-	7	7	-	-	6	6	0	-	-
2012	3	-	13	-	16	0	-	-	2	-	-	-	2	2	2	11	-
2017	1	-	10	-	9	-	-	3	1	8	-	-	6	14	-	16	15
2022	-	4	18	31	9	-	6	-	1	1	-	-	0	22	9	-	6
year	Average Cover (%)																
1997	0.0	0.0	0.0	-	0.1	0.0	-	-	0.5	0.1	-	-	0.0	0.6	0.0	0.6	0.2
2002	-	0.0	0.1	-	0.4	0.0	-	-	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-
2007	0.0	-	0.3	-	0.1	-	0.1	-	0.0	0.1	-	-	0.1	0.0	0.0	-	-
2012	0.0	-	0.0	-	0.0	0.0	-	-	0.0	-	-	-	0.0	0.0	0.0	0.2	-
2017	0.0	-	0.1	-	0.0	-	-	0.0	0.0	0.2	-	-	0.1	0.4	-	0.2	0.0
2022	-	0.1	0.3	0.6	0.1	-	0.2	-	0.0	0.0	-	-	0.0	0.7	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency															
<i>Lappula occidentalis</i> ^a (flatspine stickseed)	-	1	21	-	-	-	-	27	73	2	-	263	-	31	-	150
<i>Lithospermum ruderale</i> (western stoneseed)	-	1	-	-	-	-	-	34	94	1	3	295	-	10	4	100
<i>Medicago sativa</i> ⁱ (alfalfa)	3	14	-	13	-	-	-	42	18	-	3	291	-	36	-	111
<i>Melilotus officinalis</i> ⁱ (sweetclover)	-	3	32	3	-	-	-	29	40	1	7	301	-	31	-	86
<i>Mertensia oblongifolia</i> (oblongleaf bluebells)	-	-	3	1	-	1	-	40	41	-	7	221	1	36	-	84
<i>Microsteris gracilis</i> ^a (slender phlox)	-	1	-	-	22	-	6	40	60	-	1	211	1	151	-	134
<i>Orogenia linearifolia</i> (Great Basin Indian potato)	Average Cover (%)															
<i>Petradoria pumila</i> (rock goldenrod)	-	0.0	0.3	-	-	-	-	1.1	0.2	0.0	-	8.2	-	0.2	-	2.7
<i>Phlox longifolia</i> (longleaf phlox)	-	0.1	-	-	-	-	-	1.8	0.7	0.0	0.0	10.0	-	0.1	0.0	0.9
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)	0.0	0.3	-	0.2	-	-	-	2.5	0.1	-	0.0	8.7	-	0.3	-	0.7
<i>Sphaeralcea coccinea</i> (scarlet globemallow)	-	0.0	0.3	0.0	-	-	-	0.8	0.1	0.0	0.0	7.6	-	0.3	-	0.4
<i>Symphytotrichum ascendens</i> (western aster)	-	-	0.0	0.0	-	0.0	-	2.1	0.2	-	0.2	7.6	0.0	0.3	-	1.0
<i>Taraxacum officinale</i> (common dandelion)	-	0.1	-	-	0.2	-	0.0	2.7	0.4	-	0.0	6.3	0.0	5.4	-	2.4
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)	Line Intercept Cover (%)															
<i>Veronica biloba</i> ^{ai} (two-lobed speedwell)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Vicia americana</i> (American vetch)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quadrat Cover (%)															
	0.0	4.7	0.0	1.7	0.5	0.3	1.8	0.1	1.9	0.1	1.1	0.3				
	-	4.3	0.0	1.2	0.5	0.2	1.8	-	2.5	0.1	1.8	0.1				
	-	3.8	0.1	1.3	0.5	0.0	2.1	0.1	1.5	0.1	1.6	0.4				
	-	3.2	0.0	0.4	0.7	0.0	6.6	0.0	1.8	0.0	1.5	0.1				
	0.0	2.4	0.2	1.0	0.4	0.6	0.6	-	2.4	0.0	1.8	0.5				
	0.9	3.8	0.5	1.0	0.3	0.2	3.0	0.1	1.9	-	1.4	0.3				

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-44.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
<i>Amelanchier utahensis</i> ^p (Utah serviceberry)	-	-	-	-	-	-	-	-	-	-	-	-
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	-	-	-	-	-	-	-	-	-	-	-	-
<i>Chrysothamnus depressus</i> ^p (longflower rabbitbrush)	-	4.3	0.2	1.2	1.2	0.1	7.2	0.4	2.6	0	2.8	0.4
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	-	2.2	0.1	1	1.5	-	7.2	0.2	1.9	-	1.7	0.6
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)	0.2	2.2	0.5	0.6	1.4	0.5	9.6	-	2.4	-	3	0.6
<i>Gutierrezia sarothrae</i> (broom snakeweed)	0.5	3	0.2	0.4	0.1	0.1	11.1	0.1	2.1	-	2.3	0.7
<i>Juniperus osteosperma</i> ⁱ (Utah juniper)	Quadrat Cover (%)											
<i>Prunus virginiana</i> ^p (chokecherry)	0.0	4.7	0.0	1.7	0.5	0.3	1.8	0.1	1.9	0.1	1.1	0.3
<i>Purshia tridentata</i> ^p (antelope bitterbrush)	-	4.3	0.0	1.2	0.5	0.2	1.8	-	2.5	0.1	1.8	0.1
<i>Rosa woodsii</i> ^p (Woods' rose)	-	3.8	0.1	1.3	0.5	0.0	2.1	0.1	1.5	0.1	1.6	0.4
<i>Symphoricarpos oreophilus</i> ^p (mountain snowberry)	-	3.2	0.0	0.4	0.7	0.0	6.6	0.0	1.8	0.0	1.5	0.1
<i>Tetradymia canescens</i> (spineless horsebrush)	0.0	2.4	0.2	1.0	0.4	0.6	0.6	-	2.4	0.0	1.8	0.5
	0.9	3.8	0.5	1.0	0.3	0.2	3.0	0.1	1.9	-	1.4	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-44.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	40	-	0	100	0	50	0	0	55/70
2002	60	-	33	67	0	33	33	0	63/92
2007	20	-	0	100	0	100	0	0	90/89
2012	-	-	-	-	-	-	-	-	67/87
2017	60	-	33	67	0	33	67	33	53/62
2022	160	-	25	75	0	25	25	0	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1260	20	5	41	54	52	2	40	67/93
2002	1160	-	10	33	57	26	55	29	67/77
2007	980	-	10	37	53	55	10	41	64/87
2012	600	20	7	70	23	23	27	20	58/80
2017	960	-	40	46	15	4	4	15	53/68
2022	1080	20	26	61	13	54	19	20	- / -
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
1997	460	-	4	96	0	0	0	0	19/27
2002	180	-	0	89	11	11	0	0	18/29
2007	220	-	0	100	0	0	0	0	18/31
2012	200	20	10	90	0	10	0	0	13/20
2017	720	-	36	64	0	94	0	0	19/31
2022	680	40	3	97	0	0	0	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	700	-	3	94	3	0	0	0	37/46
2002	720	-	8	92	0	0	0	3	28/43
2007	680	-	0	94	6	0	0	0	36/56
2012	520	-	15	85	0	0	0	12	35/39
2017	580	-	3	97	0	3	0	0	36/50
2022	480	-	17	79	4	0	0	4	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	660	-	9	91	0	3	0	0	54/54
2002	420	-	0	67	33	19	5	0	57/75
2007	320	-	0	88	13	13	0	6	73/62
2012	420	-	5	95	0	0	0	10	61/69
2017	460	-	13	83	4	44	9	4	52/53
2022	120	-	0	17	83	17	33	83	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	920	-	30	65	4	0	0	0	22/24
2002	940	-	0	98	2	0	0	0	17/16
2007	320	20	0	81	19	0	0	6	22/21
2012	80	-	25	75	0	0	0	0	19/23
2017	700	-	3	97	0	0	0	0	24/24
2022	180	-	22	44	33	0	0	33	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	40	20	0	100	0	0	0	0	- / -
2002	60	-	0	100	0	0	0	0	- / -
2007	120	-	67	17	17	0	0	0	- / -
2012	60	-	67	33	0	0	0	33	- / -
2017	100	-	40	60	0	0	0	20	- / -
2022	80	-	50	50	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Prunus virginiana^p -- (chokecherry)									
1997	60	-	0	100	0	0	0	0	40/40
2002	40	-	0	50	50	0	50	0	70/59
2007	20	-	0	100	0	0	0	0	75/90
2012	40	-	0	100	0	0	100	0	45/53
2017	-	-	-	-	-	-	-	-	28/20
2022	80	-	75	25	0	0	100	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	540	-	4	89	7	37	56	7	56/94
2002	380	-	0	79	21	16	79	5	41/84
2007	400	20	10	90	0	60	15	0	64/120
2012	520	-	35	62	4	0	100	50	66/128
2017	500	-	24	72	4	28	72	4	55/108
2022	580	-	3	69	28	7	93	24	- / -
Rosa woodsii^p -- (Woods' rose)									
1997	100	-	40	60	0	0	0	0	- / -
2002	160	-	63	38	0	0	0	0	18/26
2007	180	-	67	33	0	0	0	0	22/24
2012	20	-	100	0	0	0	0	0	17/14
2017	20	20	100	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	320	20	69	31	0	0	0	0	49/102
2002	680	-	27	74	0	6	0	12	39/88
2007	520	-	8	89	4	31	27	0	46/96
2012	500	200	0	100	0	0	0	4	44/63
2017	1120	-	5	95	0	5	0	11	40/68
2022	600	20	27	73	0	3	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	520	-	23	77	0	0	0	0	25/35
2002	560	60	14	86	0	4	0	4	20/38
2007	640	-	9	66	25	3	0	0	23/41
2012	360	-	17	83	0	0	0	0	25/29
2017	660	-	9	91	0	0	0	12	23/29
2022	560	-	43	50	7	0	0	11	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

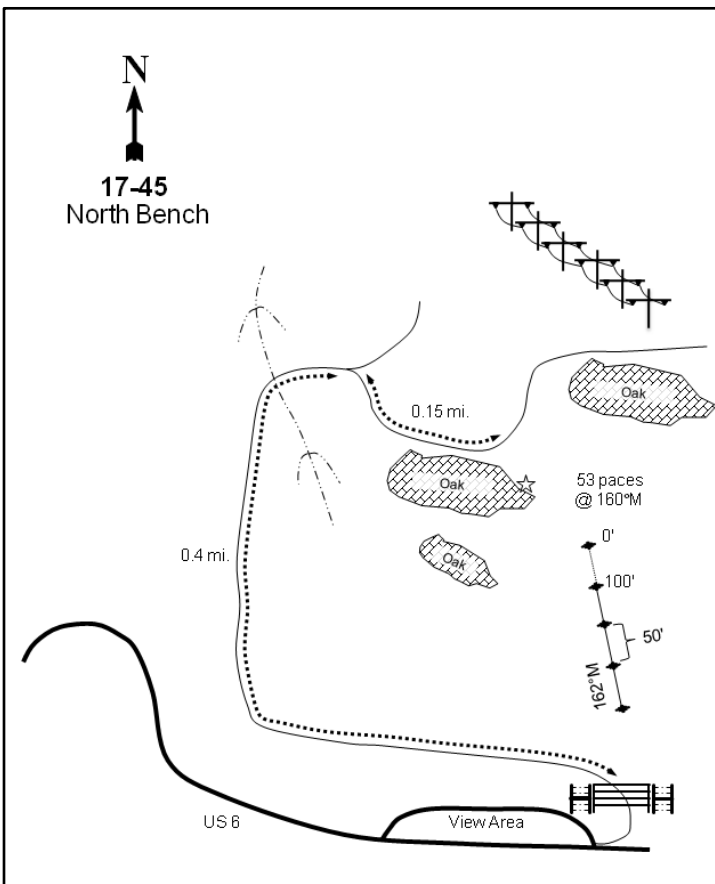
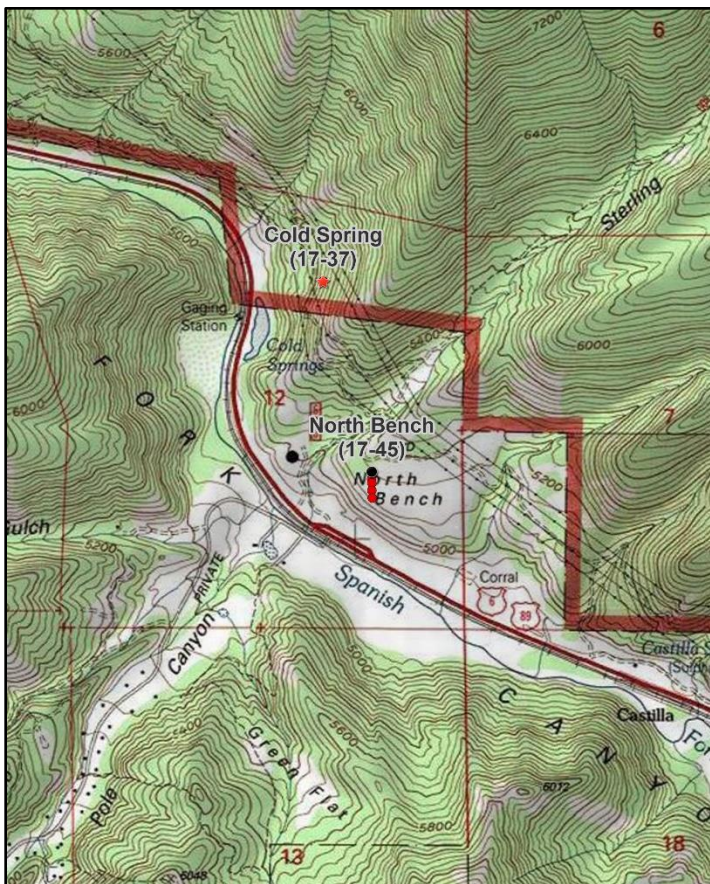
Table 17-44.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	10	-	22	33	22	22	19.2
2022	10	-	-	33	11	56	26.8

Table 17-44.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.9	5.7	7.0	30.0	-0.6	10.0	-2.0	60.9	Fair
2002	11.9	4.9	5.5	30.0	0.0	10.0	-2.0	60.2	Fair
2007	14.3	8.4	4.0	30.0	-0.4	10.0	0.0	66.3	Fair
2012	9.6	12.7	5.8	30.0	-0.2	10.0	-2.0	65.8	Fair
2017	12.0	13.5	10.5	30.0	-0.7	10.0	-2.0	73.4	Good
2022	10.5	11.2	10.1	30.0	-0.7	10.0	-2.0	69.0	Fair-Good

NORTH BENCH - STUDY NO. 17-45



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Spanish Fork Peak SE; Township 9S, Range 3E, Section 12
NAD 83 UTM ZONE 12, 453800 East 4432784 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
162° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From the west side of the viewing area in lower Spanish Fork Canyon (about 3.5 miles east of the mouth), look for a dirt road that goes through a gate and by an old corral. Take this rough road for 0.4 miles to an intersection. At the intersection, turn right and continue for 0.15 miles to the top of the bench and an old fence line. From the wooden post near the left-hand (north) side of the road, walk 53 paces at a bearing of 160 degrees magnetic into the sagebrush flat. The first stake marks the 0-foot end of the baseline, and the remainder of the study stakes are south at 100 foot intervals.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,150ft (1,570m)
Aspect	South
Slope	3-10%
Sample Dates	05/28/1997, 06/05/2002, 07/23/2007, 07/02/2012, 06/01/2017, 05/22/2022

Table 17-45.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Milestone	Utah County CWMA Priority Weeds Treatment and Restoration-Phase I	1116	2009	50

Wildlife Habitat and Vegetation History**Table 17-45.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Shiras Moose	substantial	winter

Table 17-45.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1997	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2002	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2007	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2012	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2017	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2022	Mountain Big Sagebrush/Perennial Grass	No Encroachment

Site Notes

The nearest perennial sources of water are Spanish Fork River 0.2 miles southwest and Cold Springs 0.4 miles northwest of the study. Spanish Fork River is on the opposite side of US-6, but Cold Springs is on the same side as the study site, which may make it the primary water source. The slope west of the study was being developed during the 2007 sample year.

Soils**Table 17-45.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.1	36.7	36.5	26.8	1.7	27.3	227.2	0.3	05/28/1997

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From the time of establishment in 1989 through the most recent sample year, the site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grasses. The forb community on this site is abundant and diverse, with hairy false goldenaster (*Heterotheca villosa*) and silvery lupine (*Lupinus argenteus*) being the co-dominant species (Table 17-45.11). The grasses on the site are mostly introduced perennial species, with crested wheatgrass (*Agropyron cristatum*), bulbous bluegrass (*Poa bulbosa*), and Kentucky bluegrass (*P. pratensis*) being co-dominant (Table 17-45.10). Mountain big sagebrush is the dominant browse species, while broom snakeweed (*Gutierrezia sarothrae*) is a lesser component of the shrub layer (Table 17-45.12, Table 17-45.13). The presence of high levels of introduced perennial grasses, in particular bulbous bluegrass, could lead to an ecological shift away from the rich forb component currently found on the site to a more depleted forb community.

Trend Summary Tables

Table 17-45.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.8	1.2	-	-	-	-
2002	13.1	2.4	-	-	-	-
2007	12.1	1.6	-	18.8	0.7	-
2012	11.4	1.2	-	10.8	1.1	-
2017	21.8	2.6	-	19.7	0.9	-
2022	21.8	3.3	-	20.3	3.1	-

Table 17-45.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	17	490	296	238	0.1	45.8	3.9	8.8
2002	-	489	171	257	-	50.7	3.1	12.9
2007	-	455	96	303	-	27.1	0.5	14.1
2012	5	453	146	282	0.0	30.5	1.2	10.9
2017	13	475	173	279	0.7	68.4	2.8	18.6
2022	22	483	182	233	0.2	56.0	4.1	15.6

Table 17-45.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.4	1.0	39.0	0.3	0.1	58.8
2002	5.0	0.8	37.4	0.1	0.0	71.5
2007	13.9	0.0	42.4	0.0	-	56.2
2012	3.7	0.0	51.9	0.0	0.7	54.9
2017	14.3	2.0	46.7	0.2	0.0	73.9
2022	10.3	0.6	33.5	0.4	0.0	76.9

Table 17-45.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	2	1	-
2002	5	7	1
2007	3	4	4
2012	1	1	-
2017	6	1	1
2022	4	1	1
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	5.8 (14.3)	8.1 (19.9)	-
2007	31.2 (77.1)	4.0 (9.9)	4.0 (9.9)
2012	8.7 (21.5)	0.7 (1.7)	0.7 (1.7)
2017	28.3 (69.9)	18.7 (46.3)	-
2022	23.2 (57.4)	4.7 (11.6)	-

Table 17-45.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
1997	229	-	-	17	14	443	157	14	-	-
2002	262	-	-	-	19	456	166	9	-	-
2007	194	-	-	-	12	314	213	11	3	-
2012	322	-	-	5	34	216	88	43	-	-
2017	234	1	3	12	41	401	261	-	4	19
2022	210	-	3	22	47	385	133	-	2	83
year	Average Cover (%)									
1997	9.3	-	-	0.1	0.7	31.3	4.0	0.5	-	-
2002	12.3	-	-	-	0.7	32.9	4.8	0.0	-	-
2007	6.3	-	-	-	0.3	12.3	8.1	0.0	0.0	-
2012	15.4	-	-	0.0	0.5	9.6	1.1	3.9	-	-
2017	18.5	0.0	0.1	0.7	1.8	30.6	16.6	-	0.1	0.6
2022	17.6	-	0.4	0.2	1.6	26.7	4.7	-	0.0	5.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-45.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria parvifolia (small-leaf pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirarius (browse milkvetch)	Cardaria draba ⁿⁱ (whiteweed)	Cirsium (thistle)	Claytonia perfoliata (miner's lettuce)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis atriobarba (slender hawkbeard)	Cynoglossum officinale ⁿⁱ (gypsy flower)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1997	-	-	4	-	-	27	-	2	-	-	-	70	-	-	164	-	32
2002	-	-	2	-	31	10	-	-	2	9	-	20	-	-	57	-	-
2007	1	1	5	-	-	4	-	-	-	-	-	1	-	-	36	-	2
2012	20	47	8	3	-	-	-	5	-	-	-	2	-	-	12	-	3
2017	6	31	4	-	-	-	-	9	-	-	-	17	5	5	45	1	2
2022	11	35	6	-	-	-	5	43	-	-	0	21	3	45	3	4	-
year	Average Cover (%)																
1997	-	-	0.1	-	-	0.7	-	0.0	-	-	-	0.7	-	-	0.4	-	0.1
2002	-	-	0.1	-	0.4	0.0	-	-	0.0	0.0	-	0.4	-	-	0.2	-	-
2007	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0	-	-	0.1	-	0.0
2012	0.1	1.2	0.2	0.0	-	-	-	0.0	-	-	-	0.0	-	-	0.0	-	0.0
2017	0.0	2.0	0.2	-	-	-	-	0.1	-	-	-	0.3	0.1	0.0	0.2	0.0	0.0
2022	0.1	1.3	0.2	-	-	-	0.0	0.3	-	-	0.0	0.1	0.0	0.1	0.2	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Erythronium grandiflorum (yellow avalanche-lily)	Galium aparine ^a (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^{ai} (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Iva axillaris (povertyweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Microseris nutans (nodding microseris)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1997	-	-	-	83	29	139	-	6	20	-	14	4	-	-	3	4	55
2002	-	-	-	8	6	214	-	-	29	-	22	1	-	-	-	6	16
2007	-	-	-	43	2	272	-	3	49	8	12	9	-	5	-	14	5
2012	-	-	-	71	8	150	-	11	66	-	21	52	-	13	-	8	17
2017	17	-	3	42	2	157	19	31	118	-	51	1	-	3	-	27	71
2022	17	4	5	23	-	73	-	1	133	-	34	-	5	-	-	18	39
year	Average Cover (%)																
1997	-	-	-	1.1	0.3	3.5	-	0.0	0.9	-	0.9	0.2	-	-	0.0	0.2	1.1
2002	-	-	-	0.1	0.0	9.0	-	-	1.3	-	1.5	0.0	-	-	-	0.2	0.3
2007	-	-	-	0.7	0.0	9.9	-	0.0	2.6	0.0	0.3	0.1	-	0.0	-	0.3	0.0
2012	-	-	-	0.8	0.0	4.3	-	0.2	1.9	-	1.0	1.0	-	0.3	-	0.0	0.0
2017	0.1	-	0.0	0.3	0.0	6.2	0.2	0.3	4.4	-	2.8	0.0	-	0.0	-	1.1	1.4
2022	1.1	0.0	0.0	0.3	-	2.2	-	0.0	8.9	-	1.2	-	0.0	-	-	0.4	0.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency		
1997	225	-	-
2002	139	-	-
2007	64	-	-
2012	117	6	-
2017	93	11	1
2022	78	-	-
year	Average Cover (%)		
1997	2.5	-	-
2002	2.5	-	-
2007	0.4	-	-
2012	0.8	0.0	-
2017	1.7	0.1	0.0
2022	2.3	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-45.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	18.7	0.1	0.7
2012	10.7	0.1	1.1
2017	19.6	0.1	0.9
2022	20	0.3	3.1
year	Quadrat Cover (%)		
1997	8.8	-	1.2
2002	13.1	-	2.4
2007	12.1	0.0	1.6
2012	11.4	0.0	1.2
2017	21.6	0.1	2.6
2022	21.4	0.4	3.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-45.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Acer grandidentatumⁱ -- (bigtooth maple)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	100	0	0	0	0	0	37/19
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	5500	1480	56	35	9	3	0	5	93/108
2002	5000	40	11	68	21	10	2	6	49/59
2007	3380	380	2	85	14	24	7	9	53/73
2012	3200	60	16	59	24	9	1	30	52/67
2017	3680	2240	13	82	5	0	0	5	51/78
2022	3540	1980	11	69	20	20	0	30	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	0	0	72/122
2002	-	-	-	-	-	-	-	-	47/71
2007	40	-	0	100	0	0	0	0	69/62
2012	20	-	0	100	0	0	0	0	63/42
2017	20	-	0	100	0	0	0	0	53/80
2022	20	-	0	100	0	0	0	0	- / -

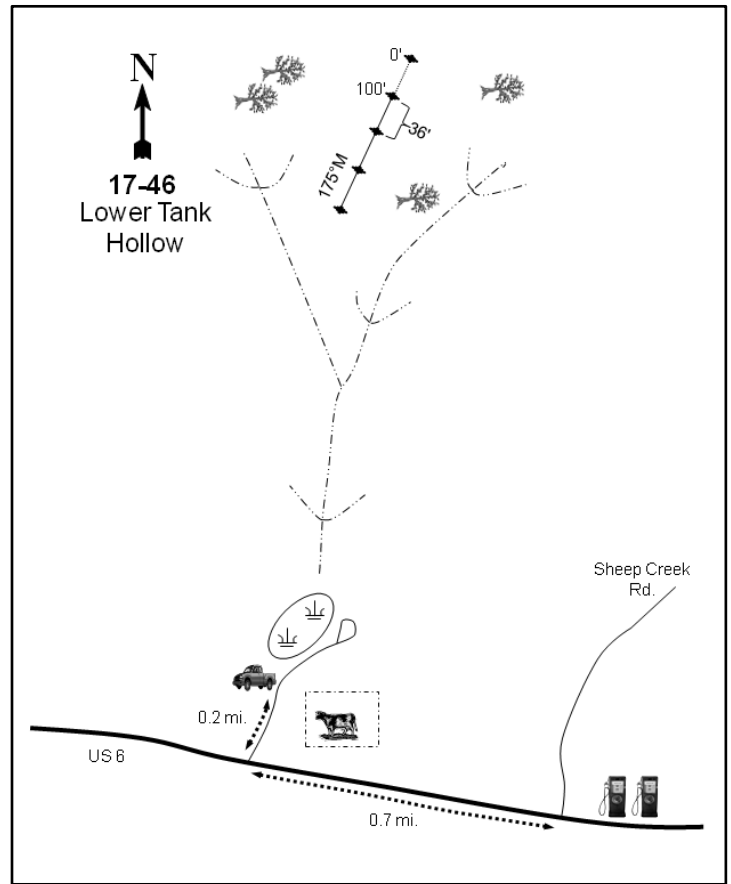
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1997	3400	1100	39	59	2	0	0	0	16/20
2002	4800	20	4	88	8	0	0	1	20/22
2007	2180	20	5	95	1	7	2	1	24/24
2012	1440	-	3	96	1	0	1	25	21/21
2017	1200	1280	7	93	0	0	0	0	25/29
2022	5820	280	27	73	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	20	-	100	0	0	0	0	0	83/71
2012	20	-	100	0	0	100	0	0	60/26
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	35/41
2012	-	-	-	-	-	-	-	-	93/68

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-45.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	11.0	12.4	15.0	28.9	-0.1	10.0	-2.0	75.1	Good
2002	16.4	8.7	5.6	30.0	0.0	10.0	-4.0	66.7	Fair
2007	23.5	10.9	0.9	29.5	0.0	10.0	-2.0	72.8	Good
2012	13.5	7.7	8.1	30.0	0.0	10.0	-2.0	67.3	Fair
2017	24.6	13.4	6.5	30.0	-0.5	10.0	-2.0	82.0	Good
2022	25.4	9.0	5.3	30.0	-0.2	10.0	-2.0	77.5	Good

LOWER TANK HOLLOW - STUDY NO. 17-46



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mill Fork NW; Township 9S, Range 5E, Section 34
NAD 83 UTM ZONE 12, 470018 East 4426679 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
175° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

In Spanish Fork Canyon, turn north up Tank Hollow, which is 0.7 miles west of the Sheep Creek Road and cafe on Highway 6. Drive for about 0.2 miles and stop by a small stock pond in the forks of the drainage. From there, walk north about 1/2 mile up the left fork, and keep left at two other major forks. Where the wash starts to flatten out at the head, there is a chained ridge to the right. The study site is on the ridge, about 20 paces from the center of the drainage, and the 0-foot baseline stake is near the highest point on the ridge.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	5,900ft (1,798m)
Aspect	Southwest
Slope	10%
Sample Dates	06/11/1997, 06/17/2002, 06/25/2007, 07/11/2012, 08/16/2017, 07/05/2022

Table 17-46.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast	Sheepcreek (Wasatch Mtns Unit) Big Game Winter Habitat Improvement FY 23 (Proposed)	5967	Spring-Fall 2023	2981
Seeding - Transplant	Sheepcreek (Wasatch Mtns Unit) Big Game Winter Habitat Improvement FY 23 (Proposed)	5967	Fall 2023	2981
Chaining - Chain Unknown	-	-	1971	-
Seeding - Seed Unknown	-	-	1971	-
Hand Crew - Lop and Scatter	Tank Hollow Habitat Improvement Project	658	July 2007-December 2008	1116

Wildlife Habitat and Vegetation History

Table 17-46.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-46.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Yellow Rabbitbrush/Perennial Grass	Phase I
1997	Perennial Grass/Bitterbrush	Phase I
2002	Perennial Grass/Bitterbrush	Phase I transitioning to Phase II
2007	Perennial Grass/Bitterbrush	Phase I transitioning to Phase II
2012	Perennial Grass/Bitterbrush/Mountain Big Sagebrush	Phase I
2017	Perennial Grass/Bitterbrush/Mountain Big Sagebrush	Phase I
2022	Perennial Grass/Bitterbrush/Mountain Big Sagebrush	Phase I

Site Notes

The nearest perennial source of water is Soldier Creek, which is 0.7 miles south of the study site, and a stock pond that is 0.5 miles south. A deer carcass was observed on the hike to the study site in 2017.

Soils

Table 17-46.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	40.7	21.5	37.8	3.2	6.8	275.2	0.5	06/11/1997

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a mixed shrub plant community since establishment in 1989 through the most recent sample year: basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), and antelope bitterbrush (*Purshia tridentata*) are the main browse species (Table 17-46.12). The dominant grass species on the site is crested wheatgrass (*Agropyron cristatum*), which has steadily increased in both cover and frequency each sample year (Table 17-46.10). The forb community is diverse and contributes moderate cover; the most dominant species are spiny phlox (*Phlox hoodii*) and western stoneseed (*Lithospermum ruderale*) (Table 17-46.11). Utah juniper (*Juniperus osteosperma*) is present on the site, although there was a lop and scatter treatment in 2007 and 2008 that significantly reduced density and cover (Table 17-46.1, Table 17-46.12, Table 17-46.14). However, there were still trees on the site following treatment, which leaves the possibility for infilling in the future.

Trend Summary Tables

Table 17-46.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	3.9	2.4	6.3	-	-	-
2002	5.6	2.2	10.6	5.3	1.9	5.8
2007	3.0	1.5	7.4	4.5	1.3	13.2
2012	4.6	1.6	1.4	7.5	2.4	3.7
2017	7.1	2.8	1.5	8.9	3.9	6.8
2022	6.7	2.8	3.1	9.6	3.7	8.9

Table 17-46.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	30	323	130	233	0.5	19.1	1.9	5.1
2002	6	320	6	104	0.0	15.9	0.1	1.8
2007	22	309	146	110	0.1	18.5	0.6	1.9
2012	1	306	72	108	0.0	19.5	0.5	1.7
2017	-	348	201	94	-	29.5	0.9	3.7
2022	-	334	132	114	-	28.3	2.2	2.3

Table 17-46.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.1	1.4	41.1	5.8	0.7	36.6
2002	35.6	2.5	40.2	3.6	2.0	34.6
2007	40.5	2.6	28.0	4.6	0.9	33.7
2012	25.3	0.9	50.5	4.1	1.3	28.7
2017	33.0	0.1	46.2	6.0	1.6	38.5
2022	39.9	0.0	38.0	5.8	1.2	40.5

Table 17-46.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	30	11	3
2002	2	36	14	8
2007	5	42	4	7
2012	4	18	1	5
2017	3	31	-	7
2022	8	23	1	5
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	6.5 (16.1)	46.9 (115.9)	5.3 (13.2)	-
2007	8.0 (19.7)	24.1 (59.6)	12.1 (29.8)	-
2012	12.3 (30.5)	20.1 (49.7)	1.3 (3.3)	-
2017	-	29.5 (72.8)	0.7 (1.7)	-
2022	21.8 (53.8)	59.0 (145.7)	2.0 (5.0)	-

Table 17-46.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency												
1997	33	16	196	-	8	30	1	-	1	70	22	42	20
2002	40	4	259	-	-	6	3	1	1	18	3	5	25
2007	26	-	283	15	-	9	-	-	-	3	16	3	14
2012	1	-	300	-	-	1	-	-	2	-	10	1	3
2017	57	-	274	-	9	-	-	4	5	18	1	-	15
2022	7	3	325	-	-	-	-	4	5	-	2	-	3
year	Average Cover (%)												
1997	0.7	0.7	12.5	-	0.2	0.5	0.0	-	0.0	1.4	0.6	2.8	0.2
2002	0.8	0.1	14.4	-	-	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2
2007	0.5	-	17.4	0.1	-	0.0	-	-	-	0.0	0.4	0.1	0.2
2012	0.0	-	19.4	-	-	0.0	-	-	0.0	-	0.0	0.0	0.0
2017	4.7	-	23.5	-	0.1	-	-	0.2	0.1	0.6	0.0	-	0.3
2022	0.2	0.0	28.0	-	-	-	-	0.0	0.0	-	0.0	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-46.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littletop false flax)	Cardaria draba ^{ai} (whiteweed)	Carduus nutans ^{ai} (nodding plumelless thistle)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1997	1	5	11	74	-	27	4	2	13	-	22	9	4	19	22	-	32
2002	-	-	2	2	-	3	-	-	1	12	-	-	-	-	4	-	-
2007	-	2	6	131	3	30	3	1	3	-	4	-	9	4	3	-	-
2012	-	-	-	68	7	4	8	4	-	-	-	3	-	-	9	2	1
2017	-	1	-	198	-	19	4	-	-	-	-	-	-	-	2	-	-
2022	-	18	12	122	6	12	8	-	6	-	5	-	10	1	-	4	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	1.2	-	0.4	0.1	0.0	0.0	-	0.4	0.0	0.0	0.1	0.5	-	0.4
2002	-	-	0.0	0.0	-	0.0	-	-	0.0	0.0	-	-	-	-	0.1	-	-
2007	-	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-
2012	-	-	-	0.2	0.0	0.0	0.1	0.1	-	-	-	0.0	-	-	0.1	0.0	0.0
2017	-	0.0	-	0.9	-	0.5	0.1	-	-	-	-	-	-	-	0.0	-	-
2022	-	0.3	0.0	1.8	0.0	0.1	0.0	-	0.0	-	0.2	-	0.0	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Hackelia patens (spotted stickseed)	Hedysanum boreale (Utah sweetvetch)	Iva axillaris (povertyweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Penstemon caespitosus (mat penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	1	4	1	-	11	-	4	4	-	-	10	20	3	-	9	18	12
2002	-	-	-	2	9	-	-	-	-	-	-	13	-	-	12	19	19
2007	-	3	-	-	2	-	3	-	18	3	-	4	-	2	5	20	16
2012	-	4	5	-	26	-	-	-	-	-	-	7	2	-	12	25	17
2017	-	7	1	-	2	3	-	0	15	-	-	13	-	-	6	19	1
2022	-	3	-	-	5	1	-	-	30	-	2	2	-	-	3	16	14
year	Average Cover (%)																
1997	0.0	0.0	0.0	-	0.3	-	0.0	0.2	-	-	0.2	0.5	0.0	-	0.3	0.4	0.0
2002	-	-	-	0.0	0.5	-	-	-	-	-	-	0.3	-	-	0.0	0.4	0.1
2007	-	0.0	-	-	0.1	-	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.6	0.1
2012	-	0.0	0.3	-	0.4	-	-	-	-	-	-	0.0	0.0	-	0.2	0.8	0.0
2017	-	0.0	0.0	-	0.0	0.0	-	0.0	0.4	-	-	0.9	-	-	0.3	0.8	0.0
2022	-	0.0	-	-	0.2	0.0	-	-	0.3	-	0.0	0.3	-	-	0.0	0.5	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency						
1997	3	100	2	17	5	36	4
2002	6	24	1	4	-	11	-
2007	2	7	-	2	-	24	-
2012	1	5	-	3	-	-	-
2017	3	26	-	-	-	5	-
2022	4	18	-	9	-	-	-
year	Average Cover (%)						
1997	0.1	1.2	0.0	0.1	0.0	0.3	0.1
2002	0.0	0.3	0.0	0.0	-	0.1	-
2007	0.0	0.1	-	0.0	-	0.2	-
2012	0.0	0.0	-	0.0	-	-	-
2017	0.0	0.6	-	-	-	0.0	-
2022	0.1	0.3	-	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-46.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. tridentata ^p (basin big sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. spectiosa ^p (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	1.3	1.3	0.1	1.4	-	0.5	0	5.8	-	2.4	-	0.2
2007	0.8	0.8	0.1	0.6	-	0.6	-	13.2	0.1	2.4	-	0.4
2012	1.1	1.2	0.3	1.4	0.3	0.8	0.2	3.7	-	3.5	-	1.1
2017	0.5	1	0.3	1.9	0.9	0.9	0.7	6.8	0.4	5.5	-	0.7
2022	0.7	2.7	-	2.5	0.5	-	1.2	8.9	0	4.5	-	1.2
year	Quadrat Cover (%)											
1997	0.8	1.0	0.4	1.9	0.0	-	0.4	6.3	0.2	1.5	-	0.1
2002	0.5	1.7	0.0	1.7	-	0.4	0.1	10.6	0.0	3.2	-	0.1
2007	0.4	0.4	0.1	0.8	-	0.4	0.0	7.4	0.2	2.0	0.0	0.0
2012	0.6	0.6	0.0	1.1	0.1	0.2	0.0	1.4	0.1	2.7	0.0	0.6
2017	0.2	1.1	0.0	1.7	0.8	0.4	0.5	1.5	0.2	4.4	-	0.6
2022	0.4	0.9	-	2.0	0.4	-	0.7	3.1	0.1	3.8	0.1	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-46.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	100	-	40	60	0	0	60	0	63/90
2002	60	-	0	67	33	0	100	33	78/96
2007	40	-	0	100	0	50	50	0	91/100
2012	40	-	0	100	0	100	0	50	78/83
2017	20	-	0	100	0	0	100	0	75/91
2022	40	-	0	50	50	0	50	50	- / -
Artemisia tridentata ssp. tridentata^p -- (basin big sagebrush)									
1997	420	-	24	62	14	10	5	10	102/96
2002	380	-	11	53	37	16	68	21	83/84
2007	220	-	9	36	55	46	18	64	80/71
2012	280	200	7	64	29	36	7	21	91/96
2017	440	-	32	50	18	23	9	14	77/81
2022	580	-	28	62	10	10	14	10	- / -
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
1997	860	80	9	91	0	0	0	0	15/39
2002	120	-	0	83	17	0	0	0	9/22
2007	180	-	0	100	0	0	0	0	19/30
2012	120	-	17	67	17	50	17	17	15/43
2017	120	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	1300	-	11	80	9	0	2	2	30/42
2002	2020	-	3	66	31	16	5	18	20/30
2007	1280	-	13	64	23	6	3	14	22/33
2012	1000	240	10	84	6	12	0	54	29/49
2017	1220	-	8	92	0	13	0	0	31/49
2022	2960	-	35	65	1	0	0	1	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	60	-	67	33	0	33	0	33	66/68
2002	20	-	0	0	100	0	0	100	67/101
2007	40	-	0	100	0	0	0	0	56/39
2012	40	-	0	100	0	100	0	0	61/64
2017	80	-	50	50	0	0	0	0	66/68
2022	20	-	0	100	0	0	0	0	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	900	-	0	82	18	60	16	11	13/29
2007	520	-	23	77	0	23	0	0	20/28
2012	1160	20	21	79	0	35	28	0	29/47
2017	1260	-	3	97	0	0	0	0	16/34
2022	40	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	480	60	21	75	4	0	0	0	30/29
2002	680	-	3	53	44	3	3	41	21/26
2007	160	-	0	88	13	0	0	0	23/22
2012	320	-	25	75	0	0	0	0	25/33
2017	1040	-	0	100	0	0	0	0	21/25
2022	1120	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	220	40	36	64	0	0	9	0	- / -
2002	160	20	13	88	0	0	0	13	- / -
2007	200	-	20	80	0	0	0	0	- / -
2012	80	-	100	0	0	0	0	0	- / -
2017	20	20	100	0	0	0	0	0	- / -
2022	120	-	67	33	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	140	80	29	71	0	0	0	0	5/35
2002	160	-	13	88	0	0	0	0	10/28
2007	120	-	17	83	0	0	0	0	11/27
2012	120	-	17	83	0	0	0	0	8/25
2017	60	-	0	100	0	0	0	33	10/22
2022	100	-	0	100	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1997	120	-	17	83	0	17	67	0	40/138
2002	260	-	0	31	69	0	92	39	39/143
2007	400	-	0	95	5	0	100	0	41/95
2012	620	-	0	100	0	23	77	13	44/98
2017	560	-	0	100	0	46	54	0	50/104
2022	660	-	33	61	6	36	55	3	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	0	100	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	31/16
2012	-	-	-	-	-	-	-	-	170/255
2017	-	-	-	-	-	-	-	-	44/98
2022	-	-	-	-	-	-	-	-	-/-
Rosa woodsii^p -- (Woods' rose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	100	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	11/18
2012	-	20	0	0	0	0	0	0	4/5
2017	-	-	-	-	-	-	-	-	21/14
2022	60	-	67	33	0	0	0	0	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	80	-	0	100	0	0	0	0	46/79
2002	100	-	0	80	20	20	0	0	40/65
2007	100	-	20	80	0	40	0	0	31/43
2012	180	-	0	100	0	0	0	0	49/79
2017	80	-	0	100	0	0	0	0	44/70
2022	280	-	0	100	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

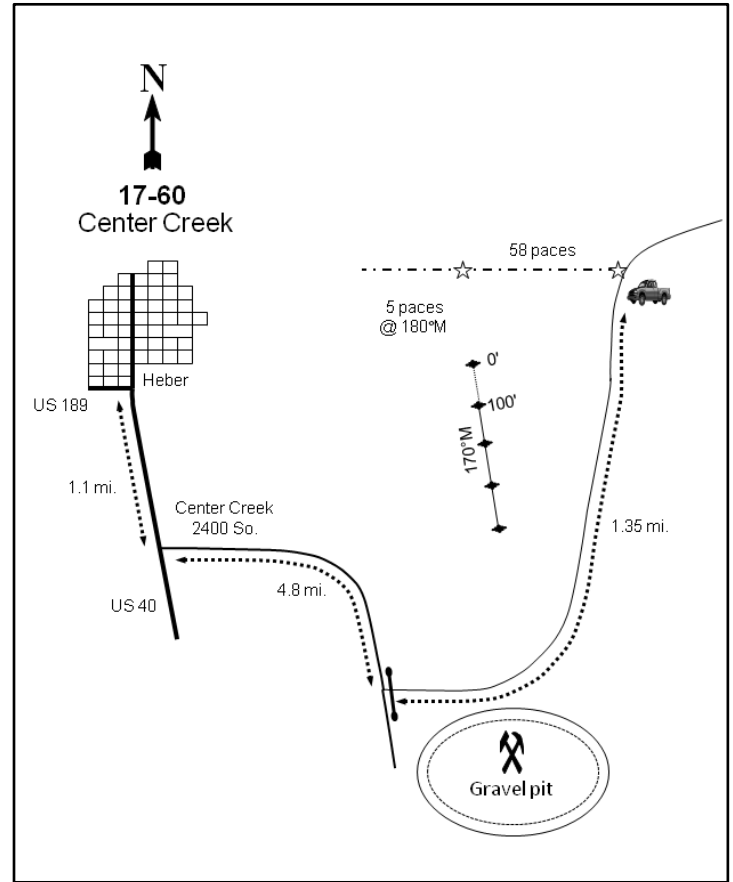
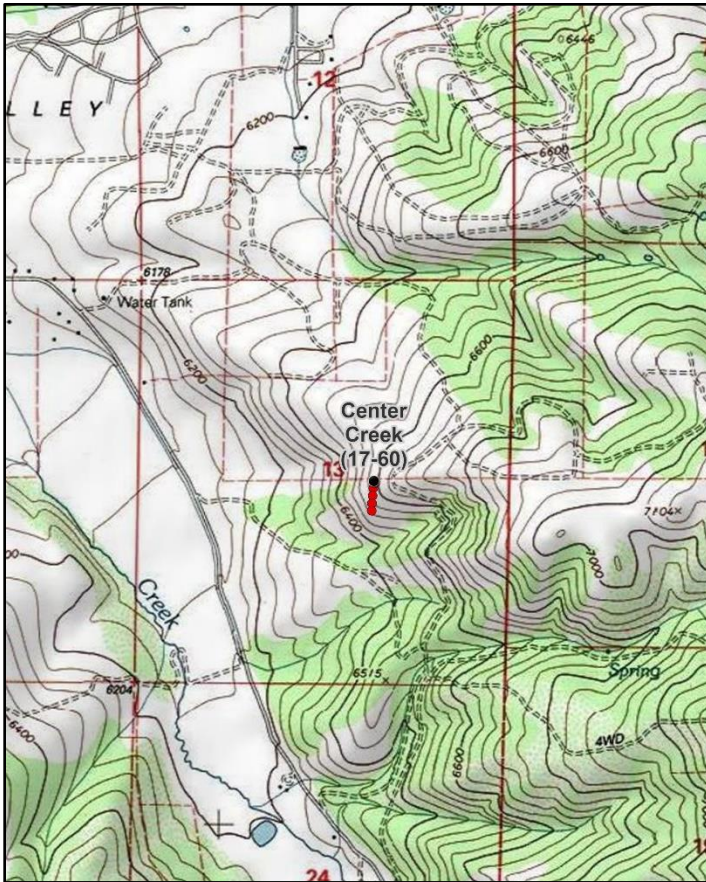
Table 17-46.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	74	-	-	-	-	-	16.1
2007	76	-	11	11	37	42	18.3
2012	25	-	33	20	13	33	14.7
2017	23	15	38	15	15	15	14.8
2022	35	-	29	29	6	35	19.6

Table 17-46.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	5.4	0.0	0.0	30.0	-0.4	10.0	-2.0	43.0	Poor
2002	7.8	-1.3	1.6	30.0	0.0	3.4	-2.0	39.5	Very Poor-Poor
2007	6.3	0.0	0.0	30.0	-0.1	3.8	-2.0	38.1	Very Poor-Poor
2012	10.3	13.4	0.9	30.0	0.0	3.5	0.0	58.0	Fair
2017	12.5	14.4	4.3	30.0	0.0	7.4	0.0	68.6	Fair-Good
2022	13.0	12.2	11.7	30.0	0.0	4.6	-2.0	69.4	Fair-Good

CENTER CREEK - STUDY NO. 17-60



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Center Creek NW; Township 4S, Range 5E, Section 13
NAD 83 UTM ZONE 12, 472300 East 4480073 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

174
170° magnetic
500ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: No Rebar

Directions to Site

From Heber City, proceed on Highway 40 towards Daniel's Canyon for 1.1 miles to Center Creek Road (2400 South). Continue for 3.0 miles until the road changes to a gravel road. Proceed for another 1.8 miles to a gravel pit, where there is a locked gate: contact Heber Valley Camp for permission and for the lock combo. Turn left and proceed 1.35 miles to a fence line: park here and walk 58 paces down the fence line. The 0-foot stake is 25 feet south of the fence line and is marked by browse tag #174.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,600ft (2,012m)
Aspect	West
Slope	22-25%
Sample Dates	06/27/2002, 08/07/2007, 08/01/2012, 07/25/2017, 07/14/2022

Wildlife Habitat and Vegetation History

Table 17-60.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-60.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Annual Grass	Phase I

Site Notes

The nearest perennial source of water is Center Creek which is 0.6 miles to the west. A quarry is located one mile south of the study site; in 2007 the quarry was active and gravel was being transported on the road that is adjacent to the study. A dead deer carcass was found near the study site baseline in 2002, and another was found in 2007. Deer bedding areas and bones were found on the study site in 2017, and deer were observed nearby.

Soils

Table 17-60.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	41.3	24.7	34.0	4.3	16.4	278.4	0.7	06/27/2002

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community type since study establishment in 2002; other preferred browse species are rare in comparison (Table 17-60.12, Table 17-60.13). The herbaceous understory has remained diverse. However, most of the cover has been provided by the introduced annual grass species cheatgrass (*Bromus tectorum*), which was a co-dominant site component in 2007, 2017, and 2022 (Table 17-60.10). Forbs have generally remained rare, with the exception of the 2017 and 2022 sample years: annual forbs provided nearly 10% and 14% cover, respectively, most of which was attributed to the introduced species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 17-60.7, Table 17-60.11).

Trend Summary Tables

Table 17-60.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	22.1	3.4	-	21.2	3.7	-
2007	16.2	2.0	-	18.7	2.4	-
2012	20.7	2.6	-	24.5	5.5	-
2017	19.4	7.2	-	24.2	8.1	-
2022	19.7	5.5	-	20.9	4.6	-

Table 17-60.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	266	153	199	140	4.4	3.8	1.2	1.8
2007	389	106	361	59	10.2	3.0	3.3	0.6
2012	300	176	137	86	7.8	5.5	0.7	1.5
2017	322	207	364	137	14.3	7.3	10.2	3.1
2022	375	211	369	94	16.1	9.0	13.7	1.5

Table 17-60.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	15.6	0.2	33.7	12.6	18.3	36.0
2007	7.4	-	39.1	10.1	12.6	42.6
2012	9.9	0.0	31.5	10.7	21.8	41.2
2017	3.7	0.6	36.1	15.0	18.0	55.7
2022	11.7	0.4	46.5	11.3	18.4	53.7

Table 17-60.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2002	1	27	1	-	7
2007	1	45	5	-	29
2012	-	33	8	-	1
2017	-	29	6	-	4
2022	-	44	7	1	4
Year	Days Use Per Acre (ha)				
2002	-	117.3 (289.7)	5.3 (13.2)	-	-
2007	-	53.0 (130.8)	38.9 (96.0)	-	-
2012	-	69.0 (170.5)	15.4 (38.1)	0.6 (1.4)	-
2017	-	69.0 (170.5)	2.7 (6.6)	-	-
2022	2.2 (5.4)	129.4 (319.5)	34.2 (84.4)	-	-

Table 17-60.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Achnatherum hymenoides (Indian ricegrass)	39	185	217	32	5	2	1	23	10	42	37	
Bromus arvensis ^{ai} (field brome)	30	93	382	12	1	9	3	4	-	17	45	
Bromus tectorum ^{ai} (cheatgrass)	43	56	278	3	14	1	3	7	10	43	94	
Elymus elymoides (squirreltail)	32	176	218	65	2	18	21	11	-	33	62	
Elymus lanceolatus (thickspike wheatgrass)	2022	37	224	307	78	-	15	29	1	-	50	49
Hesperostipa comata (needle and thread)	year	Average Cover (%)										
Poa bulbosa ⁱ (bulbous bluegrass)	2002	1.7	1.3	3.1	0.3	0.2	0.1	0.0	0.1	0.1	0.4	1.0
Poa fendleriana (muttongrass)	2007	1.0	0.3	9.9	0.2	0.0	0.1	0.0	0.0	-	0.2	1.6
Poa pratensis ⁱ (Kentucky bluegrass)	2012	0.9	0.3	7.5	0.0	0.1	0.0	0.0	0.0	0.1	0.4	3.8
Poa secunda (Sandberg bluegrass)	2017	2.0	3.8	10.4	1.5	0.0	1.1	0.2	0.1	-	0.5	1.8
Pseudoroegneria spicata (bluebunch wheatgrass)	2022	2.4	5.7	10.4	3.0	-	0.7	0.4	0.0	-	1.3	1.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-60.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)	6	47	175	6	1	3	3	13	5	3	-	4	19	3	7	-	5	
Allium (onion)	2007	-	14	353	-	-	1	4	-	-	-	1	-	17	-	7	15	4
Alyssum desertorum ^{ai} (desert madwort)	2012	-	5	109	-	2	-	6	-	-	-	2	-	23	-	26	1	-
Antennaria (pussytoes)	2017	-	57	331	-	-	1	10	17	-	-	-	-	12	-	15	-	10
Arabis (rockcress)	2022	2	17	313	-	-	-	11	5	6	6	5	-	16	-	4	3	6
Artemisia ludoviciana (white sagebrush)	year	Average Cover (%)																
Astragalus convallarius (lesser rushy milkvetch)	2002	0.0	0.1	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.1	-	0.0	0.5	0.0	0.1	-	0.0
Calochortus nuttallii (sego lily)	2007	-	0.0	1.9	-	-	0.0	0.0	-	-	-	0.0	-	0.2	-	0.2	0.0	0.0
Camelina microcarpa ^{ai} (littledod false flax)	2012	-	0.0	0.3	-	0.0	-	0.0	-	-	-	0.0	-	0.3	-	0.2	0.0	-
Castilleja linariifolia (Wyoming Indian paintbrush)	2017	-	0.2	4.5	-	-	0.0	0.9	0.1	-	-	-	-	0.2	-	0.6	-	0.0
Ceratocephala testiculata ^{ai} (curvseed butterwort)	2022	0.0	0.1	4.4	-	-	-	0.1	0.0	0.0	0.2	0.0	-	0.1	-	0.1	0.0	0.0
Chaenactis douglasii (Douglas' dustymaiden)	year	Average Cover (%)																
Chaetopappa ericoides (rose heath)	2002	0.0	0.1	0.8	0.2	0.0	0.0	0.0	0.0	0.1	-	0.0	0.5	0.0	0.1	-	0.0	
Chenopodium ^a (goosefoot)	2007	-	0.0	1.9	-	-	0.0	0.0	-	-	-	0.0	-	0.2	-	0.2	0.0	0.0
Cirsium undulatum ^a (wavyleaf thistle)	2012	-	0.0	0.3	-	0.0	-	0.0	-	-	-	0.0	-	0.3	-	0.2	0.0	-
Collinsia parviflora ^a (maiden blue eyed Mary)	2017	-	0.2	4.5	-	-	0.0	0.9	0.1	-	-	-	-	0.2	-	0.6	-	0.0
Collomia linearis ^a (tiny trumpet)	2022	0.0	0.1	4.4	-	-	-	0.1	0.0	0.0	0.2	0.0	-	0.1	-	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus (springparsley)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum brevicale (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Helianthus annuus ^{ai} (common sunflower)	Heliotropium multiflorum var. multiflorum (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola ^{ai} (prickly lettuce)	Mentzelia ^a (blazingstar)	Microsteris gracilis ^a (slender phlox)	Mirabilis linearis (narrowleaf four o'clock)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Silene antirrhina ^a (sleepy silene)	
year	Nested Frequency																	
2002	15	20	1	4	20	1	2	3	32	-	-	27	-	-	18	-	-	
2007	4	-	-	1	113	2	-	-	10	-	2	3	-	-	1	-	-	
2012	4	2	-	2	10	2	-	15	26	3	4	-	-	-	7	-	3	
2017	6	11	-	6	183	1	-	10	15	-	0	-	15	-	-	2	-	
2022	3	-	-	1	224	-	-	1	9	-	-	1	13	2	3	-	-	
year	Average Cover (%)																	
2002	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4	-	-	0.1	-	-	0.1	-	-	
2007	0.0	-	-	0.0	1.2	0.0	-	-	0.2	-	0.0	0.0	-	-	0.0	-	-	
2012	0.0	0.0	-	0.0	0.1	0.0	-	0.3	0.6	0.0	0.0	-	-	-	0.0	-	0.0	
2017	0.0	0.1	-	0.0	4.9	0.0	-	0.1	0.7	-	0.0	-	0.1	-	-	0.0	-	
2022	0.0	-	-	0.0	9.1	-	-	0.0	0.3	-	-	0.0	0.0	0.0	0.0	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Viola (violet)
year	Nested Frequency			
2002	20	-	-	-
2007	17	-	-	2
2012	19	-	4	-
2017	29	5	10	-
2022	26	-	4	-
year	Average Cover (%)			
2002	0.3	-	-	-
2007	0.1	-	-	0.0
2012	0.2	-	0.0	-
2017	0.6	0.0	0.1	-
2022	0.6	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-60.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)										
	year	2002	2007	2012	2017	2022	2002	2007	2012	2017	2022
<i>Amelanchier utahensis</i> ^p (Utah serviceberry)	0	20.7	0.1	2.2	0.3	0.2	-	0.5	0.9		
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	0	18.6	0.1	0.3	0.6	0.2	-	0.1	1.2		
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	-	24.5	0.2	2.9	0.5	0.2	-	-	1.7		
<i>Gutierrezia sarothrae</i> (broom snakeweed)	-	24.1	0.2	5.1	0.5	0.6	-	0.1	1.7		
<i>Mahonia repens</i> (creeping barberry)	0.1	20.8	0.1	2.3	0.3	0.3	-	-	1.6		
<i>Opuntia polyacantha</i> (plains pricklypear)											
<i>Prunus virginiana</i> ^p (chokecherry)											
<i>Purshia tridentata</i> ^p (antelope bitterbrush)											
<i>Tetradymia canescens</i> (spineless horsebrush)											

year	Quadrat Cover (%)									
	2002	2007	2012	2017	2022	2002	2007	2012	2017	2022
2002	0.4	21.4	0.1	2.0	0.5	0.3	-	0.3	0.6	
2007	0.1	15.6	0.0	0.3	0.3	0.4	-	0.4	1.1	
2012	1.0	19.3	0.0	1.3	0.5	0.1	-	0.4	0.8	
2017	0.4	19.0	0.2	4.4	0.8	0.6	0.0	0.0	1.1	
2022	0.4	19.3	0.0	2.5	0.5	0.3	-	-	2.2	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-60.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Amelanchier utahensis</i>^p -- (Utah serviceberry)									
2002	160	-	25	75	0	13	88	0	37/54
2007	140	-	14	71	14	0	86	0	34/44
2012	80	20	25	75	0	0	50	0	44/60
2017	60	-	33	67	0	0	67	0	38/42
2022	200	200	70	10	20	60	20	20	- / -
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>^p -- (mountain big sagebrush)									
2002	3020	-	2	70	28	32	23	21	70/97
2007	2120	-	1	67	32	30	27	16	70/98
2012	2040	380	1	82	17	30	14	5	66/96
2017	2140	20	4	64	33	22	26	24	71/123
2022	2240	20	10	53	38	27	39	48	- / -
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
2002	60	-	0	100	0	0	0	33	24/38
2007	20	-	0	100	0	0	0	0	18/26
2012	40	-	0	100	0	0	0	0	22/27
2017	100	-	0	100	0	0	0	0	31/46
2022	20	-	0	100	0	0	100	0	- / -
<i>Gutierrezia sarothrae</i> -- (broom snakeweed)									
2002	3620	-	0	95	6	0	0	4	21/25
2007	1160	360	9	90	2	3	5	7	20/19
2012	1520	200	7	93	0	0	0	0	26/36
2017	6340	20	1	99	0	0	0	0	27/27
2022	4720	380	15	80	5	1	1	11	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Linanthus pungens -- (granite prickly phlox)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
2002	2260	-	0	100	0	0	0	0	7/10
2007	4400	-	1	99	0	0	0	1	9/11
2012	2040	-	0	100	0	0	0	0	9/13
2017	2360	-	0	100	0	0	0	0	7/11
2022	3240	-	1	99	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2002	1080	-	11	87	2	0	0	4	11/22
2007	1000	20	8	88	4	0	0	6	10/21
2012	940	-	4	96	0	0	2	4	12/24
2017	1000	-	4	92	4	4	0	8	12/30
2022	760	-	0	90	11	0	3	24	- / -
Prunus virginiana^p -- (chokecherry)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
2002	-	-	-	-	-	-	-	-	215/170
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	0	100	0	100	100	- / -
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2002	160	-	0	88	13	0	88	0	26/67
2007	220	-	9	82	9	0	64	9	21/61
2012	140	-	0	100	0	0	71	0	23/46
2017	80	-	25	50	25	0	75	25	30/45
2022	60	-	0	67	33	0	100	33	- / -
Rhus trilobata^p -- (skunkbush sumac)									
2002	-	-	-	-	-	-	-	-	69/130
2007	-	-	-	-	-	-	-	-	63/142
2012	-	-	-	-	-	-	-	-	83/164
2017	-	-	-	-	-	-	-	-	64/125
2022	-	-	-	-	-	-	-	-	-/-
Ribes^p -- (currant)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	84/187
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
2002	360	-	0	94	6	6	6	0	26/42
2007	320	-	0	94	6	6	0	6	28/52
2012	480	-	0	88	13	0	0	4	32/54
2017	900	-	0	96	4	0	0	2	29/56
2022	580	-	17	62	21	3	0	21	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

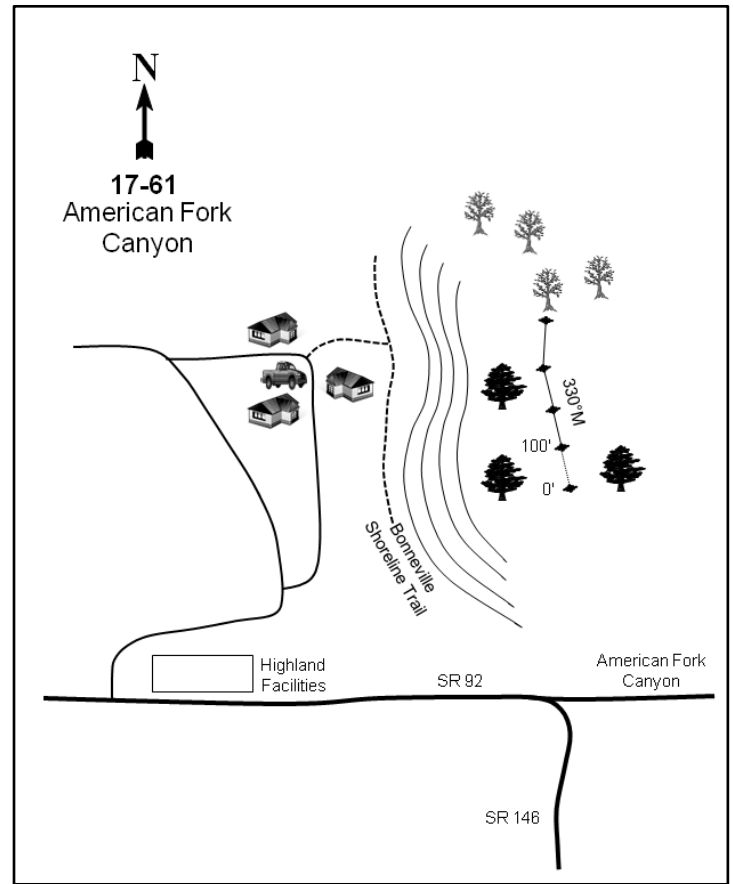
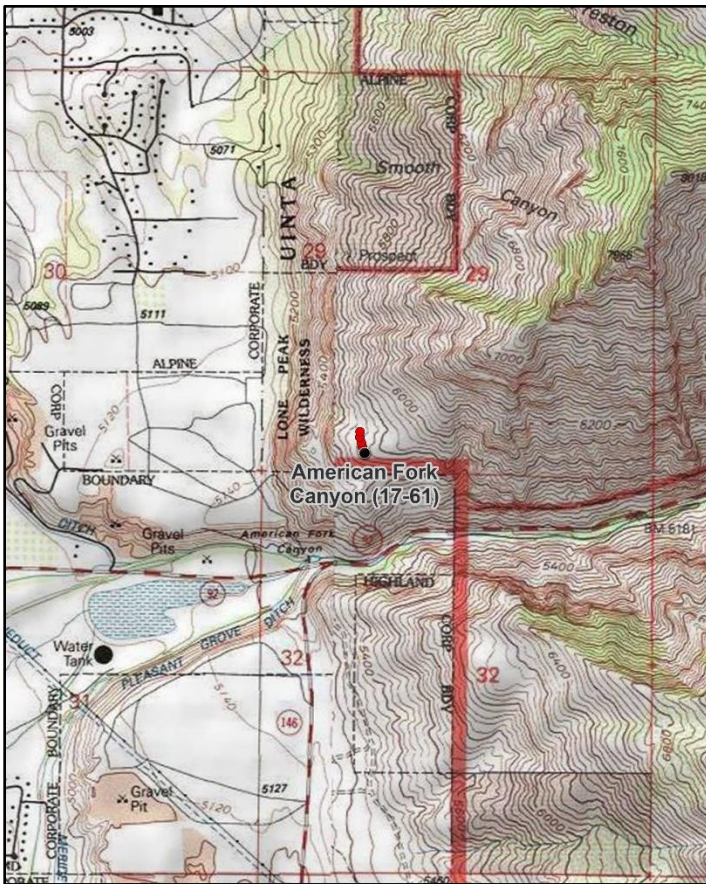
Table 17-60.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	2	-	50	-	-	50	18.0
2022	17	-	100	-	-	-	3.3

Table 17-60.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	27.8	6.7	1.2	7.7	-3.3	3.7	0.0	43.7	Poor
2007	23.4	5.4	0.5	6.0	-7.7	1.3	0.0	28.9	Very Poor
2012	30.0	10.0	0.5	10.9	-5.9	3.1	0.0	48.6	Poor
2017	30.0	5.2	1.9	14.2	-10.7	6.2	0.0	46.7	Poor
2022	26.2	3.8	5.0	17.2	-12.1	3.0	0.0	43.0	Poor

AMERICAN FORK CANYON - STUDY NO. 17-61



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Timpanogos Cave SW; Township 4S, Range 2E, Section 29
NAD 83 UTM ZONE 12, 436450 East 4476459 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
330° magnetic (Line 4: 350° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Lines 2-3: 48ft and 74ft long
Belt 1: No Rebar, Belt 2: 1ft

Directions to Site

Travel to American Fork Canyon on Highway 92. Toward the mouth of the canyon, there is a gravel pit on the north side of the road along with the Highland Facilities building. Turn left on the road and continue north just before the buildings. Continue up this road until a very steep, burned slope is encountered: the site lies on the first bench of this slope. Park here. Walk east up the slope about 1/4 of a mile to another bench; the study site is on this bench. GPS coordinates will be helpful on this site, and trail access is found in the neighborhood at the base of the slope.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	West
Slope	20-25%
Sample Dates	08/08/2002, 07/26/2007, 07/26/2012, 07/11/2017, 07/11/2022

Table 17-61.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Alpine Fire	-	June 2017	99
Fire - Wildfire	View Point	-	2020	20
Fire - Wildfire	Oak Hill	-	2000	911

Wildlife Habitat and Vegetation History**Table 17-61.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing

Table 17-61.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Annual Grass/Mountain Big Sagebrush	Phase I
2007	Annual Grass/Mountain Big Sagebrush	Phase I
2012	Annual Grass/Mountain Big Sagebrush	Phase I
2017	Barren	Phase I
2022	Annual Grass	Phase I

Site Notes

This study site was established to monitor Rocky Mountain bighorn sheep use; the sheep were transplanted to the area towards the end of 1999, but the study was not established until 2002. The nearest perennial source of water is the American Fork River 0.25 miles south of the study. There is no 100-foot stake on this study site.

Soils**Table 17-61.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.4	29.3	46.7	24.0	6.3	105.6	313.6	0.9	08/08/2002

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

From study site establishment in 2002 through the 2012 sample year, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the most dominant browse species; Utah juniper trees (*Juniperus osteosperma*) were also scattered throughout the site (Table 17-61.12, Table 17-61.13). The herbaceous understory was abundant, but almost entirely composed of the introduced annual grass cheatgrass (*Bromus tectorum*). A fire in June of 2017 removed nearly all of the shrubs and herbaceous species -- the only herbaceous species observed in 2017 were cheatgrass and the introduced annual forbs desert madwort (*Alyssum desertorum*), redstem stork's bill (*Erodium cicutarium*), and tall tumbled mustard (*Sisymbrium altissimum*) (Table 17-61.10, Table 17-61.11). The area burned again in the 2020 View Point wildfire, which effectively removed the remaining preferred browse species and leaving two juniper trees on the site, leading the community to transition to one dominated by cheatgrass and the introduced annual forb prickly Russian thistle (*Salsola tragus*) in 2022 (Photos, Table 17-61.1, Table 17-61.12, Table 17-61.13, Table 17-61.14).

Trend Summary Tables

Table 17-61.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	3.9	-	7.8	7.0	-	14.8
2007	3.9	0.1	4.6	8.3	0.4	15.9
2012	6.2	0.4	12.0	11.5	0.4	19.2
2017	0.1	-	2.0	0.5	-	10.0
2022	-	0.0	-	-	0.3	-

Table 17-61.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	425	9	100	1	40.9	0.0	1.2	0.0
2007	457	112	263	3	37.4	2.7	3.8	0.0
2012	412	119	231	8	32.4	6.1	2.0	0.1
2017	11	-	16	-	0.2	-	0.2	-
2022	466	57	326	13	49.0	1.3	14.6	0.1

Table 17-61.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	4.7	0.1	40.7	1.5	21.6	52.3
2007	1.5	0.3	43.1	0.3	17.3	51.2
2012	3.9	0.5	34.4	0.7	21.9	59.7
2017	41.2	0.1	28.1	3.3	26.9	2.4
2022	1.2	0.6	34.2	0.8	27.3	56.3

Table 17-61.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer/Big Horn Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency			
2002	43	7	-	18
2007	36	3	-	8
2012	26	-	1	12
2017	5	-	-	-
2022	30	-	-	2
Year	Days Use Per Acre (ha)			
2002	84.5 (208.6)	18.1 (44.7)	-	-
2007	55.6 (137.4)	6.7 (16.6)	-	-
2012	71.7 (177.1)	4.7 (11.6)	-	-
2017	8.7 (21.5)	-	-	-
2022	24.1 (59.6)	-	-	-

Table 17-61.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
2002	3	425	-	6	1	2
2007	-	457	2	14	46	66
2012	-	412	-	29	14	83
2017	-	11	-	-	-	-
2022	-	466	-	8	38	18
year	Average Cover (%)					
2002	0.0	40.9	-	0.0	0.0	0.0
2007	-	37.4	0.0	0.4	0.4	1.9
2012	-	32.4	-	1.2	0.4	4.4
2017	-	0.2	-	-	-	-
2022	-	49.0	-	0.2	0.5	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-61.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Salsola tragus ^{ai} (prickly Russian thistle)	Silene antirrhina ^a (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumbledmustard)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency																
2002	63	5	-	-	-	4	4	-	-	30	1	-	-	1	3	5	-
2007	54	2	2	-	3	7	38	-	-	134	-	-	16	-	199	7	1
2012	128	-	32	-	1	3	7	7	-	8	-	-	10	-	123	14	2
2017	13	-	-	-	-	-	-	-	-	7	-	-	-	-	-	0	-
2022	28	2	-	3	-	3	12	-	10	271	-	12	8	164	54	60	-
year	Average Cover (%)																
2002	0.2	0.2	-	-	-	0.0	0.0	-	-	0.6	0.0	-	-	0.0	0.0	0.3	-
2007	0.2	0.0	0.0	-	0.0	0.0	0.1	-	-	2.0	-	-	0.0	-	1.5	0.1	0.0
2012	1.3	-	0.1	-	0.0	0.0	0.0	0.1	-	0.0	-	-	0.0	-	0.5	0.1	0.0
2017	0.2	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-
2022	0.1	0.0	-	0.0	-	0.0	0.0	-	0.0	8.7	-	0.0	0.0	3.4	0.2	2.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-61.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year						
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2002	4.4	-	-	14.8	-	2.6
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	2007	7.2	-	0.2	15.9	0.2	1.1
Gutierrezia sarothrae (broom snakeweed)	2012	10.4	0	-	19.2	0.4	1.1
Juniperus osteosperma ⁱ (Utah juniper)	2017	0.5	-	-	10	-	-
Opuntia (pricklypear)	2022	-	-	-	-	0.3	-
Purshia stansburiana ^p (Stansbury cliffrose)	year	Quadrat Cover (%)					
	2002	3.5	-	-	7.8	-	0.5
	2007	3.4	-	0.1	4.6	0.0	0.5
	2012	6.0	0.0	0.4	12.0	0.1	0.2
	2017	0.1	-	-	2.0	-	-
	2022	-	-	-	-	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-61.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2002	1500	-	3	72	25	19	20	17	57/80
2007	1000	80	2	86	12	30	52	4	61/92
2012	980	60	2	84	14	20	57	69	63/90
2017	20	-	0	100	0	100	0	100	53/83
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2002	20	-	0	0	100	0	0	0	58/112
2007	20	-	0	0	100	0	0	0	65/97
2012	40	-	0	50	50	0	0	50	66/90
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2002	-	-	-	-	-	-	-	-	-/-
2007	100	-	0	100	0	0	0	0	23/28
2012	80	20	0	100	0	0	0	0	30/43
2017	-	-	-	-	-	-	-	-	20/38
2022	20	-	0	100	0	0	0	0	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
2002	100	-	0	100	0	0	0	0	-/-
2007	100	-	0	100	0	0	0	0	-/-
2012	100	-	0	100	0	0	0	0	-/-
2017	60	-	0	67	33	0	0	100	-/-
2022	-	-	-	-	-	-	-	-	-/-

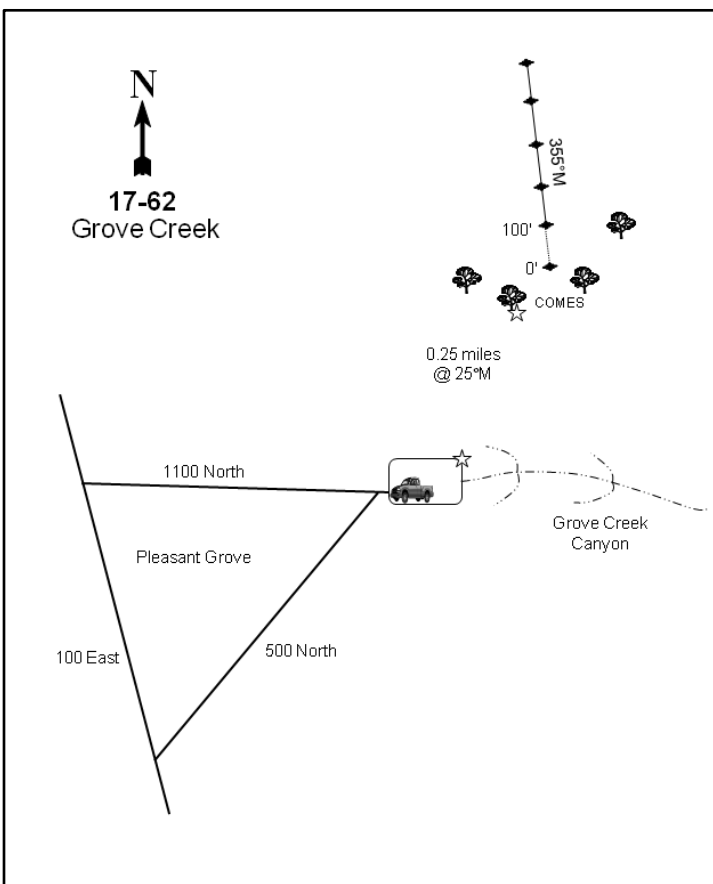
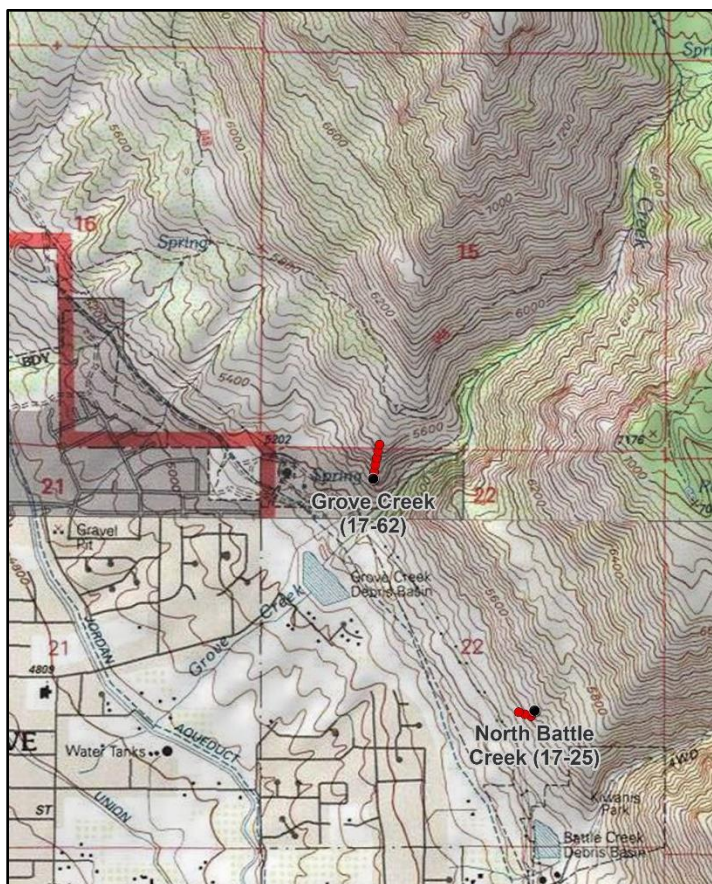
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
2002	80	-	25	75	0	0	0	0	8/13
2007	120	-	17	83	0	0	0	0	9/33
2012	160	-	0	88	13	0	0	13	9/30
2017	-	-	-	-	-	-	-	-	- / -
2022	40	-	0	100	0	0	0	0	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
2002	120	-	0	33	67	50	50	17	108/110
2007	120	-	0	17	83	33	67	17	129/123
2012	100	-	40	0	60	20	0	0	120/111
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-61.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	38	-	-	-	-	-	20.4
2007	36	-	-	17	22	61	30.7
2012	40	-	6	-	18	76	33.6
2017	29	-	-	6	19	75	35.6
2022	3	-	-	50	-	50	22.5

GROVE CREEK - STUDY NO. 17-62



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Timpanogos Cave SW; Township 5S, Range 2E, Section 22
NAD 83 UTM ZONE 12, 439692 East 4469781 North

Transect Information

Browse Tag # (0' Stake)	266
Transect Bearing	355° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belts 1 & 3: No Rebar, Belt 2: 3ft, Belt 4: 4ft

Directions to Site

From the junction of Highways 89 (State St.) and 146 in Pleasant Grove, continue on Highway 146 to 500 North, just before the school. Continue on this road until it comes to the parking lot at the mouth of Grove Creek Canyon. From the parking lot, follow the ridge for 0.25 miles at 25 degrees magnetic to the 0-foot stake in the cliffrose. The 300-foot stake is missing.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,350ft (1,631m)
Aspect	Southwest
Slope	40%
Sample Dates	08/08/2002, 08/06/2007, 07/27/2012, 07/11/2017, 07/12/2022

Wildlife Habitat and Vegetation History**Table 17-62.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-62.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2007	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2012	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2017	Stansbury Cliffrose/Mountain Big Sagebrush	NA
2022	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA

Site Notes

This study was established to monitor deer and bighorn sheep winter range; bighorn sheep were transplanted into the area in the late 1990s. This study has become increasingly important winter range as a result of the expansion of residential development. Big game bedding areas were seen on the site in 2012. The nearest perennial source of water is Grove Creek, which is 400 feet south of the study site.

Soils**Table 17-62.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	33.3	34.7	32.0	3.4	11.4	198.4	0.7	08/07/2002

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have been the dominant browse species on this site since study establishment in 2002 with few other shrubs present. Although the sagebrush population is small, it is notable that density of sagebrush has gradually increased while cover and density of cliffrose has decreased since 2012, which may indicate a transition in community composition (Table 17-62.12, Table 17-62.13). The herbaceous understory was dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*) from 2002 through 2012, and then again in 2022. In 2017, however, most herbaceous cover was provided by the introduced annual forb redstem stork's bill (*Erodium cicutarium*). In addition, the noxious and introduced annual grass species jointed goatgrass (*Aegilops cylindrica*) was present in 2012, and the noxious and introduced annual forb yellow star-thistle (*Centaurea solstitialis*) was observed in most study years (Table 17-62.7, Table 17-62.10, Table 17-62.11). Without a major disturbance, this site is expected to remain in a similar state in future sample years, though annual grass may increase.

Trend Summary Tables

Table 17-62.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	5.9	-	-	4.7	-	-
2007	2.5	0.3	-	6.1	-	-
2012	6.0	0.2	-	8.7	0.2	-
2017	3.8	0.1	-	9.2	0.6	-
2022	4.6	0.0	-	7.3	0.3	-

Table 17-62.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	398	138	280	40	19.2	4.3	3.9	0.5
2007	432	110	321	30	20.0	4.2	6.1	0.4
2012	411	148	311	57	20.9	8.8	6.5	1.7
2017	250	128	372	75	7.8	6.1	18.1	1.7
2022	392	127	345	54	18.8	6.0	11.8	0.9

Table 17-62.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	22.7	0.2	31.4	15.9	9.6	35.3
2007	10.9	0.2	51.1	12.3	6.4	35.1
2012	10.9	-	35.1	10.5	8.8	47.4
2017	22.5	-	29.9	18.0	8.5	36.6
2022	20.2	-	34.4	18.8	19.8	40.3

Table 17-62.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Coyote	Mule Deer/Big Horn Sheep	Rocky Mountain Elk	Other	Rabbit
	Quadrat Frequency				
2002	-	36	1	-	-
2007	-	36	14	-	8
2012	-	26	1	-	-
2017	-	32	-	-	3
2022	-	24	-	-	3
Days Use Per Acre (ha)					
2002	-	71.7 (177.1)	4.7 (11.6)	-	-
2007	-	120.0 (296.3)	4.0 (9.9)	-	-
2012	8.7 (21.5)*	37.5 (92.7)	-	-	-
2017	-	108.6 (268.2)	-	-	-
2022	-	49.6 (122.5)	-	17.4 (43.0)*	-

*Pellets per acre (ha)

Table 17-62.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
<i>Aegilops cylindrica</i> ^{ani} (jointed goatgrass)							
<i>Bromus arvensis</i> ^{ai} (field brome)							
<i>Bromus tectorum</i> ^{ai} (cheatgrass)							
<i>Poa bulbosa</i> ⁱ (bulbous bluegrass)							
<i>Poa fendleriana</i> (muttongrass)							
<i>Poa secunda</i> (Sandberg bluegrass)							
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)							
year	Average Cover (%)						
2002	-	60	396	6	1	37	114
2007	-	9	432	2	-	10	106
2012	2	-	411	4	-	4	143
2017	-	3	250	9	-	1	123
2022	-	2	392	8	-	7	122
year	Average Cover (%)						
2002	-	0.3	18.9	0.1	0.0	0.4	3.8
2007	-	0.0	20.0	0.0	-	0.1	4.1
2012	0.0	-	20.9	0.2	-	0.1	8.6
2017	-	0.0	7.8	0.1	-	0.0	6.0
2022	-	0.0	18.8	0.2	-	0.1	5.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-62.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Alyssum desertorum</i> ^{ai} (desert madwort)																	
<i>Ambrosia psilostachya</i> (Cuman ragweed)																	
<i>Antennaria</i> (pussytoes)																	
<i>Artemisia ludoviciana</i> (white sagebrush)																	
<i>Astragalus utahensis</i> (Utah milkvetch)																	
<i>Camelina microcarpa</i> ^{ai} (littlegod false flax)																	
<i>Centaurea solstitialis</i> ^{smi} (yellow star-thistle)																	
<i>Ceratocephala testiculata</i> ^{ai} (curveseed butterwort)																	
<i>Cirsium</i> (thistle)																	
<i>Collinsia parviflora</i> ^a (maiden blue eyed Mary)																	
<i>Convolvulus arvensis</i> ^{ai} (field bindweed)																	
<i>Cryptantha</i> (cryptantha)																	
<i>Descurainia pinnata</i> ^a (western tansymustard)																	
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)																	
<i>Galium aparine</i> ^a (stickywilly)																	
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)																	
<i>Lappula occidentalis</i> ^a (flatspine stickseed)																	
year	Average Cover (%)																
2002	135	6	1	5	0	3	-	154	-	-	-	-	-	145	-	-	4
2007	174	5	-	2	-	-	6	16	1	-	2	1	-	281	-	3	1
2012	273	44	-	2	-	12	5	10	-	2	4	-	1	195	2	-	9
2017	244	39	-	3	-	3	1	100	-	-	-	1	4	327	5	-	6
2022	177	20	-	5	1	1	-	50	-	2	2	3	-	316	1	-	6
2002	0.4	0.2	0.0	0.0	0.0	0.0	-	0.8	-	-	-	-	-	2.3	-	-	0.2
2007	0.6	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0	-	5.3	-	0.0	0.0
2012	1.8	1.5	-	0.1	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	4.5	0.0	-	0.0
2017	1.6	0.5	-	0.0	-	0.1	0.0	0.5	-	-	-	0.1	0.0	15.5	0.2	-	0.2
2022	1.1	0.4	-	0.2	0.0	0.0	-	0.1	-	0.0	0.0	0.1	-	10.5	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
<i>Lathyrus brachycalyx</i> (Bonneville pea)					
<i>Malcolmia africana</i> ^{ai} (African mustard)					
<i>Silene antirrhina</i> ^a (sleepy silene)					
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)					
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)					
year	Nested Frequency				
2002	28	-	5	7	4
2007	19	-	43	4	-
2012	9	-	9	21	-
2017	32	-	-	4	-
2022	24	1	-	1	-
year	Average Cover (%)				
2002	0.3	-	0.0	0.1	0.0
2007	0.3	-	0.1	0.0	-
2012	0.1	-	0.0	0.1	-
2017	1.0	-	-	0.0	-
2022	0.1	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-62.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)						
<i>Celtis laevigata</i> var. <i>reticulata</i> (netleaf hackberry)						
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)						
<i>Gutierrezia sarothrae</i> (broom snakeweed)						
<i>Purshia stansburiana</i> ^p (Stansbury cliffrose)						
<i>Rhus trilobata</i> ^p (skunkbush sumac)						
year	Line Intercept Cover (%)					
2002	0.8	-	1.2	-	2.7	-
2007	0.3	0	0.8	-	5	-
2012	1.4	-	1.7	0.2	5.4	0.2
2017	1.9	-	1.6	0.6	5.7	-
2022	2	-	1.4	0.3	3.9	-
year	Quadrat Cover (%)					
2002	1.6	-	1.5	-	2.7	0.0
2007	0.2	0.0	1.0	0.3	1.1	0.1
2012	1.1	-	0.9	0.2	3.8	0.1
2017	1.2	0.0	1.2	0.1	1.5	-
2022	2.5	-	0.9	0.0	1.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-62.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

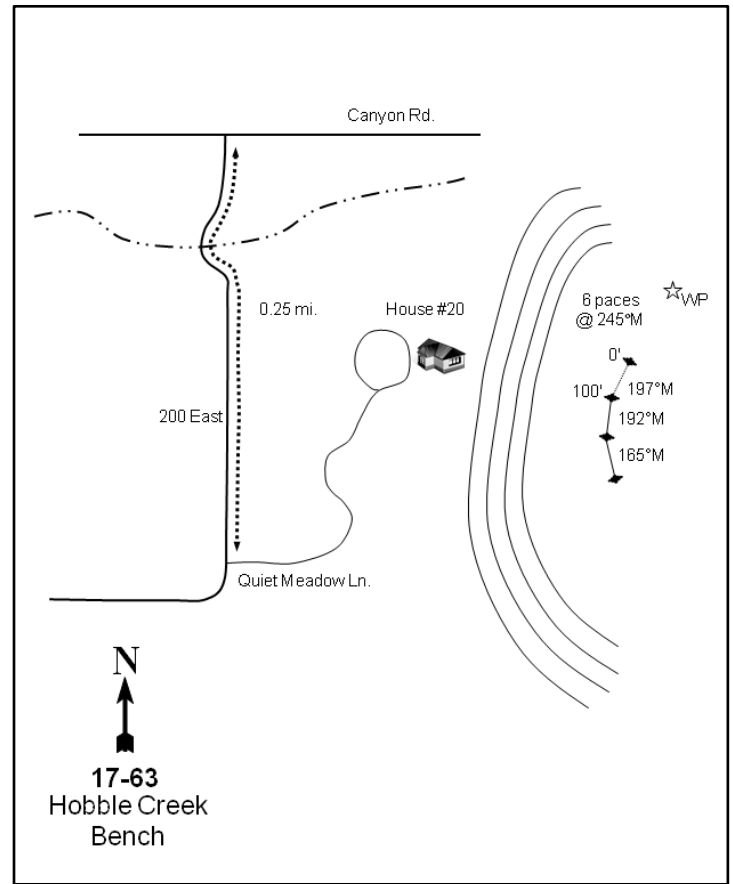
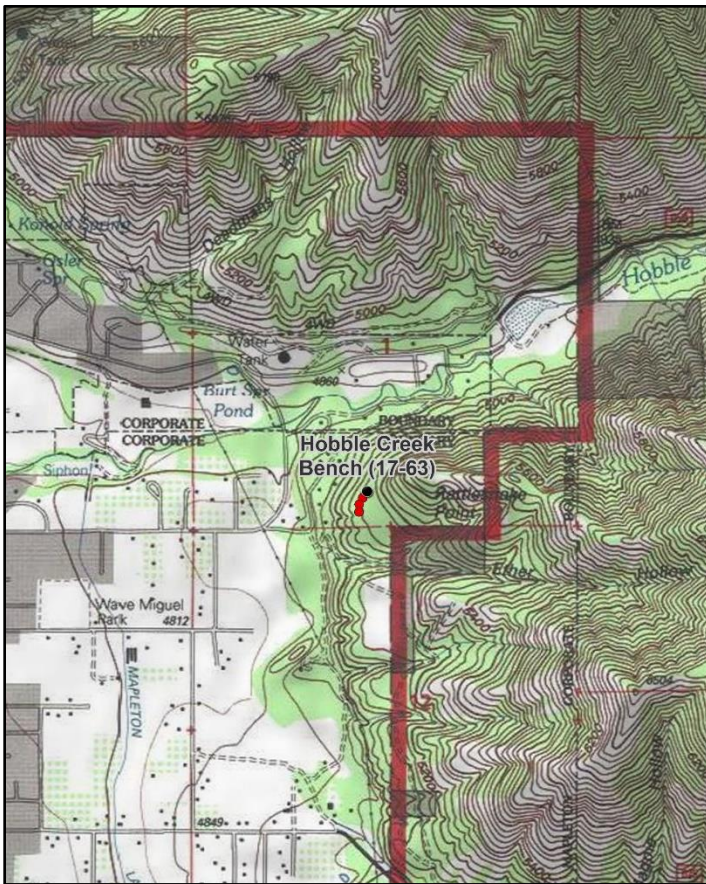
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2002	380	-	0	47	53	26	37	37	60/87
2007	240	-	0	58	42	17	58	42	64/103
2012	160	-	0	88	13	38	13	25	78/109
2017	180	-	11	78	11	33	33	0	68/115
2022	260	-	8	77	15	31	39	39	- / -
Celtis laevigata var. reticulata -- (netleaf hackberry)									
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	107/273
2012	-	-	-	-	-	-	-	-	44/86
2017	-	-	-	-	-	-	-	-	28/80
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2002	180	-	0	56	44	11	0	22	65/105
2007	140	-	0	71	29	0	0	14	92/133
2012	100	-	0	100	0	0	0	60	87/147
2017	60	-	0	100	0	33	67	0	88/164
2022	60	-	0	67	33	0	0	33	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2002	40	-	0	100	0	0	0	0	20/30
2007	100	-	0	100	0	20	0	0	26/33
2012	180	60	0	89	11	0	0	22	30/50
2017	200	-	0	70	30	0	0	20	22/30
2022	60	-	0	67	33	0	0	33	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
2002	120	-	50	50	0	17	17	0	174/210
2007	80	-	0	75	25	50	25	25	180/218
2012	140	-	29	71	0	29	0	0	183/259
2017	120	-	17	83	0	33	17	0	203/256
2022	100	-	0	100	0	40	20	0	- / -
Rhus trilobata^p -- (skunkbush sumac)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	126/307
2017	-	-	-	-	-	-	-	-	125/249

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-62.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	8.0	7.0	11.4	8.4	-14.4	1.1	0.0	21.5	Very Poor
2007	8.9	7.1	0.0	8.4	-15.0	0.7	-4.0	6.1	Very Poor
2012	12.2	14.1	8.9	17.3	-15.7	3.3	-6.0	34.0	Very Poor-Poor
2017	12.9	14.3	6.3	12.1	-5.9	3.3	-2.0	41.1	Poor
2022	10.1	11.8	1.1	11.6	-14.1	1.8	-2.0	20.2	Very Poor

HOBBLE CREEK BENCH - STUDY NO. 17-63



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Springville SE; Township 8S, Range 3E, Section 01
NAD 83 UTM ZONE 12, 453021 East 4444162 North

Transect Information

Browse Tag # (0' Stake)	183
Transect Bearing	197° magnetic (The study curves; use GPS to find stakes)
Length	300ft
Belt Placement	Line 1 (97ft), Line 2 (11ft, 37ft & 95ft), Line 3 (34ft)
Belt Marker Placement	No Rebar

Directions to Site

On Highway 89 in Mapleton, take 1650 South, which will change into 1600 North. Follow 1600 North until it junctions with Quiet Meadow Lane (1600 North ends at this point). Park in front of house #20: it has a pond in the front yard. Ask owner, Mark Petersen (ownership may have changed), for permission to walk into his backyard. Go up his driveway to a steep footpath up the hill. Hike up the steep hill until a bench is reached; a half-high witness post is located in a clearing. The 0-foot stake is 6 paces at 245 degrees magnetic from the witness post and is marked by browse tag #183. All line stakes are rebar.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,120ft (1,561m)
Aspect	West
Slope	7-15%
Sample Dates	07/26/2002, 09/19/2012, 07/06/2017, 07/14/2022

Table 17-63.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Ether Hollow	-	September 2020	849

Wildlife Habitat and Vegetation History

Table 17-63.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 17-63.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA
2012	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA
2022	Bulbous Bluegrass/Annual Forb	NA

Site Notes

The study is situated on a lake terrace left by ancient Lake Bonneville. Houses are located at the base of the slope, though future development may be unlikely due to the terrain. A geocache was found in 2017.

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with Gambel oak (*Quercus gambelii*) patches scattered throughout the area; cover and health of bitterbrush and sagebrush exhibited an overall decrease between 2002 and 2017. In 2020 the Ether Hollow wildfire removed much of the preferred browse and effectively transitioned the community to one dominated by perennial grasses and annual forbs in 2022 (photos, Table 17-63.12, Table 17-63.13). The herbaceous understory has remained fairly diverse and very abundant, but has been dominated by the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) in all sample years. The introduced annual grass cheatgrass (*Bromus tectorum*) is also present in moderate amounts, and the introduced annual forb redstem stork's bill (*Erodium cicutarium*) contributed nearly 24% and 29% cover in 2017 and 2022, respectively (Table 17-63.7, Table 17-63.10, Table 17-63.11). It is expected that Gambel oak will recover quickly and provide some forage value to wildlife. However, barring the lack of disturbance, it will likely take a long time for sagebrush and bitterbrush to recover due to the competition from introduced perennial grasses and/or cheatgrass in future sample years.

Trend Summary Tables

Table 17-63.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	16.2	0.3	-	22.5	-	-
2012	12.6	0.3	-	25.9	0.6	-
2017	14.8	0.0	-	20.9	0.1	-
2022	0.3	0.0	-	1.0	-	-

Table 17-63.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	65	466	19	57	0.6	56.4	0.2	2.6
2012	348	405	221	78	16.7	43.8	3.8	3.6
2017	381	422	334	56	17.4	35.7	25.4	2.5
2022	247	405	418	87	8.1	44.9	29.5	2.2

Table 17-63.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	3.1	8.0	26.4	0.5	0.1	75.6
2012	0.9	2.0	37.8	0.1	0.1	79.2
2017	1.6	1.0	67.2	1.4	0.1	79.4
2022	12.8	0.4	31.8	1.3	1.0	69.4

Table 17-63.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2002	28	13	2
2012	45	6	5
2017	16	5	3
2022	18	-	-
Days Use Per Acre (ha)			
2002	58.3 (144.0)	22.8 (56.3)	-
2012	62.3 (153.9)	11.4 (28.1)	-
2017	20.8 (51.3)	3.4 (8.3)	-
2022	4.0 (9.9)	-	-

Table 17-63.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Aristida purpurea (purple threeawn)										
Bromus briziformis ^{ai} (rattlesnake brome)										
Bromus tectorum ^{ai} (cheatgrass)										
Elymus glaucus ssp. glaucus (blue wildrye)										
Hesperostipa comata (needle and thread)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Secale cereale ^{ai} (cereal rye)										
Sporobolus cryptandrus (sand dropseed)										
year	Nested Frequency									
2002	44	-	65	-	29	460	5	29	-	32
2012	82	-	348	0	36	343	9	8	-	54
2017	34	4	381	10	42	402	31	19	2	86
2022	5	5	242	-	25	398	29	6	1	79
year	Average Cover (%)									
2002	1.1	-	0.6	-	1.2	52.1	0.0	0.5	-	1.5
2012	5.6	-	16.7	0.0	3.6	31.5	0.3	0.5	-	2.2
2017	0.9	0.0	17.4	0.1	3.9	27.1	1.0	0.5	0.0	2.2
2022	0.0	0.1	8.0	-	1.3	39.1	1.4	0.5	0.0	2.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-63.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Arenaria (sandwort)																	
Artemisia ludoviciana (white sagebrush)																	
Asclepias (milkweed)																	
Astragalus utahensis (Utah milkvetch)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Chamaesyce (sandmat)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Cymopterus (springparsley)																	
Draba ^a (draba)																	
Erigeron divergens ^a (spreading fleabane)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Galium aparine ^a (stickywilly)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
year	Nested Frequency																
2002	2	3	-	-	-	0	14	2	-	4	2	1	-	-	5	4	-
2012	7	-	-	4	-	3	11	-	3	3	-	5	-	91	39	2	1
2017	1	13	-	-	-	5	5	17	-	1	-	-	-	17	295	10	-
2022	2	27	4	-	7	1	1	10	27	3	-	1	6	8	408	-	-
year	Average Cover (%)																
2002	0.0	0.0	-	-	-	0.0	0.8	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-
2012	0.0	-	-	0.2	-	0.0	1.6	-	0.0	0.0	-	0.0	-	2.1	0.2	0.1	0.0
2017	0.0	0.1	-	-	-	0.2	0.8	0.1	-	0.0	-	-	-	0.7	23.7	0.2	-
2022	0.0	0.1	0.0	-	0.0	0.0	0.1	0.0	0.1	0.3	-	0.0	0.0	0.4	28.7	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Heterotheca villosa (hairy false goldenaster)												
Lactuca serriola ^{ai} (prickly lettuce)												
Linum lewisii (Lewis flax)												
Lithospermum ruderale (western stoneseed)												
Microsteris gracilis ^a (slender phlox)												
Oenothera caespitosa (tufted evening primrose)												
Phlox longifolia (longleaf phlox)												
Polygonum douglasii ^a (Douglas' knotweed)												
Silene antirrhina ^a (sleepy silene)												
Sisymbrium altissimum ^{ai} (tall tumblemustard)												
Sphaeralcea coccinea (scarlet globemallow)												
Tragopogon dubius ^{ai} (yellow salsify)												
year	Nested Frequency											
2002	6	-	-	12	2	-	16	-	-	-	0	6
2012	14	7	3	23	-	4	2	-	2	-	-	143
2017	14	4	-	13	-	-	2	10	-	-	3	59
2022	46	2	-	5	-	2	-	8	-	6	5	0
year	Average Cover (%)											
2002	0.6	-	-	0.9	0.0	-	0.1	-	-	-	0.0	0.1
2012	1.0	0.3	0.0	0.8	-	0.0	0.0	-	0.0	-	-	1.1
2017	0.6	0.0	-	0.7	-	-	0.0	0.1	-	-	0.0	0.6
2022	1.2	0.0	-	0.4	-	0.0	-	0.0	-	0.3	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-63.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)						
Ericameria nauseosa (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Opuntia fragilis (brittle pricklypear)						
Purshia tridentata ^p (antelope bitterbrush)						
Quercus gambelii ^p (Gambel oak)						
year	Line Intercept Cover (%)					
2002	2.1	-	-	-	17.9	2.5
2012	2	-	0.6	0	21.5	2.4
2017	1.5	-	0.1	-	17	2.4
2022	-	-	-	-	0.1	0.9
year	Quadrat Cover (%)					
2002	2.1	-	0.2	0.1	13.5	0.6
2012	1.8	-	0.1	0.2	10.2	0.6
2017	1.5	-	0.0	0.0	11.7	1.6
2022	-	0.0	-	-	0.0	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-63.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

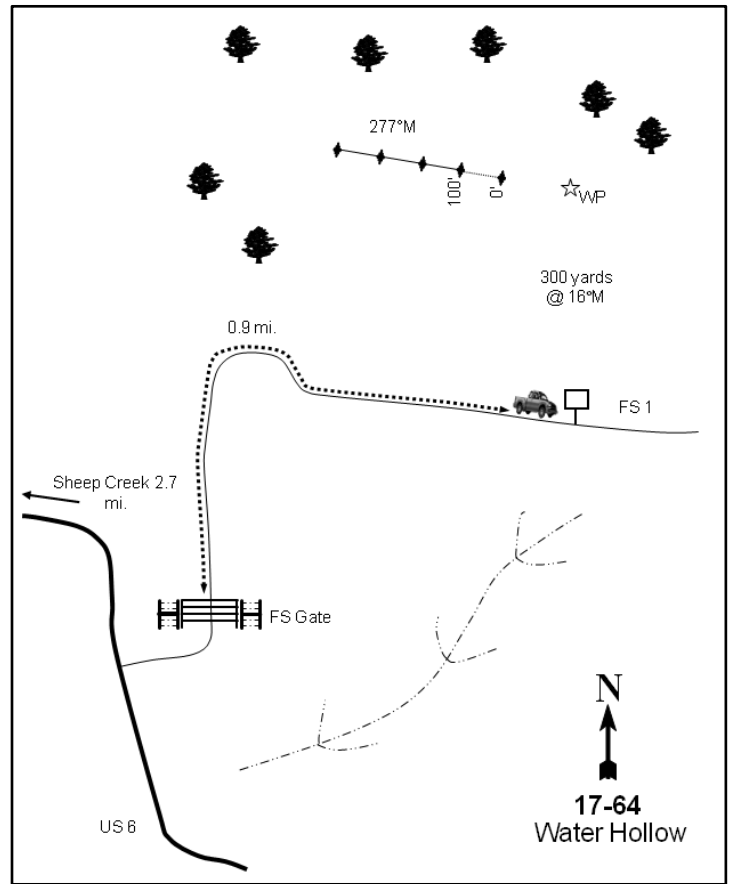
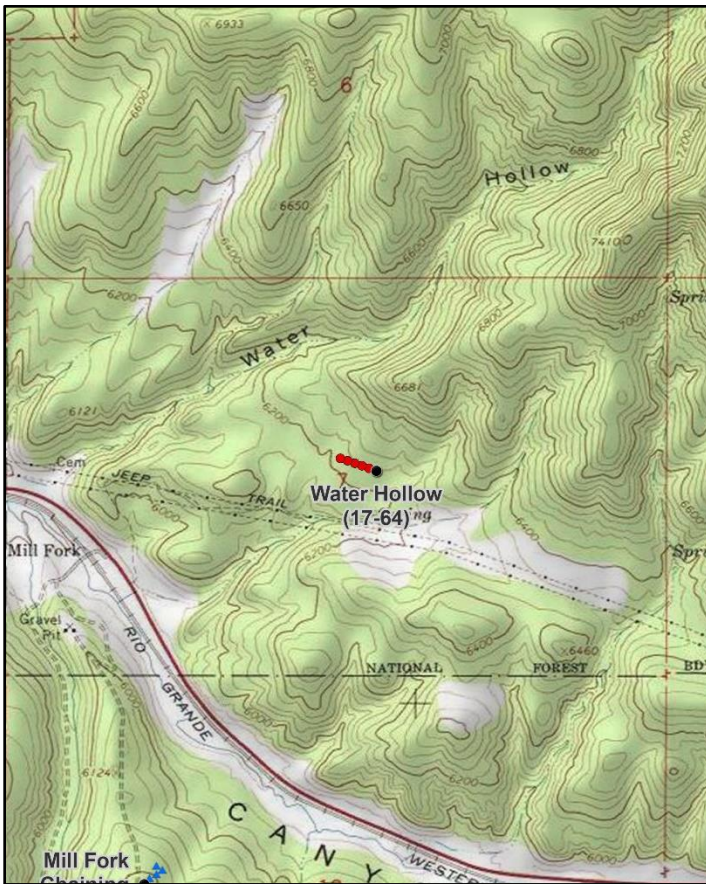
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2002	640	-	3	66	31	13	0	25	55/86
2012	440	-	0	82	18	50	14	11	50/96
2017	300	-	7	80	13	27	20	13	48/79
2022	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2002	-	-	-	-	-	-	-	-	245/310
2012	-	-	-	-	-	-	-	-	221/251
2017	-	-	-	-	-	-	-	-	182/275
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2002	-	-	-	-	-	-	-	-	61/153
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	63/95
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2002	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	83/177
2017	-	-	-	-	-	-	-	-	121/242
2022	160	-	100	0	0	0	0	0	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2002	80	-	0	50	50	0	0	25	37/37
2012	80	-	0	100	0	0	0	25	37/60
2017	80	-	0	100	0	0	0	0	33/41
2022	-	-	-	-	-	-	-	-	-/-
Opuntia fragilis -- (brittle pricklypear)									
2002	80	-	0	100	0	0	0	0	8/18
2012	60	-	0	100	0	0	0	0	10/29
2017	100	-	0	100	0	0	0	20	20/37
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2002	1040	-	4	85	12	8	79	4	71/199
2012	1960	-	10	84	6	16	82	44	53/140
2017	1740	-	1	92	7	23	70	5	53/132
2022	100	-	0	100	0	0	0	0	-/-
Quercus gambelii^p -- (Gambel oak)									
2002	180	-	0	100	0	0	0	0	96/74
2012	320	-	50	50	0	6	0	0	94/97
2017	340	-	47	53	0	6	0	0	109/102
2022	300	-	87	13	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-63.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	23.5	10.9	1.8	8.7	-0.4	5.2	0.0	49.6	Poor
2012	30.0	13.1	6.6	24.6	-12.5	7.3	0.0	69.0	Fair-Good
2017	29.8	13.0	3.4	17.2	-13.1	4.9	0.0	55.2	Poor-Fair
2022	1.1	0.0	0.0	11.6	-6.1	4.4	0.0	11.0	Very Poor

WATER HOLLOW - STUDY NO. 17-64



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mill Fork NE; Township 10S, Range 6E, Section 07
NAD 83 UTM ZONE 12, 474878 East 4424104 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

132
265° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt 5: No Rebar

Directions to Site

From Spanish Fork Canyon, take Highway 6 to the Sheep Creek turnoff. Continue on Highway 6 for 2.2 miles to a road on the north side of the road (left). Turn left again just after exiting Highway 6, and then follow this road to a Forest Service gate. From the gate, go 0.9 miles to a Forest Service sign. Park here and walk 300 yards at 16 degrees magnetic to the witness post: a large clump of chained PJ is in front of the post. The 0-foot stake is just west of the witness post and is marked with browse tag #132. Extra rebar and T-posts are present on the site from another unrelated study.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	WATERSHED CLOSURE
Elevation	6,240ft (1,902m)
Aspect	South
Slope	11-12%
Sample Dates	08/26/2002, 06/28/2007, 07/10/2012, 07/05/2017, 07/06/2022

Table 17-64.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Smooth	-	-	1990s	60
Seeding - Seed Unknown	-	-	1990s	-

Wildlife Habitat and Vegetation History**Table 17-64.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-64.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Perennial Grass	Phase I
2007	Perennial Grass	Phase I
2012	Perennial Grass	Phase I
2017	Perennial Grass	Phase I
2022	Perennial Grass	Phase I

Site Notes

The nearest perennial source of water is Soldier Creek, which is located on the opposite side of US-6, 0.75 miles southwest of the study site. A rattlesnake was observed on site in 2017. In 2022, it was noted that a powerline project was being installed in the area. As a result, belts four and five were destroyed (possibly for new power poles) and the 400 and 500-foot stakes were missing.

Soils**Table 17-64.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	48.7	20.0	31.3	3.4	4.5	236.8	0.7	08/06/2002

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

A diverse number of perennial grasses dominate this study site, with the introduced species crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), and native species basin wildrye (*Leymus cinerius*) contributing the most cover in 2022 (Table 17-64.10). Forbs have remained rare throughout the study period (Table 17-64.7, Table 17-64.11). Shrubs are also uncommon, but the most prevalent preferred species are fourwing saltbush (*Atriplex canescens*) and antelope bitterbrush (*Purshia tridentata*) (Table 17-64.12, Table 17-64.13). Point-quarter data and photos reveal that Utah juniper trees (*Juniperus osteosperma*) are present with low density, placing this study site in Phase I of woodland succession (Table 17-64.4, Table 17-64.13, Table 17-64.14).

Trend Summary Tables

Table 17-64.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	0.6	-	1.9	0.8	-	1.2
2007	0.6	-	1.9	1.7	-	1.5
2012	1.9	-	1.2	2.1	-	2.6
2017	1.2	-	-	2.1	-	-
2022	1.4	0.0	-	2.1	-	-

Table 17-64.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	8	315	18	22	0.0	20.4	0.1	0.3
2007	95	367	77	37	0.7	23.9	0.3	0.4
2012	11	369	79	16	0.2	32.4	0.2	0.1
2017	49	369	205	8	0.6	27.7	3.7	0.3
2022	27	269	175	6	0.6	20.8	3.3	0.0

Table 17-64.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	29.9	0.2	55.8	3.7	1.9	25.1
2007	23.0	0.6	44.6	3.7	0.7	36.6
2012	16.4	0.0	65.8	2.1	1.8	39.7
2017	16.7	1.6	59.9	4.2	0.6	37.0
2022	30.3	0.2	64.8	2.9	1.1	24.3

Table 17-64.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2002	14	36	27
2007	11	31	9
2012	1	10	-
2017	28	3	14
2022	13	4	5
Days Use Per Acre (ha)			
2002	25.5 (62.9)	115.3 (284.7)	-
2007	25.5 (62.9)	109.9 (271.5)	-
2012	18.7 (46.3)	9.4 (23.2)	-
2017	119.3 (294.6)	12.1 (29.8)	-
2022	50.9 (125.8)	17.4 (43.0)	-

Table 17-64.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus inermis ⁱ (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency																
2002	13	156	3	-	103	6	5	0	19	7	-	24	42	-	-	12	9
2007	6	196	40	-	111	28	66	-	5	7	-	36	52	5	4	24	16
2012	2	200	1	-	94	1	10	1	5	-	-	44	66	7	-	47	17
2017	-	171	1	3	190	6	49	-	6	0	1	28	20	-	-	2	8
2022	-	159	5	0	122	-	22	-	-	-	-	18	-	2	-	-	14
year	Average Cover (%)																
2002	0.9	6.6	0.0	-	2.7	0.2	0.0	0.0	0.6	0.2	-	3.7	2.0	-	-	0.0	0.4
2007	0.2	7.3	0.1	-	3.4	1.0	0.4	-	0.2	0.2	-	2.9	1.4	0.1	0.2	0.6	1.2
2012	0.1	13.0	0.0	-	2.4	0.0	0.2	0.0	0.0	-	-	7.5	1.3	0.1	-	1.4	0.8
2017	-	8.3	0.0	0.0	7.8	0.1	0.6	-	0.2	0.2	0.0	4.0	0.2	-	-	0.0	0.6
2022	-	10.5	0.0	0.0	4.1	-	0.6	-	-	-	-	3.3	-	0.0	-	-	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

GRASS SPECIES	Secale cereale ^{ai} (cereal rye)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency	
2002	0	128
2007	7	106
2012	-	140
2017	-	176
2022	-	58
year	Average Cover (%)	
2002	0.0	3.1
2007	0.2	5.4
2012	-	5.8
2017	-	6.5
2022	-	2.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-64.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Camelina microcarpa ^{ai} (littlegod false flax)	Carduus nutans ^{mi} (nodding plumeless thistle)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium (thistle)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
2002	-	-	2	-	-	5	-	0	-	-	-	4	1	-	18	0	-
2007	21	-	-	-	15	-	3	1	1	9	-	10	3	18	26	0	-
2012	77	-	3	-	-	-	4	-	3	-	2	-	-	-	3	-	-
2017	164	0	3	-	13	1	-	-	-	32	14	2	3	22	5	-	1
2022	173	-	-	1	-	-	-	-	5	3	-	-	-	6	-	-	-
year	Average Cover (%)																
2002	-	-	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	-	0.3	0.0	-
2007	0.1	-	-	-	0.1	-	0.0	0.0	0.1	0.0	-	0.1	0.0	0.1	0.2	0.0	-
2012	0.2	-	0.0	-	-	-	0.0	-	0.0	-	0.0	-	-	-	0.0	-	-
2017	3.2	0.0	0.1	-	0.1	0.1	-	-	-	0.2	0.0	0.0	0.0	0.1	0.2	-	0.0
2022	3.1	-	-	0.0	-	-	-	-	0.0	0.1	-	-	-	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Medicago sativa ^a (alfalfa)	Penstemon caespitosus (mat penstemon)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency				
2002	0	1	-	1	9
2007	-	7	-	-	8
2012	-	1	-	4	-
2017	-	-	2	-	-
2022	-	-	-	-	1
year	Average Cover (%)				
2002	0.0	0.0	-	0.0	0.0
2007	-	0.0	-	-	0.0
2012	-	0.0	-	0.0	-
2017	-	-	0.0	-	-
2022	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-64.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
2002	-	0.5	-	1.2	0.3
2007	-	0.8	-	1.5	0.9
2012	-	0.8	-	2.6	1.3
2017	-	0.9	-	-	1.2
2022	0.1	1.1	-	-	0.9
year	Quadrat Cover (%)				
2002	-	0.6	-	1.9	0.0
2007	-	0.4	-	1.9	0.1
2012	-	0.8	-	1.2	1.0
2017	-	0.8	-	-	0.4
2022	0.0	0.8	0.0	-	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-64.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2002	-	-	-	-	-	-	-	-	54/73
2007	-	-	-	-	-	-	-	-	61/94
2012	-	-	-	-	-	-	-	-	84/125
2017	20	-	0	100	0	0	0	0	61/98
2022	20	-	0	100	0	0	100	0	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2002	40	-	0	100	0	50	0	0	113/124
2007	60	-	0	100	0	33	0	0	140/192
2012	60	-	33	0	67	100	0	0	125/154
2017	40	-	0	100	0	0	0	0	134/167
2022	40	-	0	100	0	0	100	0	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	58/67
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2002	-	-	-	-	-	-	-	-	36/60
2007	-	-	-	-	-	-	-	-	56/86
2012	-	-	-	-	-	-	-	-	58/97
2017	-	-	-	-	-	-	-	-	89/137
2022	20	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2002	-	-	-	-	-	-	-	-	74/110
2007	-	-	-	-	-	-	-	-	97/133
2012	-	-	-	-	-	-	-	-	132/222
2017	-	-	-	-	-	-	-	-	100/171
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	51/63
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
2002	20	-	100	0	0	0	0	0	- / -
2007	60	-	0	100	0	0	0	0	- / -
2012	80	-	25	75	0	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2002	60	-	67	33	0	0	100	0	43/70
2007	80	-	0	100	0	25	75	0	70/105
2012	60	-	0	100	0	33	33	0	99/139
2017	80	-	25	75	0	50	25	0	114/153
2022	40	-	0	100	0	50	50	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2002	-	-	-	-	-	-	-	-	32/45
2007	-	-	-	-	-	-	-	-	36/42
2012	-	-	-	-	-	-	-	-	65/90
2017	20	-	0	100	0	0	0	0	49/89

t - Tree Species; p - Preferred Browse; i - Introduced Species

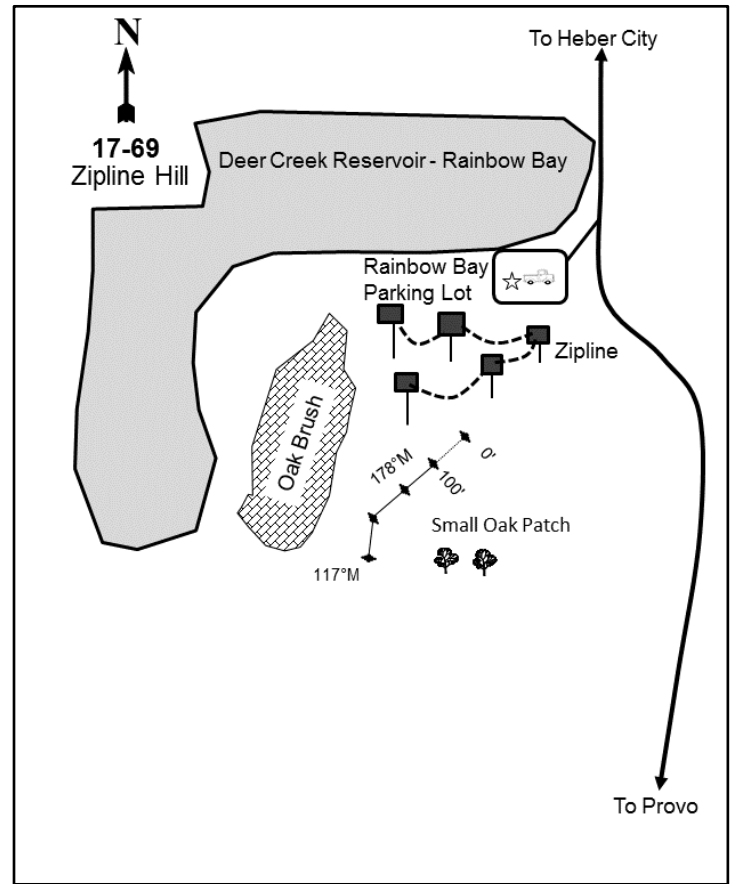
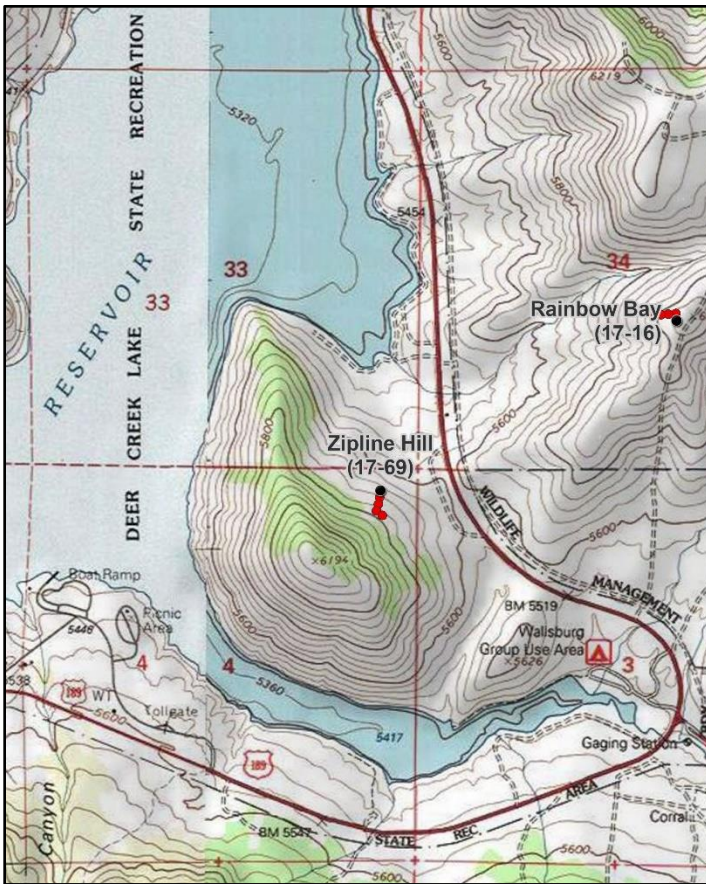
Table 17-64.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	36	-	-	-	-	-	10.3
2007	39	-	8	77	15	-	14.5
2012	54	-	14	71	14	-	7.6
2017	8	-	100	-	-	-	3.3
2022	9	20	60	20	-	-	6.0
Pinus edulis (twoneedle pinyon)							
2002	5	-	-	-	-	-	5.0
2007	7	-	-	100	-	-	8.2
2012	4	-	-	100	-	-	10.3

Table 17-64.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	0.8	0.0	0.0	30.0	0.0	0.7	-2.0	29.4	Very Poor
2007	2.4	0.0	0.0	30.0	-0.5	0.9	0.0	32.7	Very Poor
2012	3.0	0.0	0.0	30.0	-0.1	0.2	0.0	33.1	Very Poor
2017	2.9	0.0	0.0	30.0	-0.4	0.6	-2.0	31.1	Very Poor
2022	2.9	0.0	0.0	30.0	-0.5	0.0	0.0	32.4	Very Poor

ZIPLINE HILL - STUDY NO. 17-69



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SW; Township 5S, Range 4E, Section 04
NAD 83 UTM ZONE 12, 458224 East 4474350 North

Transect Information

Browse Tag # (0' Stake)	537
Transect Bearing	178° magnetic (Line 4: 117° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Travelling north on Highway 189 to Heber City, turn into the Rainbow Bay parking lot. Hike 600 paces at 175 degrees magnetic past the zip lines. The site is located on the hillside overlooking the bay and parking lot.

Site Information

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	No data
Aspect	East-Northeast
Slope	15-25%
Sample Dates	07/12/2017, 07/13/2022

Table 17-69.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 17-69.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 17-69.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Bitterbrush/Perennial Grass	NA
2022	Bitterbrush/Perennial Grass	NA

Site Notes

No Notes

Soils

Table 17-69.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.6	28.2	35.1	36.8	3.8	9.5	215.0	0.4	07/12/2017

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the dominant browse species on this study site since the study began in 2017; lesser amounts of preferred browse such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and chokecherry (*Prunus virginiana*) have also been present (Table 17-69.12, Table 17-69.13). The herbaceous understory has remained abundant (Table 17-69.7). Native perennial grasses, including Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), have been co-dominant site components in both sample years. In addition, the introduced annual grasses field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) are present and contributed a combined 18.5% cover in 2017, but decreased to a combined cover of 4.6% in 2022 (Table 17-69.10). The forb component is diverse, and perennial forbs have been more common than annual forbs (Table 17-69.11).

Trend Summary Tables

Table 17-69.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	13.6	8.1	-	17.6	10.3	-
2022	13.3	9.7	-	16.5	10.0	-

Table 17-69.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	368	430	323	257	18.5	33.5	3.3	11.6
2022	269	433	307	211	4.7	34.2	3.7	6.8

Table 17-69.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	3.4	1.1	44.9	0.9	2.7	69.9
2022	7.9	6.4	39.7	2.5	3.8	58.1

Table 17-69.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
2017	13	-
2022	45	-
Year	Days Use Per Acre (ha)	
	2017	69.0 (170.5)
2022	174.9 (432.0)	-

Table 17-69.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Bromus arvensis ^{ai} (field brome)										
Bromus tectorum ^{ai} (cheatgrass)										
Elymus elymoides (squirreltail)										
Melica bulbosa (oniongrass)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa fendleriana (muttongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Thinopyrum intermedium ⁱ (intermediate wheatgrass)										
year	Nested Frequency									
2017	314	54	3	7	22	115	54	279	312	1
2022	265	24	3	1	44	69	36	319	320	-
year	Average Cover (%)									
2017	17.0	1.5	0.1	0.1	0.4	3.3	0.9	13.7	15.0	0.0
2022	4.3	0.3	0.0	0.0	1.0	1.4	0.7	15.0	16.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-69.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Achillea millefolium (Common yarrow)																		
Agoseris glauca (pale agoseris)																		
Allium acuminatum (tapertip onion)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Arabis (rockcross)																		
Astragalus (milkvetch)																		
Astragalus convallarius (lesser rushy milkvetch)																		
Balsamorhiza hookeri (Hooker's balsamroot)																		
Balsamorhiza sagittata (arrowleaf balsamroot)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Cirsium (thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Collomia linearis ^a (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawksbeard)																		
Descurainia pinnata ^a (western tansymustard)																		
year	Nested Frequency																	
2017	24	8	39	208	-	20	19	2	1	44	-	2	40	153	28	2	10	
2022	13	2	18	160	2	8	15	-	-	15	9	12	131	117	-	-	7	
year	Average Cover (%)																	
2017	0.3	0.0	0.3	1.4	-	0.8	0.3	0.0	0.1	0.2	-	0.0	0.2	0.8	0.2	0.0	0.0	
2022	0.3	0.0	0.1	1.9	0.0	0.1	0.1	-	-	0.0	0.1	0.2	0.3	0.4	-	-	0.0	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Draba ^a (draba)																		
Epilobium brachycarpum ^a (tall annual willow herb)																		
Erigeron divergens ^a (spreading fleabane)																		
Gayophytum racemosum ^a (blackfoot groundsmoke)																		
Helianthella uniflora (oneflower helianthella)																		
Heliomeris multiflora var. multiflora (showy goldeneye)																		
Holosteum umbellatum ^{ai} (jagged chickweed)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Linaria dalmatica ^{ai} (Dalmatian toadflax)																		
Lupinus argenteus (silvery lupine)																		
Machaeranthera canescens (hoary tansyaster)																		
Microsteris gracilis ^a (slender phlox)																		
Polygonum douglasii ^a (Douglas' knotweed)																		
Senecio integerrimus ^a (lambstongue ragwort)																		
Silene antirrhina ^a (sleepy silene)																		
Symphotrichum ascendens (western aster)																		
Taraxacum officinale (common dandelion)																		
year	Nested Frequency																	
2017	10	28	2	4	59	17	-	6	10	44	-	15	5	5	-	42	4	
2022	51	19	-	4	58	6	8	7	10	37	3	15	10	4	1	35	3	
year	Average Cover (%)																	
2017	0.0	0.2	0.0	0.1	3.9	0.1	-	0.0	0.1	3.3	-	0.0	0.0	0.0	-	1.0	0.0	
2022	0.1	0.0	-	0.0	3.3	0.5	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.6	0.0	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES				
Tragopogon dubius ^{ai} (yellow salsify)				
Viola (violet)				
Wyethia amplexicaulis (mule-ears)				
Zigadenus paniculatus (foothill deathcamas)				
year	Nested Frequency			
2017	56	1	3	46
2022	51	-	-	51
year	Average Cover (%)			
2017	0.6	0.0	0.1	0.8
2022	0.8	-	-	1.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-69.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)						
2017	2.9	-	9.3	-	1	0.1	14.6
2022	3.2	0.2	9.8	-	0.2	-	13.1
year	Quadrat Cover (%)						
2017	1.4	0.5	7.1	0.1	0.8	0.1	11.7
2022	1.0	1.8	8.1	0.8	0.9	-	10.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-69.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

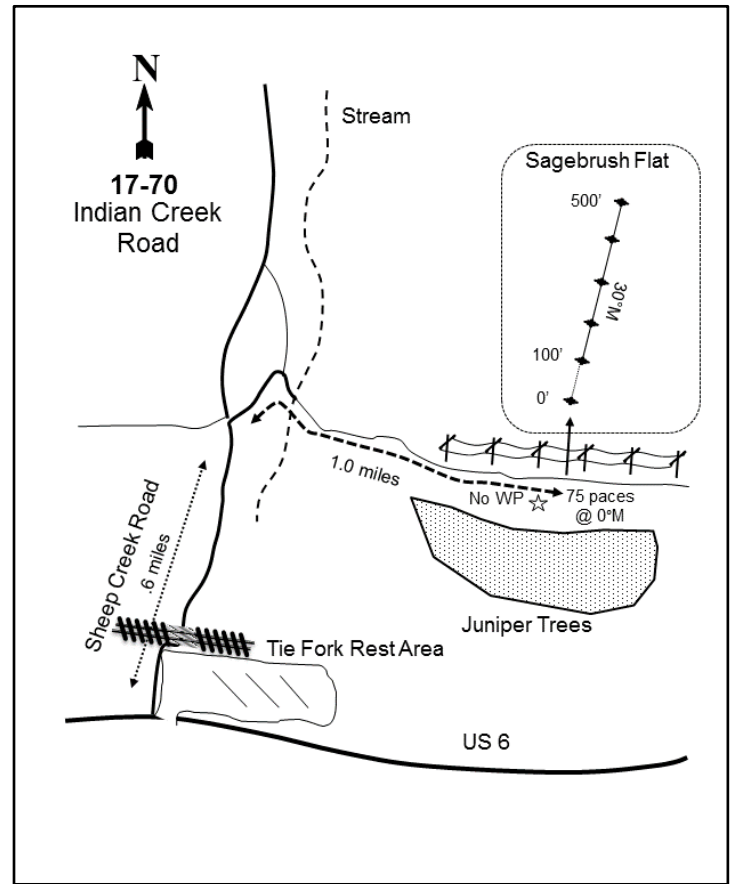
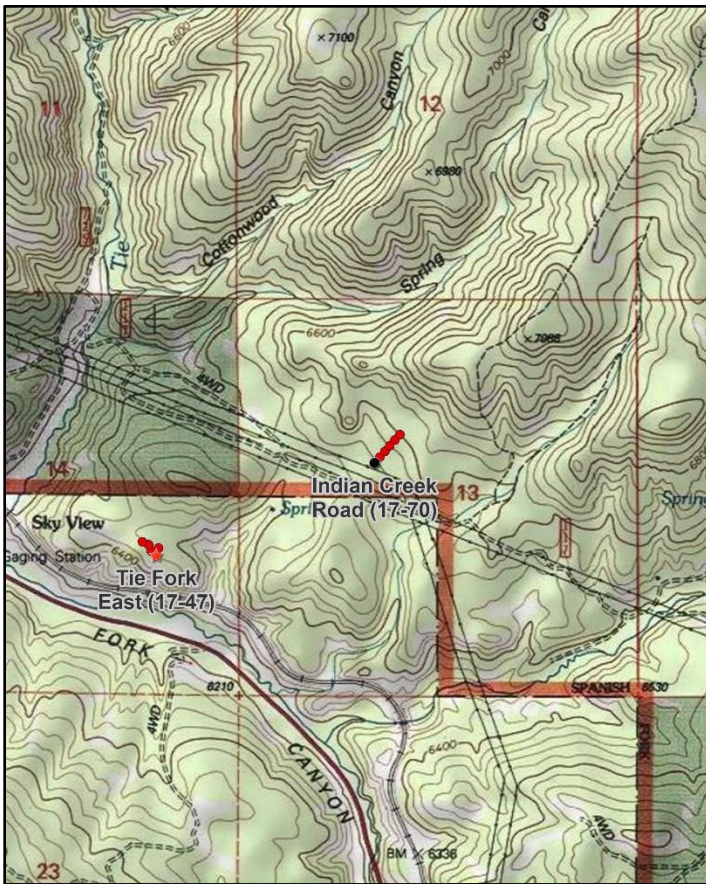
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2017	700	-	37	63	0	37	40	0	68/74
2022	860	80	33	61	7	21	65	2	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	80	-	0	100	0	50	0	0	61/65
2022	240	-	58	42	0	25	8	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	4740	-	2	98	1	0	0	1	35/50
2022	4600	-	10	90	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	220	-	0	100	0	0	0	0	25/24
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
2017	4440	-	0	100	0	1	0	0	11/9
2022	4000	-	11	89	0	0	0	0	- / -
Prunus virginiana^p -- (chokecherry)									
2017	240	40	100	0	0	0	0	0	20/21
2022	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2017	1160	-	9	88	3	53	22	17	73/129
2022	1480	-	18	73	10	16	76	11	- / -
Quercus gambelii^p -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	146/92

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-69.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	26.4	14.2	6.9	30.0	-13.9	10.0	-2.0	71.5	Fair-Good
2022	24.7	12.3	10.5	30.0	-3.5	10.0	-2.0	82.0	Good

INDIAN CREEK ROAD - STUDY NO. 17-70



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Tucker NW; Township 10S, Range 6E, Section 13
NAD 83 UTM ZONE 12, 483031 East 4422573 North

Transect Information

Browse Tag # (0' Stake)	705
Transect Bearing	30° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

At the rest area at Tie Fork road, turn left and proceed up the road for 0.75 miles, then turn right at the road that crosses the creek. Proceed across the creek and drive down the powerline road for 1.0 mile. The site is in a sagebrush flat on the left (north) side of the road. Park and walk 50 paces to the 0-foot stake, which is marked by browse tag #705.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	WATERSHED CLOSURE
Elevation	6,550ft (1,996m)
Aspect	South
Slope	12%
Sample Dates	07/05/2017, 07/07/2022

Table 17-70.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Sheep Creek Phase 1	2629	May 2014	552

Wildlife Habitat and Vegetation History

Table 17-70.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	winter

Table 17-70.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Shrub/Perennial Grass	Phase I
2022	Mixed Shrub/Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 17-70.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	44.2	28.1	27.7	2.8	8.1	242.0	0.4	07/05/2017

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2017, mixed shrubs -- mainly yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and spineless horsebrush (*Tetradymia canescens*) -- have dominated this site. The preferred browse species Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*) have also been observed with lower abundance (Table 17-70.12, Table 17-70.13). A diverse number of native and introduced perennial grasses have also co-dominated the site (Table 17-70.7, Table 17-70.10). Annual forbs have been more abundant than perennial forbs, with desert madwort (*Alyssum desertorum*) contributing the most cover of any single species in both sample years (Table 17-70.11). The presence of Utah juniper (*Juniperus osteosperma*) (Table 17-70.14), which places this site in Phase I of woodland succession (Table 17-70.4), indicates that there is potential for this area to be infilled in the future.

Trend Summary Tables

Table 17-70.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	4.2	14.6	-	5.4	18.4	-
2022	6.4	15.5	-	6.7	17.6	-

Table 17-70.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	96	377	416	81	1.2	19.3	8.6	1.2
2022	133	363	396	40	1.6	14.5	8.0	0.3

Table 17-70.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	29.6	0.8	35.9	3.2	1.4	47.0
2022	48.2	0.6	39.4	2.7	1.3	39.3

Table 17-70.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2017	-	48	4	4
2022	-	68	4	2
Days Use Per Acre (ha)				
2017	4.4 (10.8)	168.2 (415.5)	6.0 (14.9)	-
2022	-	86.4 (213.5)	10.0 (24.8)	-

Table 17-70.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Achnatherum hymenoides (Indian ricegrass)											
Agropyron cristatum ⁱ (crested wheatgrass)											
Bromus inermis ⁱ (smooth brome)											
Bromus marginatus (mountain brome)											
Bromus tectorum ^{ai} (cheatgrass)											
Hesperostipa comata (needle and thread)											
Pascopyrum smithii (western wheatgrass)											
Poa bulbosa ⁱ (bulbous bluegrass)											
Poa secunda (Sandberg bluegrass)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
Thinopyrum intermedium ⁱ (intermediate wheatgrass)											
year	Nested Frequency										
2017	17	51	5	84	96	1	79	5	39	201	104
2022	9	45	62	18	133	2	194	4	24	112	35
year	Average Cover (%)										
2017	0.5	1.6	0.0	1.7	1.2	0.1	2.4	0.0	0.8	9.0	3.3
2022	0.3	1.5	1.5	0.1	1.6	0.0	4.8	0.0	0.9	4.5	0.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 17-70.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Agoseris glauca (pale agoseris)																		
Alyssum alyssoides ^{ai} (pale madwort)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Alyssum szovitsianum ^{ai} (Szowitz' madwort)																		
Astragalus calycosus (Torrey's milkvetch)																		
Astragalus convallarius (lesser rushy milkvetch)																		
Calochortus nuttallii (sego lily)																		
Camelina microcarpa ^{ai} (littlepod false flax)																		
Castilleja (Indian paintbrush)																		
Centaurea diffusa ^{ai} (diffuse knapweed)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Cirsium undulatum ⁿ (wavyleaf thistle)																		
Collinsia parviflora ⁿ (maiden blue eyed Mary)																		
Comandra umbellata (bastard toadflax)																		
Cryptantha (cryptantha)																		
Descurainia pinnata ⁿ (western tansymustard)																		
Eriogonum umbellatum (sulphur-flower buckwheat)																		
year	Nested Frequency																	
2017	6	32	410	-	2	12	3	1	1	-	20	1	11	2	1	4	16	
2022	1	219	310	7	3	6	1	-	-	0	49	1	11	1	2	-	2	
year	Average Cover (%)																	
2017	0.0	0.6	7.6	-	0.0	0.2	0.0	0.0	0.0	-	0.1	0.1	0.1	0.0	0.0	0.0	0.5	
2022	0.0	2.5	5.2	0.0	0.0	0.1	0.0	-	-	0.0	0.2	0.0	0.0	0.0	0.0	-	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES										
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)										
<i>Lappula occidentalis</i> ^a (flatspine stickseed)										
<i>Linum lewisii</i> (Lewis flax)										
<i>Machaeranthera canescens</i> (hoary tansyaster)										
<i>Microsteris gracilis</i> ^a (slender phlox)										
<i>Penstemon</i> (beardtongue)										
<i>Phlox austromontana</i> (mountain phlox)										
<i>Phlox longifolia</i> (longleaf phlox)										
<i>Schoenocrambe linifolia</i> (flaxleaf plainsmustard)										
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)										
year	Nested Frequency									
2017	5	-	6	6	39	1	3	27	7	-
2022	6	1	1	-	16	2	2	22	1	12
year	Average Cover (%)									
2017	0.0	-	0.0	0.1	0.2	0.0	0.0	0.1	0.1	-
2022	0.0	0.0	0.0	-	0.1	0.0	0.0	0.1	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 17-70.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES									
<i>Amelanchier utahensis</i> ^p (Utah serviceberry)									
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)									
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)									
<i>Ericameria nauseosa</i> (rubber rabbitbrush)									
<i>Opuntia polyacantha</i> (plains pricklypear)									
<i>Purshia tridentata</i> ^p (antelope bitterbrush)									
<i>Symphoricarpos oreophilus</i> ^p (mountain snowberry)									
<i>Tetradymia canescens</i> (spineless horsebrush)									
year	Line Intercept Cover (%)								
2017	0.3	4	9.9	0.1	0.1	0.3	0.8	8.3	
2022	0.1	5	7.3	0.3	0.1	0.1	1.5	9.9	
year	Quadrat Cover (%)								
2017	0.0	3.5	7.8	0.0	0.1	0.2	0.6	6.7	
2022	0.0	5.7	7.0	0.1	0.0	0.0	0.6	8.2	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17-70.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Amelanchier utahensis</i>^p -- (Utah serviceberry)									
2017	40	-	0	100	0	50	0	0	37/39
2022	40	-	0	100	0	0	100	0	- / -
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>^p -- (mountain big sagebrush)									
2017	640	-	6	88	6	31	59	3	61/77
2022	760	-	8	87	5	21	45	5	- / -
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
2017	9300	-	4	96	0	0	0	0	25/35
2022	8540	-	14	81	4	33	38	4	- / -
<i>Ericameria nauseosa</i> -- (rubber rabbitbrush)									
2017	80	-	0	50	50	50	0	0	43/39
2022	80	-	50	0	50	0	100	50	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	100	0	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
2017	20	-	0	100	0	0	0	0	-/-
2022	20	-	0	100	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2017	160	-	0	100	0	38	63	0	40/77
2022	160	-	25	75	0	0	100	0	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2017	260	-	0	92	8	0	0	8	41/63
2022	380	-	32	47	21	26	63	21	-/-
Tetradymia canescens -- (spineless horsebrush)									
2017	3340	-	4	95	1	0	0	1	28/48
2022	3760	-	13	75	12	12	0	19	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

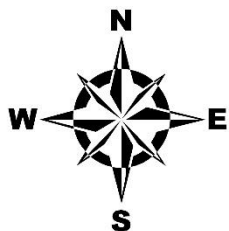
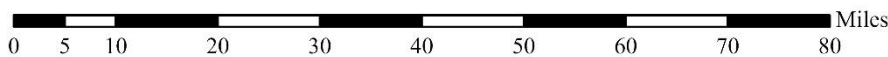
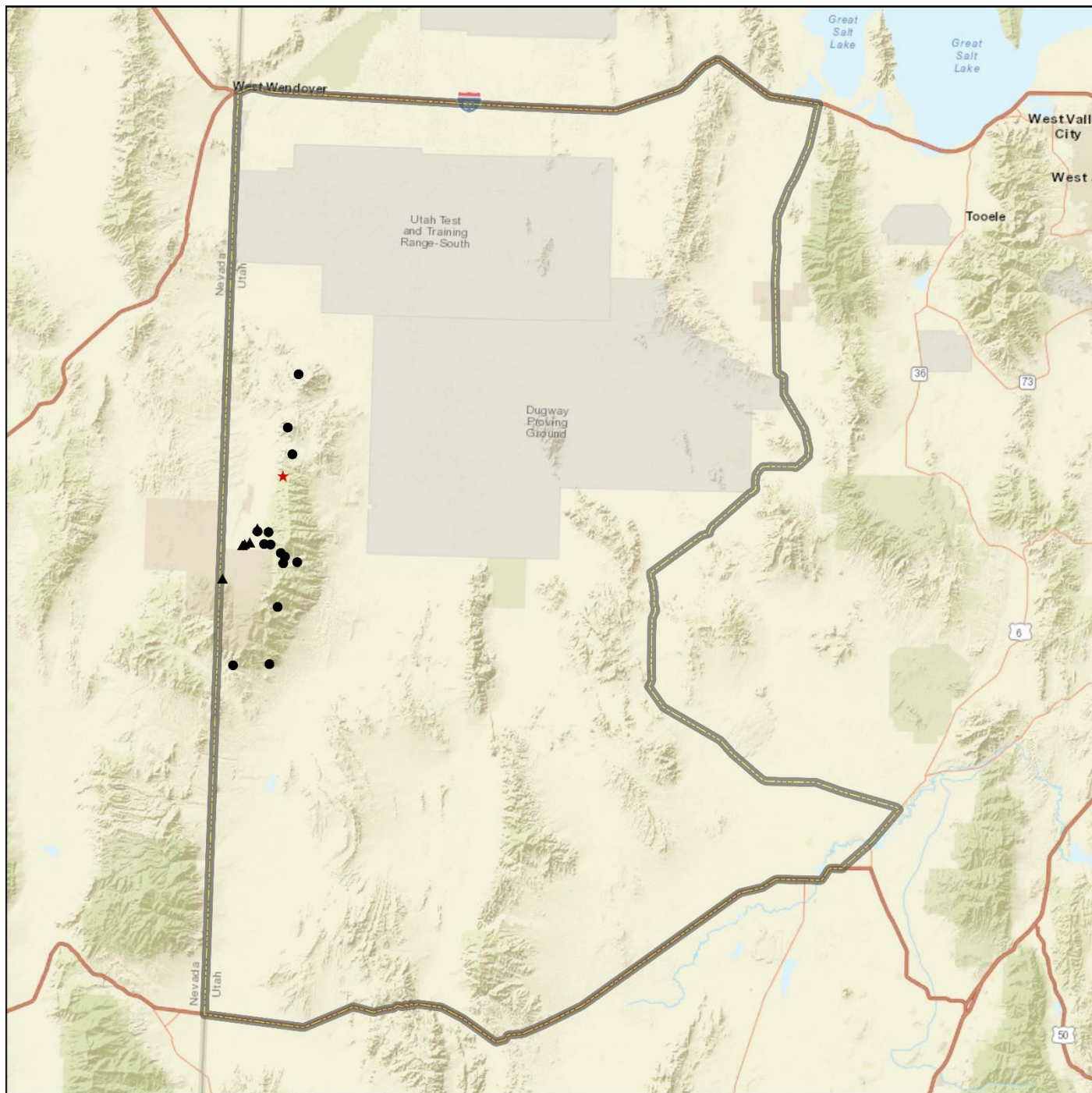
Table 17-70.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	44	8	85	8	-	-	4.2
2022	45	7	80	13	-	-	4.1
Juniperus scopulorum (Rocky Mountain juniper)							
2022	8	-	100	-	-	-	2.0
Pinus edulis (twoneedle pinyon)							
2022	25	25	75	-	-	-	2.0

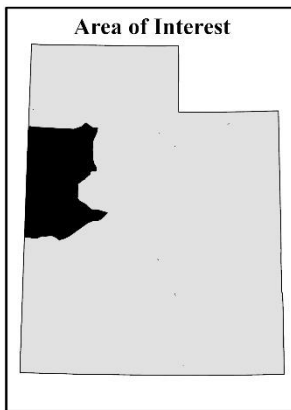
Table 17-70.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	6.7	13.3	2.3	30.0	-0.9	2.4	0.0	53.8	Poor-Fair
2022	8.1	12.4	6.7	29.0	-1.2	0.7	-2.0	53.5	Poor-Fair

WILDLIFE MANAGEMENT UNIT 19A – WEST DESERT, DEEP CREEK

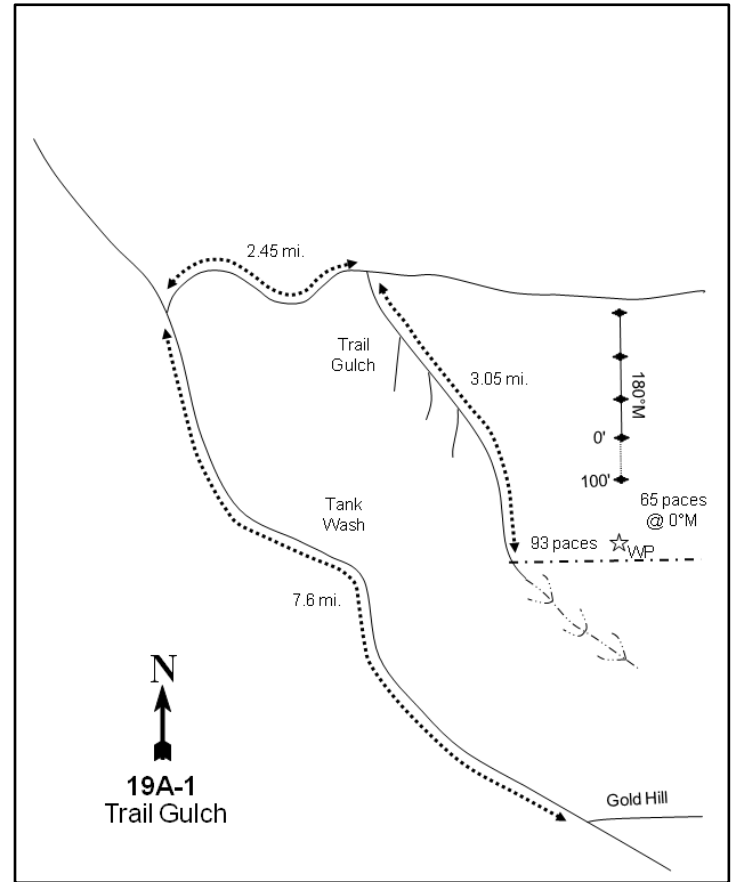
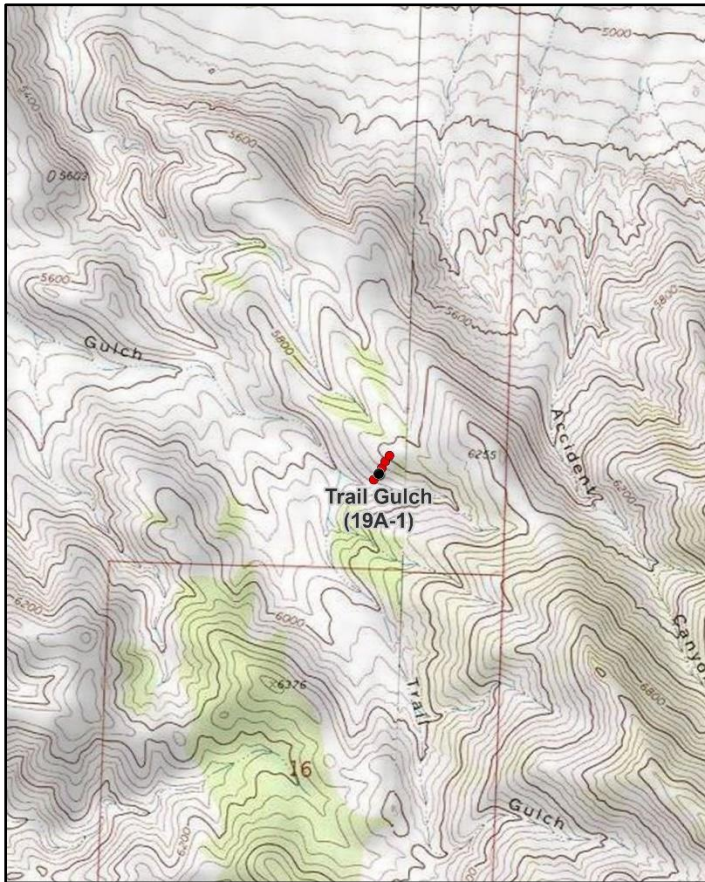


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 19A
★ RT, Suspended	
▲ WRI, Active	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

TRAIL GULCH - STUDY NO. 19A-1



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Ochre Mountain NE; Township 7S, Range 18W, Section 09
NAD 83 UTM ZONE 12, 255222 East 4457093 North

Transect Information

Browse Tag # (0' Stake)	3970
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

Beginning at Gold Hill, proceed northwesterly toward Gold Hill Pass and Tank Wash for 7.6 miles to a road to the north. Turn right and continue northerly for 2.45 miles to a dirt road to the southeast up Trail Gulch. Proceed up Trail Gulch for 3.05 miles, staying to the left (straight) at all intersections. Stop where the road ends and two drainages come together. From the intersection of the streambeds, walk 93 paces to the east, along the left drainage to a green "T" fencepost on the north side of the streambed. From the fencepost, walk 65 paces north to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag #3970 attached.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	DUTCH MOUNTAIN
Elevation	5,800ft (1,768m)
Aspect	South
Slope	30-45%
Sample Dates	07/16/1997, 07/16/2002, 07/09/2007, 07/16/2012, 06/27/2017, 06/27/2022

Wildlife Habitat and Vegetation History**Table 19A-01.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 19A-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose	Phase I
1989	Stansbury Cliffrose	Phase I
1997	Stansbury Cliffrose	Phase I
2002	Stansbury Cliffrose	Phase I
2007	Stansbury Cliffrose	Phase I
2012	Stansbury Cliffrose	Phase I
2017	Stansbury Cliffrose	Phase I
2022	Stansbury Cliffrose	Phase I

Site Notes

Several broods of chukars were observed in the area in 1983. A bedding area with a high number of sheep pellets was noted in 2012, just at the top of the ridge near the 400-foot stake. A dead sheep was also found on the site in 2012.

Soils**Table 19A-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	38.0	32.4	29.6	2.4	7.7	76.8	0.7	07/16/1997

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Shallow Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this study site since establishment in 1983, and density has exhibited an overall increase over the study period. Other preferred browse species, including black sagebrush (*Artemisia nova*) and Nevada jointfir (*Ephedra nevadensis*) are also present as minor components (Table 19A-01.12, Table 19A-01.13). Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) have been observed since site establishment and this study has remained in Phase I of woodland succession in all sample years (Photos, Table 19A-01.4, Table 19A-01.13, Table 19A-01.14). Although moderately diverse, the herbaceous understory has remained sparse (Table 19A-01.7). The introduced annual grass species cheatgrass (*Bromus tectorum*) and perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) have generally provided the most herbaceous cover from sample year to sample year (Table 19A-01.10). Forbs have remained rare (Table 19A-01.11). Unless a major disturbance occurs, this study site is expected to remain in this or a similar state in future sample years.

Trend Summary Tables

Table 19A-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	10.2	1.9	11.4	-	-	-
2002	8.6	0.4	10.1	13.9	0.9	15.2
2007	8.0	0.7	8.7	11.7	1.1	17.3
2012	8.6	0.7	13.1	11.3	1.1	18.5
2017	7.8	2.0	11.7	13.7	2.1	18.7
2022	9.0	0.9	11.6	12.5	0.6	22.7

Table 19A-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	292	140	1	25	7.1	4.1	0.0	0.1
2002	231	113	6	18	5.4	4.9	0.0	0.0
2007	228	127	31	16	3.7	4.1	0.3	0.1
2012	193	117	6	4	3.4	3.8	0.0	0.0
2017	186	107	53	7	8.5	3.1	1.5	0.1
2022	259	121	69	30	10.0	7.8	1.0	0.1

Table 19A-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	3.3	1.7	30.2	16.4	27.4	35.1
2002	13.3	2.1	27.3	18.4	32.2	28.5
2007	6.9	0.7	30.0	19.1	31.6	25.5
2012	16.8	0.8	28.6	22.8	32.5	28.2
2017	6.9	0.8	22.4	26.8	30.3	31.1
2022	5.2	0.3	32.3	16.7	35.8	35.6

Table 19A-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
1997	-	-	-	8
2002	2	-	-	9
2007	6	-	-	25
2012	2	-	-	1
2017	-	-	-	3
2022	2	-	-	3
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	22.1 (54.6)	-	-	-
2007	5.3 (13.2)	1.3 (3.3)	-	-
2012	5.3 (13.2)	2.0 (5.0)	-	-
2017	0.7 (1.7)	-	1.2 (2.9)	-
2022	-	-	-	-

Table 19A-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency						
1997	6	292	7	14	16	112	-
2002	1	231	7	5	20	89	5
2007	2	228	-	2	13	121	-
2012	8	193	-	9	32	79	1
2017	22	186	4	4	28	60	-
2022	7	259	3	7	28	87	-
year	Average Cover (%)						
1997	0.2	7.1	0.0	0.4	0.4	3.1	-
2002	0.2	5.4	0.1	0.1	0.3	4.3	0.0
2007	0.1	3.7	-	0.1	0.1	3.9	-
2012	0.0	3.4	-	0.1	0.4	3.2	0.0
2017	0.3	8.5	0.0	0.1	0.5	2.2	-
2022	0.3	10.0	0.0	0.2	0.6	6.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus utahensis (Utah milkvetch)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia ^a (gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	unknown perennial forb (unknown forb)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1997	-	-	4	1	-	-	-	-	-	-	1	12	-	-	8	-
2002	-	-	-	1	-	5	1	4	-	1	3	6	3	2	-	4
2007	-	-	-	2	4	5	-	19	-	3	1	7	5	-	3	-
2012	-	-	2	2	-	-	-	-	-	4	-	-	2	-	-	-
2017	-	-	2	7	-	2	2	45	-	-	-	-	5	-	-	-
2022	1	6	1	7	8	1	4	48	3	4	-	21	1	-	-	1
year	Average Cover (%)															
1997	-	-	0.0	0.0	-	-	-	-	-	-	0.0	0.0	-	-	0.1	-
2002	-	-	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.0
2007	-	-	-	0.1	0.0	0.0	-	0.2	-	0.0	0.0	0.0	0.1	-	0.0	-
2012	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	0.0	-	-	-
2017	-	-	0.0	0.2	-	0.0	0.0	1.3	-	-	-	-	0.1	-	-	-
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	-	0.1	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Brickellia californica (California brickellbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis ^p (Nevada jointfir)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ⁱ (singleleaf pinyon)	Purshia stansburiana ^p (Stansbury cliffrose)	Tetradymia glabrata (littleaf horsebrush)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	4.2	-	0.1	0.7	2.3	-	13.1	-	2.1	7.4	0.1
2007	3.3	-	0.2	0.1	0.6	-	15.2	-	2.1	7.8	0.8
2012	4.6	-	0.1	0.4	0.3	-	14	0.1	4.5	6.4	0.5
2017	5	-	0.3	1	0.7	-	14.3	-	4.4	8	0.8
2022	2.2	-	0.1	0.5	1.3	-	20.4	-	2.3	9	0
year	Quadrat Cover (%)										
1997	5.4	0.5	0.0	0.1	1.8	0.6	11.4	-	-	2.5	1.1
2002	3.6	0.0	0.0	0.4	1.0	0.0	10.0	0.0	0.1	4.0	0.0
2007	3.6	0.2	0.0	0.4	0.6	-	8.2	-	0.6	3.6	0.3
2012	4.8	0.3	0.0	0.3	0.7	-	11.3	0.0	1.9	2.7	0.4
2017	2.8	-	0.4	0.7	0.6	-	10.1	-	1.7	4.4	0.9
2022	3.3	-	0.1	0.4	0.9	-	10.8	-	0.7	4.8	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1997	840	-	2	79	19	19	0	7	33/67
2002	1400	-	1	70	29	51	13	6	26/62
2007	980	-	2	69	29	29	57	22	38/73
2012	1580	-	0	80	20	43	0	20	30/64
2017	1220	-	0	100	0	67	0	7	34/72
2022	880	-	2	59	39	66	7	75	- / -
Atriplex confertifolia^p -- (shadscale saltbush)									
1997	120	20	0	67	33	0	0	0	21/31
2002	60	-	0	33	67	0	0	33	14/30
2007	80	-	0	75	25	0	25	25	22/41
2012	100	-	0	100	0	0	0	0	13/23
2017	-	-	-	-	-	-	-	-	30/60
2022	-	-	-	-	-	-	-	-	- / -
Brickellia californica -- (California brickellbush)									
1997	160	60	13	88	0	0	0	0	31/36
2002	40	-	0	100	0	0	0	0	26/38
2007	160	-	0	100	0	38	0	0	24/50
2012	200	-	0	100	0	0	0	0	18/29
2017	60	-	0	100	0	0	0	0	26/48
2022	200	-	0	80	20	10	0	20	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	220	-	0	82	18	0	0	9	24/40
2002	100	-	0	80	20	0	0	0	29/59
2007	120	-	0	100	0	0	0	0	28/49
2012	160	-	0	38	63	13	13	75	23/45
2017	120	-	0	83	17	0	0	33	27/64
2022	140	-	0	43	57	0	0	57	- / -
Echinocereus engelmannii -- (Engelmann's hedgehog cactus)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	9/12
2007	-	-	-	-	-	-	-	-	8/21
2012	20	-	0	100	0	0	0	0	13/19
2017	20	-	0	100	0	0	0	0	7/11
2022	-	20	0	0	0	0	0	0	- / -
Ephedra nevadensis^P -- (Nevada jointfir)									
1997	820	-	20	73	7	34	0	0	47/72
2002	660	-	3	55	42	27	39	46	45/82
2007	720	-	0	31	69	11	75	39	44/80
2012	700	-	11	40	49	6	77	54	34/59
2017	600	-	0	70	30	23	50	50	40/78
2022	840	-	5	83	12	2	48	57	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	640	20	6	94	0	0	0	0	19/32
2002	180	-	0	22	78	0	0	67	17/29
2007	20	-	0	100	0	0	0	0	16/31
2012	-	-	-	-	-	-	-	-	15/18
2017	100	-	0	100	0	0	0	0	19/32
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	160	-	25	63	13	0	0	0	- / -
2002	100	-	0	100	0	0	0	0	- / -
2007	160	20	38	50	13	0	0	0	- / -
2012	140	-	29	71	0	0	0	0	- / -
2017	160	-	25	63	13	0	0	0	- / -
2022	140	-	43	43	14	0	0	43	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	40	-	0	100	0	0	0	0	17/33
2002	80	-	0	100	0	0	0	0	11/30
2007	20	-	0	0	100	0	0	100	11/21
2012	20	-	0	100	0	0	0	0	11/20
2017	20	-	0	100	0	0	0	0	10/34
2022	40	-	0	100	0	0	0	0	- / -
Pinus monophylla¹ -- (singleleaf pinyon)									
1997	20	-	0	100	0	0	0	0	- / -
2002	60	20	67	33	0	0	0	0	- / -
2007	40	20	50	50	0	0	0	0	- / -
2012	100	20	80	20	0	0	0	0	- / -
2017	60	-	67	33	0	0	0	0	- / -
2022	60	20	100	0	0	0	0	33	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	340	20	18	65	18	12	0	6	96/149
2002	380	-	5	79	16	42	37	11	112/161
2007	360	-	0	67	33	17	28	17	116/168
2012	280	-	14	43	43	64	0	21	107/163

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
2017	320	-	0	88	13	19	0	0	108/160
2022	400	-	5	85	10	20	0	25	- / -
Sclerocactus pubispinus -- (Great Basin fishhook cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	8/21
2022	-	-	-	-	-	-	-	-	-/-
Tetradymia glabrata -- (littleleaf horsebrush)									
1997	340	-	6	53	41	0	0	12	45/58
2002	120	-	0	0	100	0	0	100	57/35
2007	220	-	0	27	73	18	9	73	32/55
2012	180	-	0	56	44	0	0	100	42/62
2017	180	-	0	33	67	11	0	33	43/76
2022	180	-	0	0	100	0	0	89	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

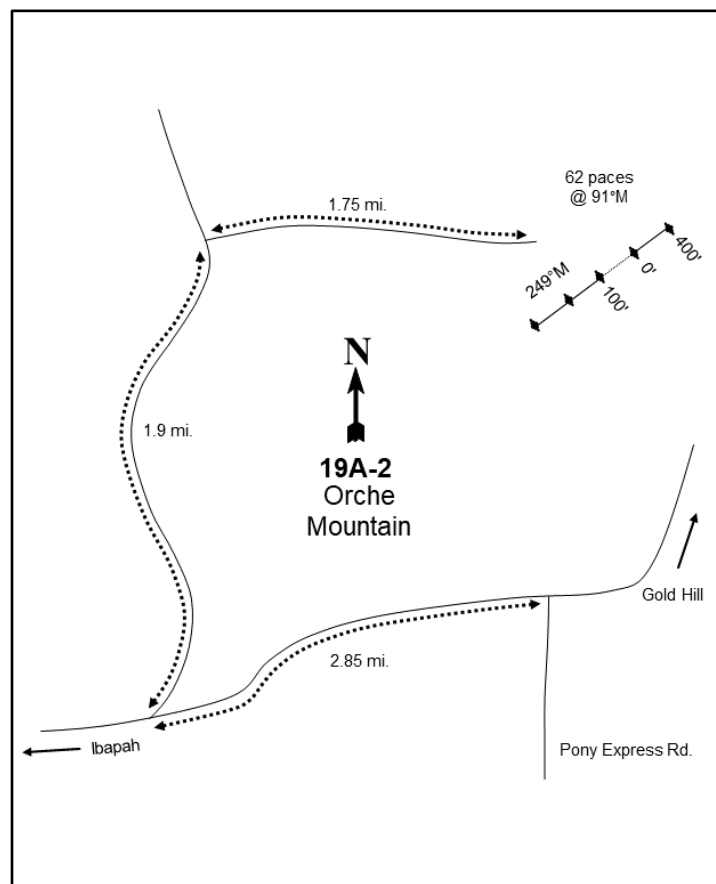
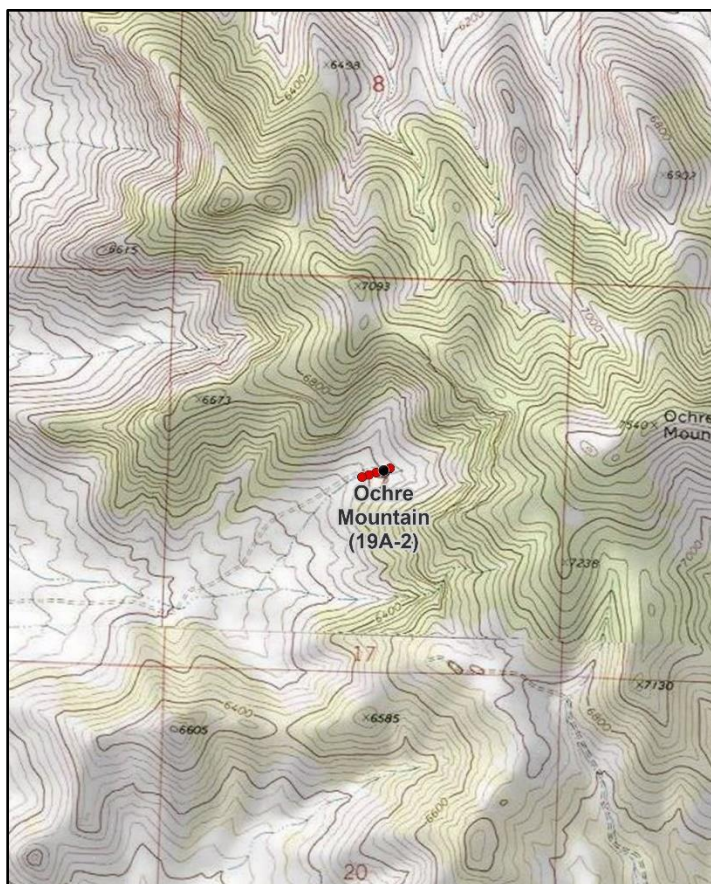
Table 19A-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2007	75	7	20	47	20	7	19.6
2012	59	5	5	42	32	16	23.3
2017	52	6	-	56	17	22	25.9
2022	54	10	15	45	15	15	30.9
Pinus monophylla (singleleaf pinyon)							
2007	59	10	50	20	20	-	7.6
2012	62	23	15	38	8	15	9.5
2017	54	7	21	29	21	21	10.5
2022	34	31	23	15	23	8	11.6

Table 19A-01.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	13.2	9.8	4.5	8.2	-5.4	0.2	0.0	30.6	Very Poor
2002	11.7	7.7	1.7	9.9	-4.0	0.1	0.0	27.0	Very Poor
2007	16.6	4.9	0.3	8.2	-2.8	0.2	0.0	27.3	Very Poor
2012	15.7	4.8	4.2	7.6	-2.6	0.0	0.0	29.8	Very Poor
2017	19.1	12.4	0.0	6.3	-6.4	0.1	0.0	31.5	Very Poor
2022	17.9	10.4	2.3	15.7	-7.5	0.3	0.0	39.0	Poor

OCHRE MOUNTAIN - STUDY NO. 19A-2



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Ochre Mountain SE; Township 8S, Range 18W, Section 17
NAD 83 UTM ZONE 12, 253041 East 4446319 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3931
249° magnetic
400ft
Line 4 (71ft), Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft)
Standard

Directions to Site

From Gold Hill, proceed southwest toward Pony Express Road. From the intersection at Pony Express Road, continue on the main road (east) towards Ibapah for another 2.85 miles to an intersection going north (right). Travel on the road going north for 1.91 miles to a road leading east (right). Turn right and continue for 1.75 miles to a small box canyon. Stop and walk 62 paces at 91 degrees magnetic to a green steel "T" fencepost with a red browse tag, numbered 3931, attached; this marks the 0-foot stake of the baseline. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. ***Pay close attention to study setup***

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	OCHRE
Elevation	6,400ft (1,951m)
Aspect	West
Slope	15-20%
Sample Dates	07/16/1997, 07/16/2002, 07/10/2007, 07/16/2012, 06/28/2017, 06/29/2022

Wildlife Habitat and Vegetation History**Table 19A-02.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 19A-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush/Annual Grass	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Annual Grass	Phase I

Site Notes

It was noted in 2017 that many shrubs were host to spider mites. In 2022, there were errors with study setup, resulting in belts not being placed in the same location.

Soils**Table 19A-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	50.0	32.4	17.6	3.4	7.6	150.4	1.0	07/16/1997

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Gravelly Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY306UT
States and Transitions	1997-Present - Utah Juniper/Invasive Annual State: Community Phase 3.1

This site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community type since study establishment in 1983; other shrubs such as black sagebrush (*A. nova*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus* or *viscidiflorus*) have also been present throughout the years to a lesser extent. However, in 2022 there was a notable decrease in both cover and density of mountain big sagebrush, which may indicate a future community compositional change (Table 19A-02.12, Table 19A-02.13). Although, the decrease in cover and density of sagebrush could be to errors associated with study setup in 2022. In addition, site photos and cover data reveal that singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) have been in the area and the site has remained in Phase I of woodland succession since study establishment (Photos, Table 19A-02.4, Table 19A-02.12, Table 19A-02.13, Table 19A-02.14). The herbaceous understory has been diverse and abundant in all sample years. However, much of the herbaceous cover has been contributed by the introduced annual grass species cheatgrass (*Bromus tectorum*), and annual grasses were co-dominant with sagebrush in most sample years since 1997. Perennial grasses and forbs, mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and Bonneville pea (*Lathyrus brachycalyx*) have also remained abundant (Table 19A-02.7, Table 19A-02.10, Table 19A-02.11) (USDA-ARS Jornada Experimental Range, 2022).

Trend Summary Tables

Table 19A-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	16.6	0.3	-	-	-	-
2002	16.6	0.7	-	13.6	0.3	-
2007	14.4	1.3	-	18.0	1.4	-
2012	13.9	1.2	-	19.9	1.2	0.2
2017	13.1	1.6	0.0	16.8	1.7	1.3
2022	5.8	3.2	-	8.4	4.2	-

Table 19A-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	394	290	20	213	10.8	9.4	0.1	6.0
2002	322	236	61	247	7.6	12.2	1.2	8.3
2007	375	252	89	257	12.5	13.7	1.2	12.1
2012	383	262	17	136	23.5	13.7	0.3	3.0
2017	430	246	55	236	38.5	11.8	1.6	11.6
2022	427	269	96	199	34.5	13.6	1.1	8.1

Table 19A-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.6	1.4	53.2	8.3	5.1	39.3
2002	4.9	1.8	49.6	12.6	8.2	45.1
2007	2.3	0.1	40.5	6.2	3.8	50.9
2012	4.7	0.7	41.0	7.5	6.7	56.5
2017	2.4	0.3	43.3	7.8	4.3	68.8
2022	1.4	0.9	46.1	8.8	7.2	58.0

Table 19A-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	5	5	-	1	1
2002	3	18	5	1	2
2007	1	5	10	1	5
2012	5	2	6	1	-
2017	2	4	-	-	2
2022	5	4	1	5	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	3.6 (9.0)	43.6 (107.6)	14.7 (36.4)	5.2 (12.9)	-
2007	4.4 (10.8)	1.3 (3.3)	29.5 (72.8)	4.7 (11.5)	-
2012	32.7 (80.7)	7.4 (18.2)	12.1 (29.8)	-	-
2017	19.6 (48.4)	10.7 (26.5)	-	3.5 (8.6)	-
2022	5.8 (14.3)	6.7 (16.6)	2.7 (6.6)	5.8 (14.3)	-

Table 19A-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
Agropyron cristatum ⁱ (crested wheatgrass)	4	394	-	137	214
Bromus tectorum ^{ai} (cheatgrass)	-	322	3	104	177
Poa fendleriana (muttongrass)	-	375	10	93	198
Poa secunda (Sandberg bluegrass)	-	383	5	131	199
Pseudoroegneria spicata (bluebunch wheatgrass)	-	430	12	58	214
	-	427	-	108	227
year	Average Cover (%)				
1997	0.2	10.8	-	1.6	7.6
2002	-	7.6	0.0	0.9	11.3
2007	-	12.5	0.2	1.3	12.2
2012	-	23.5	0.2	3.0	10.5
2017	-	38.5	0.1	0.7	11.1
2022	-	34.5	-	3.2	10.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	-	5	-	1	0	-	3	-	7	-	4	-	2	-	-	199
Alyssum desertorum ^{ai} (desert madwort)	21	-	1	-	-	-	-	2	3	5	-	-	-	-	4	45	221
Arabis (rockcress)	7	-	3	3	-	-	-	8	-	10	-	-	-	-	-	60	235
Astragalus (milkvetch)	8	-	-	-	-	-	-	-	-	1	-	-	-	-	-	4	126
Castilleja angustifolia (northwestern Indian paintbrush)	9	-	0	-	-	-	-	2	3	3	-	-	-	-	-	-	226
Cirsium (thistle)	1	2	-	58	-	6	2	-	-	16	3	5	3	-	2	47	129
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Crepis acuminata (tapertip hawkbeard)																	
Delphinium nuttallianum (two-lobed larkspur)																	
Descurainia pinnata ^a (western tansymustard)																	
Draba ^a (draba)																	
Erigeron pumilus (shaggy fleabane)																	
Gilia inconspicua ^a (sly gilia)																	
Hackelia patens (spotted stickseed)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Lappula occidentalis ^a (flatspine stickseed)																	
Lathyrus brachycalyx (Bonneville pea)																	
year	Average Cover (%)																
1997	-	-	0.0	-	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	-	5.7
2002	0.1	-	0.0	-	-	-	-	0.0	0.0	0.0	-	-	-	-	0.0	0.8	8.0
2007	0.0	-	0.0	0.0	-	-	-	0.4	-	0.1	-	-	-	-	-	0.3	11.5
2012	0.1	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	2.9
2017	0.2	-	0.0	-	-	-	-	0.0	0.0	0.3	-	-	-	-	-	-	11.3
2022	0.0	0.0	-	3.0	-	0.2	0.0	-	-	0.1	0.0	0.0	0.0	-	0.0	0.1	4.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Oenothera caespitosa (tufted evening primrose)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{at} (tall tumblemustard)	Tragopogon dubius ^{at} (yellow salsify)
year	Nested Frequency					
1997	-	1	-	13	13	-
2002	3	-	-	29	15	-
2007	-	-	-	15	35	-
2012	2	-	-	6	14	-
2017	-	2	1	-	48	5
2022	-	-	-	13	45	-
year	Average Cover (%)					
1997	-	0.0	-	0.1	0.1	-
2002	0.0	-	-	0.1	0.3	-
2007	-	-	-	0.1	0.9	-
2012	0.0	-	-	0.0	0.2	-
2017	-	0.0	0.0	-	1.1	0.1
2022	-	-	-	0.1	0.9	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	0.3	13.3	0.3	-	-
2007	0.4	17.6	1.4	-	-
2012	0.5	19.4	1.2	-	0.2
2017	0.1	16.7	0.8	0.9	1.3
2022	0.3	8.1	2.9	1.3	-
year	Quadrat Cover (%)				
1997	0.3	16.3	0.3	-	-
2002	0.4	16.2	0.7	-	-
2007	0.5	13.9	1.3	-	-
2012	0.6	13.4	1.2	-	0.0
2017	0.0	13.1	1.1	0.5	0.0
2022	1.0	4.8	2.3	0.9	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^P -- (black sagebrush)									
1997	220	-	0	82	18	0	0	18	24/44
2002	260	-	0	54	46	54	15	92	36/59
2007	360	-	11	33	56	0	0	22	31/63
2012	280	-	0	64	36	0	0	0	31/49
2017	20	-	0	0	100	0	0	100	22/55
2022	140	-	0	29	71	14	0	71	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	2720	20	6	61	33	15	4	21	89/124
2002	1820	-	0	50	51	15	12	79	91/116
2007	1100	20	9	49	42	16	0	40	101/152
2012	1120	-	4	61	36	25	0	36	87/137
2017	1440	-	1	78	21	32	0	13	81/116
2022	840	-	0	48	52	0	0	64	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	460	-	0	91	9	0	0	9	45/56
2002	340	-	0	94	6	0	0	0	38/57
2007	300	-	13	80	7	0	0	0	39/72
2012	380	-	5	90	5	0	0	37	37/81
2017	240	-	8	92	0	0	0	0	37/68
2022	400	20	5	60	35	0	0	45	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	20	-	0	100	0	0	0	0	38/86
2012	-	-	-	-	-	-	-	-	- / -
2017	140	-	0	100	0	14	0	0	46/81
2022	320	-	0	75	25	0	0	31	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

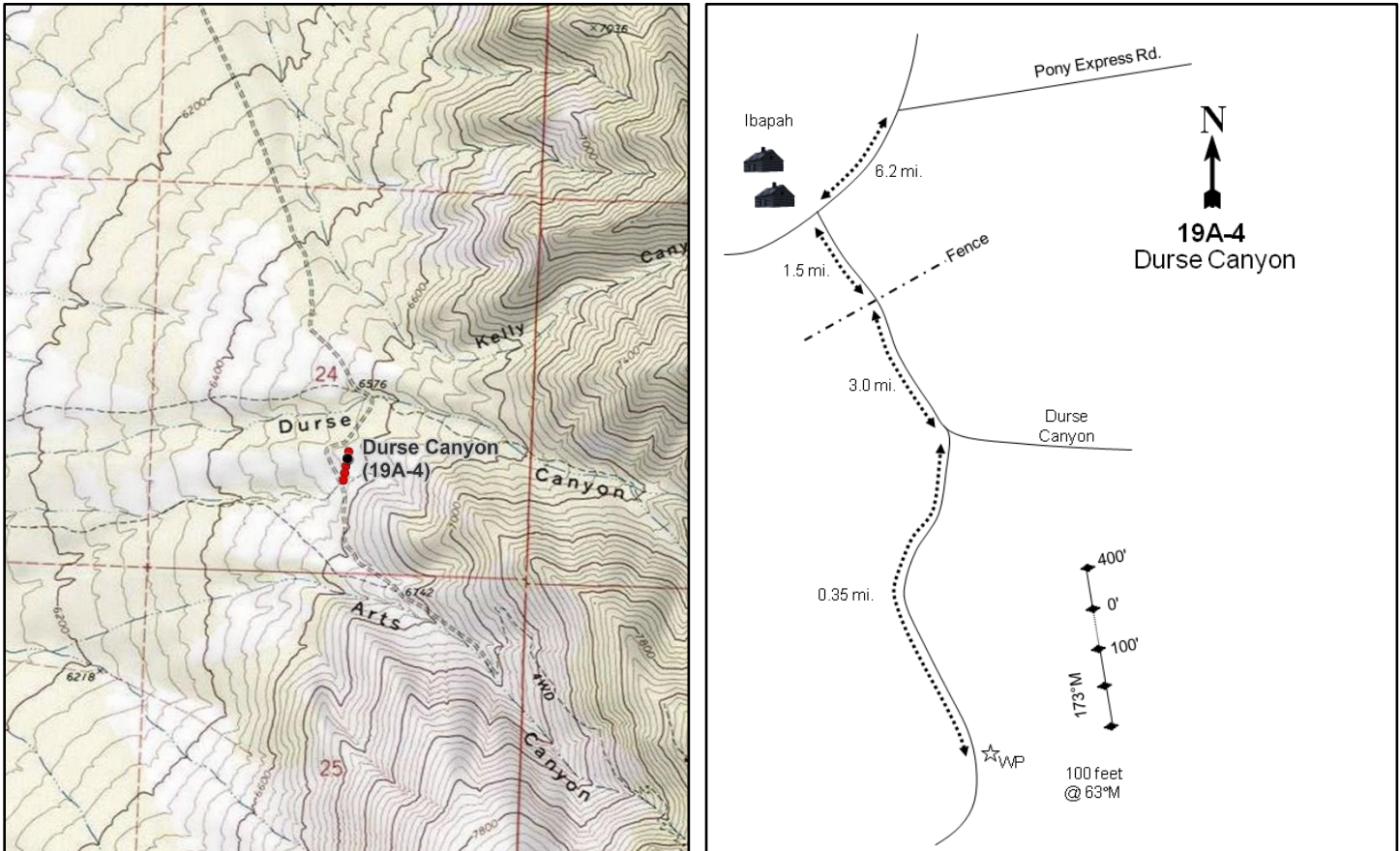
Table 19A-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	1	-	-	100	-	-	9.0
2022	1	-	-	100	-	-	23.0
Pinus monophylla (singleleaf pinyon)							
2017	1	-	100	-	-	-	4.0
2022	1	-	50	50	-	-	5.5

Table 19A-02.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	20.8	5.2	2.9	18.8	-8.1	10.0	0.0	49.5	Poor-Fair
2002	20.7	-0.1	0.0	24.4	-5.7	10.0	0.0	49.3	Poor-Fair
2007	22.5	2.4	4.6	27.4	-9.4	10.0	0.0	57.5	Fair
2012	24.9	4.3	1.8	27.4	-17.6	6.1	0.0	46.7	Poor
2017	21.0	8.6	0.7	23.6	-20.0	10.0	0.0	43.9	Poor
2022	10.5	-0.9	0.0	27.3	-20.0	10.0	0.0	26.9	Very Poor

DURSE CANYON - STUDY NO. 19A-4

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute NE; Township 10S, Range 19W, Section 24
NAD 83 UTM ZONE 12, 249133 East 4425145 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3971
173° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (71ft), Line 4 (59ft)
Standard

Directions to Site

From the intersection of the Pony Express Road to Gold Hill and the oiled road to Ibabah and Goshute, proceed southwest towards Goshute for 6.2 miles to a dirt road to the east. Turn left and proceed southeast for 4.55 miles, then turn right and continue 0.15 miles to another fork. Proceed for another 0.2 miles to a red steel "T" fencepost on the left (east) side of the road. From the fencepost, the 0-foot baseline stake is located 100 feet away at 63 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height, and a red browse tag #3971 is attached to the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	IBAPAH
Elevation	6,560ft (1,999m)
Aspect	West
Slope	10%
Sample Dates	07/15/1997, 07/16/2002, 07/17/2012, 06/27/2017, 06/28/2022

Wildlife Habitat and Vegetation History**Table 19A-04.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long
Pronghorn	crucial	year-long
Rocky Mountain Bighorn	substantial	year-long

Table 19A-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose	Phase I
1989	Stansbury Cliffrose	Phase I
1997	Stansbury Cliffrose/Pinyon-Juniper	Phase I transitioning to Phase II
2002	Pinyon-Juniper/Stansbury Cliffrose	Phase II
2012	Pinyon-Juniper/Stansbury Cliffrose	Phase II transitioning to Phase III
2017	Pinyon-Juniper/Stansbury Cliffrose	Phase II transitioning to Phase III
2022	Pinyon-Juniper/Stansbury Cliffrose	Phase II transitioning to Phase III

Site Notes

No Notes

Soils**Table 19A-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	38.0	37.4	24.6	4.0	15.9	150.4	0.7	07/15/1997

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983. Singleleaf pinyon (*Pinus monophyllus*) and Utah juniper (*Juniperus osteosperma*) have also been present in all sample years, and from 1983 to 1989, the site was considered to be within Phase I of woodland succession. As cover has increased and pinyon-juniper and has become co-dominant with cliffrose the study has progressed through phases of woodland succession since the 2012 (Photos, Table 19A-04.4, Table 19A-04.12, Table 19A-04.13, Table 19A-04.14). The herbaceous understory has remained diverse in composition, but has never been particularly abundant (Table 19A-04.7, Table 19A-04.10, Table 19A-04.11). Without a tree-removing disturbance, this study site will likely advance to Phase III of woodland succession, and eventually lose the remaining shrub and herbaceous components that are currently present.

Trend Summary Tables**Table 19A-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	13.8	1.3	8.8	-	-	-
2002	20.3	1.4	12.2	18.3	1.5	21.3
2012	14.9	0.4	13.6	22.3	0.7	29.4
2017	15.0	0.5	9.6	26.0	-	34.9
2022	8.4	0.6	10.4	18.8	0.5	29.9

Table 19A-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	270	254	66	160	3.7	5.4	0.5	3.9
2002	30	257	-	75	0.2	5.8	-	0.9
2012	70	227	5	105	0.6	6.7	0.0	1.0
2017	65	224	80	126	0.7	4.5	0.2	1.7
2022	84	196	132	86	0.7	2.7	0.6	1.2

Table 19A-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.6	1.7	39.0	19.2	5.1	35.3
2002	13.9	3.4	41.2	24.4	7.7	37.8
2012	11.8	0.5	51.5	11.9	11.3	35.8
2017	12.8	2.7	53.9	25.2	5.3	32.9
2022	11.9	3.2	53.7	24.4	6.4	22.4

Table 19A-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	10	-	11
2002	10	-	9
2012	1	1	10
2017	-	1	3
2022	-	1	6
Days Use Per Acre (ha)			
1997	-	-	-
2002	34.2 (84.4)	6.0 (14.9)	-
2012	11.4 (28.1)	0.7 (1.7)	-
2017	-	-	-
2022	3.4 (8.3)	2.0 (5.0)	-

Table 19A-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
Bromus tectorum ^{ai} (cheatgrass)	270	39	-	1	219	27
Elymus elymoides (squirreltail)	30	26	-	-	241	17
Poa bulbosa ⁱ (bulbous bluegrass)	70	3	-	-	225	5
Poa fendleriana (muttongrass)	65	23	0	0	218	5
Poa secunda (Sandberg bluegrass)	84	26	-	1	175	2
Pseudoroegneria spicata (bluebunch wheatgrass)						
year	Average Cover (%)					
1997	3.7	0.9	-	0.0	4.2	0.2
2002	0.2	0.2	-	-	5.5	0.1
2012	0.6	0.0	-	-	6.7	0.0
2017	0.7	0.6	0.0	0.0	3.8	0.1
2022	0.7	0.3	-	0.0	2.4	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum ^{ai} (desert madwort)	13	6	5	1	62	17	4	16	17	-	20	2	-	4	9	-	-
Arabis (rockcress)	-	-	-	-	9	-	-	-	-	-	6	-	-	-	-	6	-
Asclepias labrifloris (Utah milkweed)	3	0	-	-	34	-	-	-	5	-	26	-	-	-	-	1	-
Astragalus (milkvetch)	-	-	1	18	24	6	-	20	47	2	23	2	4	2	-	15	3
Astragalus utahensis (Utah milkvetch)	-	-	-	9	22	7	-	98	26	-	8	13	3	1	-	-	-
Camelina microcarpa ^{ai} (littletop false flax)																	
Castilleja (Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	
Descurainia pinnata ^a (western tansymustard)																	
Draba ^a (draba)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Ipomopsis aggregata (scarlet gilia)																	
Lathyrus brachycalyx (Bonneville pea)																	
Linum perenne ⁱ (blue flax)																	
year	Average Cover (%)																
1997	0.1	0.4	0.1	0.0	1.6	0.3	0.0	0.1	0.1	-	0.1	0.0	-	0.0	0.0	-	-
2002	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	0.0	-
2012	0.0	0.0	-	-	0.6	-	-	-	0.0	-	0.1	-	-	-	-	0.0	-
2017	-	-	0.0	0.4	0.1	0.0	-	0.0	0.1	0.0	0.3	0.0	0.0	0.0	-	0.1	0.0
2022	-	-	-	0.1	0.4	0.0	-	0.4	0.1	-	0.3	0.1	0.0	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Pleiocanthus spinosus (thorn skeletonweed)	Streptanthus cordatus (heartleaf twistflower)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1997	-	12	2	3	23	68	-	33	0
2002	-	2	-	10	20	24	4	-	2
2012	-	-	-	1	13	40	1	-	5
2017	1	-	2	4	18	54	1	1	2
2022	0	-	1	8	14	42	-	-	1
year	Average Cover (%)								
1997	-	0.1	0.0	0.0	0.7	0.2	-	0.7	0.0
2002	-	0.0	-	0.0	0.7	0.1	0.0	-	0.0
2012	-	-	-	0.0	0.2	0.1	0.0	-	0.0
2017	0.0	-	0.0	0.0	0.6	0.2	0.0	0.0	0.0
2022	0.0	-	0.0	0.0	0.3	0.1	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Grayia spinosa (spiny hopsage)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ^t (singleleaf pinyon)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	2.1	3.4	0.1	-	0.4	1	6.4	-	14.9	12.8	-
2012	1.7	2	-	-	0.5	0.1	13	0.1	16.4	18.6	-
2017	2.1	0.8	-	-	-	-	17.1	-	17.8	23.1	-
2022	1.8	0.5	-	-	0.2	-	17.9	0.3	12	16.5	-
year	Quadrat Cover (%)										
1997	1.9	3.8	0.5	-	-	0.7	6.0	0.1	2.8	8.1	-
2002	1.5	6.9	0.6	-	0.3	0.3	4.0	0.1	8.2	11.9	-
2012	1.8	1.4	-	-	0.4	0.0	7.8	0.0	5.8	11.7	-
2017	2.5	0.3	0.0	-	0.3	0.0	4.2	0.2	5.4	12.1	-
2022	1.3	0.0	0.1	0.0	0.1	-	6.4	0.3	4.0	6.9	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^P -- (black sagebrush)									
1997	1100	100	38	46	16	2	0	6	33/58
2002	2120	-	26	45	28	3	0	21	25/43
2012	840	20	17	74	10	0	0	33	28/55
2017	1160	20	5	62	33	0	0	38	33/47
2022	1040	20	4	17	79	0	0	83	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1100	80	22	36	42	9	0	44	53/74
2002	1400	20	10	40	50	3	0	29	42/64
2012	1180	20	12	59	29	2	0	42	35/55
2017	600	-	10	60	30	0	0	40	40/53
2022	320	20	0	69	31	0	0	31	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	520	20	35	62	4	0	0	4	25/35
2002	580	-	0	86	14	0	0	7	21/48
2012	60	-	0	100	0	0	0	67	22/40
2017	-	-	-	-	-	-	-	-	22/32
2022	40	-	0	100	0	0	0	0	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	20	0	0	0	0	0	0	- / -
Grayia spinosa -- (spiny hopsage)									
1997	560	40	75	25	0	0	0	0	35/68
2002	240	-	8	58	33	0	0	8	43/77
2012	120	-	0	83	17	0	0	17	39/60
2017	180	-	22	67	11	0	0	22	31/44
2022	100	-	0	60	40	0	0	40	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1520	100	47	51	1	0	0	1	21/26
2002	1180	-	2	88	10	0	0	3	15/16
2012	40	-	0	100	0	0	0	0	25/29
2017	180	-	33	56	11	0	0	11	23/23
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	200	100	70	30	0	0	0	0	- / -
2002	180	60	44	56	0	0	0	0	- / -
2012	160	100	50	50	0	0	0	0	- / -
2017	220	60	55	46	0	0	0	0	- / -
2022	520	60	39	62	0	0	0	4	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	220	-	18	82	0	0	0	0	14/32
2002	240	-	8	92	0	0	0	0	14/25
2012	200	-	10	90	0	0	0	10	13/30
2017	320	-	0	100	0	0	0	0	13/35
2022	280	-	0	79	21	0	0	21	- / -

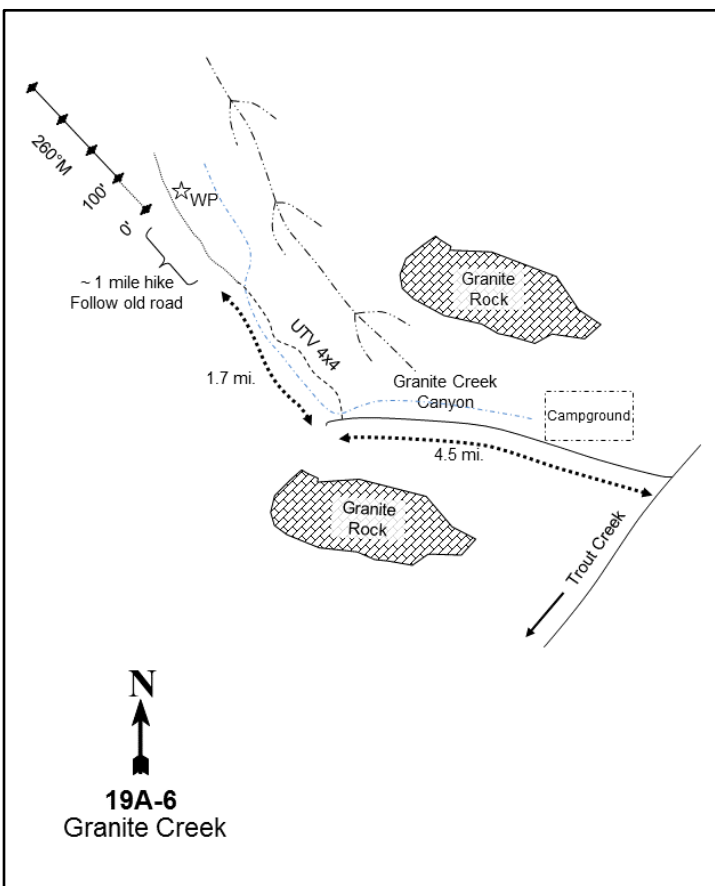
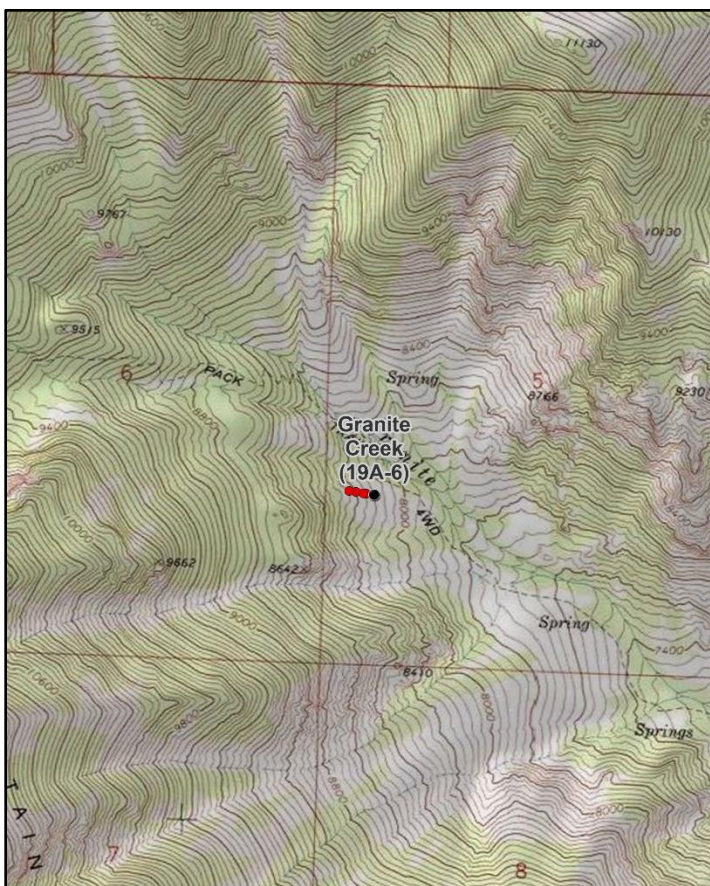
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pinus monophylla^t -- (singleleaf pinyon)									
1997	180	60	67	33	0	0	0	0	- / -
2002	280	120	43	50	7	0	0	21	- / -
2012	200	100	40	60	0	0	0	10	- / -
2017	160	-	38	63	0	0	0	13	- / -
2022	460	20	78	22	0	0	0	9	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	840	160	33	64	2	2	0	2	158/144
2002	820	-	15	68	17	17	2	5	173/164
2012	660	-	15	76	9	0	0	24	168/182
2017	780	40	8	77	15	0	0	8	164/158
2022	680	1080	6	85	9	0	0	15	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	0	100	0	0	100	16/27
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	60	-	0	67	33	0	0	33	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	442	-	-	-	-	-	6.8
2012	351	15	10	40	25	10	10.7
2017	417	15	5	45	20	15	10.3
2022	356	20	10	5	30	35	10.2
Pinus monophylla (singleleaf pinyon)							
2002	355	-	-	-	-	-	6.4
2012	351	40	-	25	20	15	9.8
2017	329	25	25	10	20	20	11.1
2022	374	30	20	5	5	40	8.9

GRANITE CREEK - STUDY NO. 19A-6



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Ibapah Peak SE; Township 12S, Range 18W, Section 05
NAD 83 UTM ZONE 12, 250978 East 4410010 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3921
260° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
No Rebar

Directions to Site

From the junction of Snake Valley Road and the road which runs west towards Granite Creek, proceed west up Granite Creek Canyon for 4.5 miles to an intersection. Turn right, crossing Granite Creek, and proceed 2.7 miles up the canyon to the end of the road. From the end of the road, the 0-foot baseline stake is 59 paces away at an azimuth of 194 degrees and near a single pine tree. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	THOUSAND PEAKS
Elevation	8,100ft (2,469m)
Aspect	Northeast
Slope	45%
Sample Dates	07/17/1997, 06/28/2017, 06/27/2022

Wildlife Habitat and Vegetation History**Table 19A-06.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Rocky Mountain Elk	substantial	spring/fall
Rocky Mountain Bighorn	crucial	spring/summer

Table 19A-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush/Perennial Forb	Phase I
2022	Mountain Big Sagebrush/Perennial Forb	Phase I

Site Notes

Evidence of past mining activity exists in the lower part of the canyon, but does not interfere with the study site.

Soils**Table 19A-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.1	39.6	45.8	14.6	4.3	13.1	230.4	0.9	07/17/1997

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Although a number of shrub species are present as minor components, this study site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since 1983; density of sagebrush has exhibited an overall decreasing trend over time (Table 19A-06.12, Table 19A-06.13). Singleleaf pinyon (*Pinus monophylla*) has also been observed on this site since study establishment, and the site has remained in Phase I of woodland succession for the duration of the study (Photos, Table 19A-06.4, Table 19A-06.14). The herbaceous understory has been abundant and very diverse in all sample years. Perennial grasses -- namely Idaho fescue (*Festuca idahoensis*) -- and perennial forbs have contributed the most herbaceous cover over the study period, and perennial forbs were a co-dominant site component in 2017 and 2022 (Table 19A-06.7, Table 19A-06.10, Table 19A-06.11).

Trend Summary Tables**Table 19A-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	14.4	7.9	3.1	-	-	-
2017	11.3	12.2	3.7	12.6	14.4	4.4
2022	10.6	8.1	4.6	12.0	11.5	8.2

Table 19A-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	369	185	338	-	13.9	0.7	11.9
2017	-	339	245	395	-	18.1	3.2	30.1
2022	-	263	299	437	-	10.2	4.4	44.2

Table 19A-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	5.8	1.7	51.7	3.3	10.6	50.6
2017	8.0	0.6	51.7	5.9	9.1	63.9
2022	17.9	0.2	46.2	8.1	11.2	58.4

Table 19A-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	-	21	-
2017	-	6	-
2022	3	18	-
Year	Days Use Per Acre (ha)		
1997	-	-	-
2017	-	13.4 (33.1)	0.7 (1.7)
2022	3.6 (9.0)	43.6 (107.6)	-

Table 19A-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Achnatherum lettermanii (Letterman's needlegrass)										
Achnatherum nelsonii (Columbia needlegrass)										
Bromus ciliatus (fringed brome)										
Elymus trachycaulus (slender wheatgrass)										
Festuca idahoensis (Idaho fescue)										
Hesperostipa comata (needle and thread)										
Poa fendleriana (muttongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
year	Nested Frequency									
1997	50	18	22	40	241	5	50	109	11	16
2017	-	14	31	69	237	-	34	102	15	17
2022	5	42	24	27	131	1	61	32	26	37
year	Average Cover (%)									
1997	0.7	0.2	0.3	0.2	9.9	0.0	0.7	1.7	0.1	0.2
2017	-	0.3	1.0	1.2	10.8	-	0.9	2.9	0.3	0.8
2022	0.2	0.6	0.8	0.9	4.2	0.0	1.2	0.5	0.3	1.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Allium acuminatum (tapertip onion)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Arabis (rockcross)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus purshii (woollypod milkvetch)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Castilleja linearifolia (Wyoming Indian paintbrush)																	
Chenopodium atroviridens ^a (pinyon goosefoot)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Delphinium ×occidentale (western larkspur)																	
Erigeron jonesii (Jones' fleabane)																	
year	Nested Frequency																
1997	6	79	4	1	-	13	-	34	-	108	-	87	61	29	1	14	3
2017	11	186	-	1	2	20	2	9	-	25	-	175	158	30	6	7	10
2022	61	297	-	-	3	8	4	13	1	26	1	247	76	30	11	20	5
year	Average Cover (%)																
1997	0.0	0.2	0.0	0.0	-	0.1	-	0.1	-	2.0	-	0.2	0.2	0.3	0.0	0.4	0.0
2017	0.0	1.3	-	0.0	0.1	0.3	0.6	0.0	-	0.6	-	1.7	1.2	0.4	0.0	0.4	0.1
2022	0.2	5.5	-	-	0.0	0.0	0.7	0.0	0.0	0.5	0.0	3.3	0.2	0.3	0.1	2.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Hackelia patens (spotted stickseed)																	
Heuchera parvifolia (littleleaf alumroot)																	
Hydrophyllum capitatum (ballhead waterleaf)																	
Lappula occidentalis ^a (flatspine stickseed)																	
Linum lewisii (Lewis flax)																	
Lomatium (desertparsley)																	
Lupinus caudatus (tailcup lupine)																	
Machaeranthera canescens (hoary tansyaster)																	
Mertensia oblongifolia (oblongleaf bluebells)																	
Microseris nutans (nodding microseris)																	
Microsteris gracilis ^a (slender phlox)																	
Penstemon watsonii (Watson's penstemon)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Potentilla concinna (elegant cinquefoil)																	
Pseudostellaria jamesiana (tuber starwort)																	
Sedum lanceolatum (spearleaf stonecrop)																	
Senecio integerrimus ^a (lambstongue ragwort)																	
year	Nested Frequency																
1997	62	1	-	17	3	3	119	2	6	-	11	49	81	4	202	6	19
2017	25	7	-	1	-	9	108	2	70	-	4	56	24	10	329	1	3
2022	30	7	19	-	-	10	112	3	88	19	16	116	56	19	290	-	50
year	Average Cover (%)																
1997	0.4	0.0	-	0.0	0.0	0.0	4.1	0.0	0.2	-	0.0	0.9	0.2	0.0	2.9	0.0	0.1
2017	0.7	0.2	-	0.0	-	0.1	5.9	0.0	1.1	-	0.1	3.5	0.0	0.1	14.2	0.0	0.2
2022	0.9	0.2	0.8	-	-	0.1	5.3	0.0	2.7	0.4	0.1	4.9	0.1	0.1	17.9	-	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES								
Silene drummondii (Drummond's campion)								
Symphyotrichum ascendens (western aster)								
Taraxacum officinale (common dandelion)								
Tragopogon dubius ^{a,i} (yellow salsify)								
unknown annual forb ^a (unknown forb)								
Veronica bitoba ^{a,i} (two-lobe speedwell)								
Viola (violet)								
Zigadenus paniculatus (foothill deathcamas)								
year	Nested Frequency							
1997	1	-	17	-	4	-	16	-
2017	0	3	10	-	-	-	-	15
2022	-	13	29	3	-	4	22	41
year	Average Cover (%)							
1997	0.0	-	0.1	-	0.0	-	0.1	-
2017	0.0	0.0	0.1	-	-	-	-	0.3
2022	-	0.5	0.2	0.0	-	0.0	0.1	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies concolor ^t (white fir)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ^t (singleleaf pinyon)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2017	0.1	10.3	0.5	-	13.9	-	4.3	2.3	-
2022	5.4	10	1.4	-	10.1	-	2.8	2	-
year	Quadrat Cover (%)								
1997	-	12.9	0.1	0.0	7.7	-	3.1	1.5	0.2
2017	1.6	9.2	0.2	0.1	12.0	0.0	2.1	2.0	-
2022	3.9	8.9	0.3	0.2	7.7	0.1	0.7	1.4	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies concolor^t -- (white fir)									
1997	-	-	-	-	-	-	-	-	-/-
2017	140	-	100	0	0	0	0	0	-/-
2022	200	-	40	50	10	0	0	10	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2440	100	7	66	28	14	4	24	75/106
2017	1860	-	3	74	23	4	0	20	55/78
2022	1740	-	8	74	18	15	1	18	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	180	-	0	100	0	0	0	0	45/58
2017	420	-	0	100	0	0	0	0	32/43
2022	360	-	0	100	0	0	0	0	-/-
Eriogonum microthecum^p -- (slender buckwheat)									
1997	180	-	11	89	0	0	0	0	21/20
2017	60	-	0	100	0	33	0	0	16/30
2022	360	20	0	100	0	28	0	0	-/-
Mahonia repens -- (creeping barberry)									
1997	31480	120	9	92	0	0	0	1	11/13
2017	68000	-	0	100	0	0	0	0	11/12
2022	39000	-	1	99	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	40	-	0	100	0	0	0	0	-/-
2017	20	-	0	100	0	0	0	0	15/52
2022	60	-	0	100	0	0	0	0	-/-
Pinus monophylla^t -- (singleleaf pinyon)									
1997	-	-	-	-	-	-	-	-	-/-
2017	100	-	100	0	0	0	0	20	-/-
2022	60	-	67	33	0	0	0	0	-/-

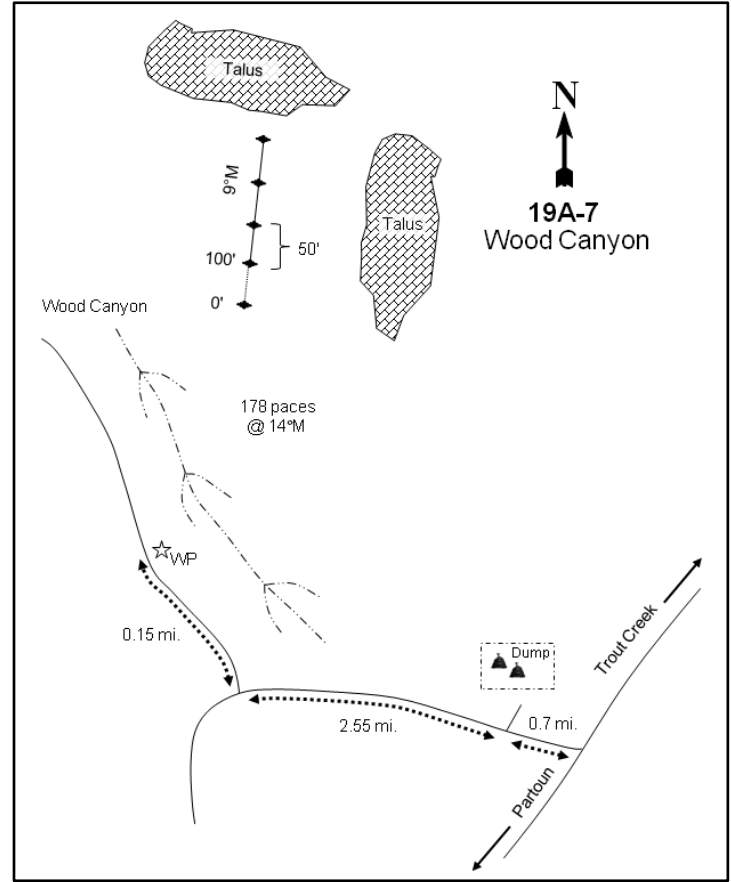
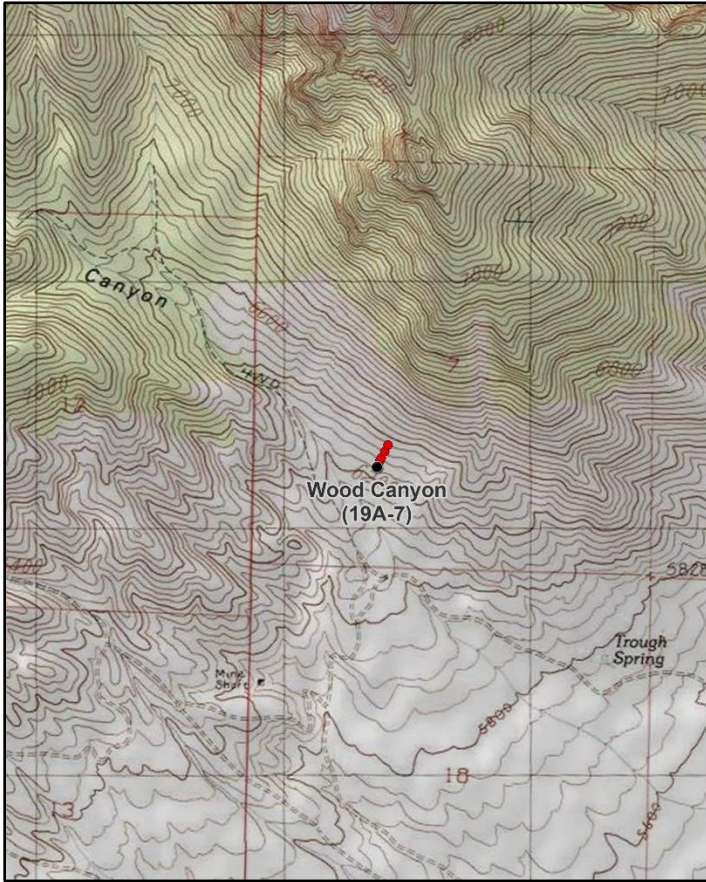
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	80	-	25	75	0	0	0	0	84/121
2017	180	-	11	89	0	0	0	11	85/164
2022	420	-	0	100	0	0	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	60	-	0	33	67	0	0	0	33/62
2017	40	-	0	100	0	0	0	0	40/48

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies concolor (white fir)							
2017	36	-	29	50	-	21	9.0
2022	39	-	31	50	-	19	7.2
Pinus monophylla (singleleaf pinyon)							
2017	18	-	27	9	-	64	22.5
2022	38	-	56	6	-	39	13.3

WOOD CANYON - STUDY NO. 19A-7

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Partoun NE; Township 13S, Range 18W, Section 07
NAD 83 UTM ZONE 12, 249327 East 4398447 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

9082
9° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: 2ft, Belt 2: 1ft; Line 2: 50ft Long

Directions to Site

From Trout Creek on Gandy Road through Snake Valley, travel south to the old Partoun dump (which is now covered over). Turn west and continue for 0.7 miles to the Trough Springs turnoff. Take this road west for 3.25 miles to the turnoff to Wood Canyon. Turn right and proceed for 0.15 miles to a witness post on the right (northeast) side of the road. From the witness post, walk 178 paces north (14 degrees magnetic) to the 0-foot baseline stake which is behind a large rock. The baseline runs uphill at 9 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PARTOUN
Elevation	6,250ft (1,905m)
Aspect	South
Slope	30-35%
Sample Dates	07/17/1997, 07/15/2002, 07/12/2007, 07/18/2012, 06/28/2017, 07/27/2022

Wildlife Habitat and Vegetation History**Table 19A-07.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Bighorn	substantial	year-long

Table 19A-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Perennial Grass/Mixed Shrub	Phase I
1989	Perennial Grass/Mixed Shrub	Phase I
1997	Perennial Grass/Mixed Shrub	Phase I
2002	Perennial Grass/Mixed Shrub	Phase I
2007	Perennial Grass/Mixed Shrub	Phase I
2012	Perennial Grass/Mixed Shrub	Phase I
2017	Perennial Grass/Mixed Shrub	Phase I
2022	Perennial Grass/Mixed Shrub	Phase I

Site Notes

Rugged cliffs cap the ridge north of the study, and it is surrounded by miles of vast open desert to the south and east. The study was established in 1989 to monitor bighorn sheep habitat, but it mainly receives winter use by deer. Chukars were heard on the nearby ledges in 1989, 1997, and 2012. In addition, pronghorn were spotted half of a mile east of the study in 2007. A stock pond one mile to the east is the closest apparent water source.

Soils**Table 19A-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.4	50.0	31.4	18.6	1.5	9.2	233.6	0.8	07/17/1997

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY252UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 1983, this site was a semi-desert ecological site dominated by perennial grasses and mixed shrubs. The site has remained in this state in subsequent study years. The most prevalent shrub species are shadscale saltbush (*Atriplex confertifolia*), broom snakeweed (*Gutierrezia sarothrae*) and Nevada jointfir (*Ephedra nevadensis*) (Photos, Table 19A-07.12). Perennial grasses compose a significant portion of the understory; with James' galleta (*Pleuraphis jamesii*), sand dropseed (*Sporobolus cryptandrus*), and Indian ricegrass (*Achnatherum hymenoides*) being the most prevalent grasses. Annual grasses have fluctuated in cover through time (Table 19A-07.10). Forbs are rather sparse and diversity is low (Table 19A-07.11). It is likely that this site will continue to remain in this state in the future barring a disturbance.

Trend Summary Tables

Table 19A-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	3.1	7.8	-	-	-	-
2002	2.0	3.6	-	3.0	3.3	-
2007	2.5	5.0	-	2.0	6.0	-
2012	1.7	3.5	-	1.5	2.9	-
2017	1.7	3.6	-	3.1	3.3	-
2022	1.3	1.7	-	2.8	1.5	-

Table 19A-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	439	207	105	11	6.2	7.8	1.2	0.1
2002	344	162	271	-	2.0	3.0	1.9	-
2007	422	208	361	2	8.6	4.7	5.2	0.0
2012	372	206	53	17	10.3	9.2	0.4	0.1
2017	321	277	318	8	3.2	14.1	6.7	0.0
2022	398	221	384	1	5.9	5.5	8.2	0.0

Table 19A-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	6.8	0.3	21.3	22.9	29.7	29.6
2002	13.9	0.4	18.4	26.9	33.7	13.7
2007	4.0	0.0	23.6	23.5	31.3	26.9
2012	14.3	0.0	18.9	19.5	35.6	26.1
2017	19.4	0.0	20.1	24.9	29.9	28.4
2022	11.8	0.0	26.1	24.2	37.3	21.2

Table 19A-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Chukar Partridge	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1997	-	-	9	2	-	4
2002	-	-	10	-	1	4
2007	-	1	6	-	1	8
2012	-	-	4	-	1	4
2017	-	-	1	7	-	5
2022	-	-	2	17	-	3
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	17.4 (43.0)*	8.0 (19.7)	14.1 (34.8)	0.7 (1.7)	1.7 (4.3)	-
2007	-	5.8 (14.3)	13.4 (33.1)	3.4 (8.3)	0.6 (1.4)	-
2012	-	2.9 (7.2)	5.3 (13.2)	3.4 (8.3)	1.7 (4.3)	-
2017	-	-	2.0 (5.0)	6.0 (14.9)	-	-
2022	-	1.5 (3.6)	5.3 (13.2)	16.1 (39.7)	-	-

*Pellets per acre (ha)

Table 19A-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency						
1997	51	439	18	56	132	5	4
2002	29	344	2	51	83	6	26
2007	25	422	31	39	90	24	38
2012	30	372	3	18	178	18	1
2017	62	321	33	8	177	32	57
2022	4	398	-	27	197	29	5
year	Average Cover (%)						
1997	1.8	6.2	0.3	1.5	4.0	0.1	0.1
2002	0.6	2.0	0.0	1.2	1.0	0.0	0.2
2007	0.4	8.6	1.1	0.9	1.5	0.2	0.7
2012	1.1	10.3	0.1	0.6	7.2	0.2	0.0
2017	3.3	3.2	0.9	0.2	6.2	0.2	3.1
2022	0.2	5.9	-	0.4	4.1	0.6	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvetch)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Draba ^a (draba)	Erigeron (fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Halogeton glomeratus ^{ai} (saltlover)	Lappula occidentalis ^a (flatspine stickseed)	Lepidium ^a (pepperweed)	Phlox longifolia (longleaf phlox)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)
year	Nested Frequency												
1997	12	1	-	-	-	8	96	-	3	-	-	-	2
2002	6	-	-	-	-	-	271	-	-	-	-	-	-
2007	74	-	-	-	-	-	355	3	1	7	-	2	-
2012	-	7	-	-	-	-	53	-	-	-	-	3	7
2017	9	-	7	4	11	-	312	20	2	3	54	1	3
2022	2	-	2	-	3	-	384	3	-	2	19	-	1
year	Average Cover (%)												
1997	0.0	0.0	-	-	-	0.0	1.2	-	0.0	-	-	-	0.0
2002	0.0	-	-	-	-	-	1.9	-	-	-	-	-	-
2007	0.3	-	-	-	-	-	4.8	0.0	0.0	0.0	-	0.0	-
2012	-	0.1	-	-	-	-	0.4	-	-	-	-	0.0	0.0
2017	0.1	-	0.0	0.0	0.0	-	6.3	0.1	0.0	0.0	0.2	0.0	0.0
2022	0.0	-	0.0	-	0.0	-	8.1	0.0	-	0.0	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Bassia americana ^p (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Echinocereus (hedgheg cactus)	Ephedra nevadensis ^p (Nevada joinfir)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata ^p (winterfat)	Opuntia polyacantha (plains pricklypear)	Tetradymia spinosa (shortspine horsebrush)
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	-	0.8	0.4	0.2	-	1.8	2.3	-	0.8	-
2007	-	0.7	-	0.3	-	1.3	4.2	0	0.3	1.2
2012	-	0.5	-	0.2	-	1	2.1	0	-	0.6
2017	-	0.2	0.1	0.3	-	2.8	2.3	0	-	0.7
2022	-	0.2	0	-	0	2.6	1.1	-	0.1	0.3
year	Quadrat Cover (%)									
1997	-	2.3	0.0	0.5	-	0.8	5.0	-	1.0	1.3
2002	-	0.7	0.0	0.3	0.0	1.3	2.2	-	0.8	0.2
2007	-	0.5	-	0.3	0.0	1.9	3.5	0.1	0.7	0.4
2012	0.1	0.1	-	0.4	0.0	1.2	2.1	0.1	0.3	0.8
2017	-	0.2	0.0	0.4	0.0	1.5	2.0	0.0	0.2	1.0
2022	-	0.2	0.0	-	0.4	1.1	1.1	0.0	0.0	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1997	-	-	-	-	-	-	-	-	34/50
2002	-	-	-	-	-	-	-	-	21/42
2007	-	-	-	-	-	-	-	-	29/76
2012	140	-	0	100	0	0	0	0	23/64
2017	-	-	-	-	-	-	-	-	31/69
2022	-	-	-	-	-	-	-	-	- / -
Atriplex confertifolia^p -- (shadscale saltbush)									
1997	1400	20	10	67	23	14	7	20	24/59
2002	1140	-	30	26	44	4	4	35	16/39
2007	800	-	0	63	38	3	0	48	19/49
2012	500	-	4	96	0	4	0	4	15/38
2017	500	-	4	80	16	0	0	8	18/48
2022	500	-	8	40	52	0	0	92	- / -
Bassia americana^p -- (green molly)									
1997	-	-	-	-	-	-	-	-	- / -
2002	240	-	58	42	0	0	8	0	12/20
2007	40	-	0	100	0	100	0	0	24/37
2012	60	-	0	100	0	0	0	0	26/41
2017	440	-	23	36	41	0	0	27	8/12
2022	280	-	79	21	0	0	0	71	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	100	-	0	80	20	0	0	20	22/41
2002	80	-	0	50	50	0	25	25	18/42
2007	120	-	0	83	17	17	0	17	22/48
2012	40	-	0	50	50	0	0	100	26/50
2017	40	-	0	50	50	0	0	100	32/65
2022	40	-	0	50	50	0	0	100	- / -
Echinocereus -- (hedgehog cactus)									
1997	-	-	-	-	-	-	-	-	- / -
2002	200	-	20	80	0	0	0	0	8/15
2007	160	20	13	88	0	0	0	0	9/16
2012	200	-	0	100	0	0	0	0	11/14
2017	280	-	0	100	0	0	0	0	9/16
2022	220	-	9	91	0	0	0	9	- / -
Ephedra nevadensis^P -- (Nevada jointfir)									
1997	160	-	0	100	0	13	0	0	42/88
2002	320	-	25	63	13	56	6	75	47/118
2007	320	-	31	50	19	13	19	50	47/119
2012	360	-	28	67	6	22	33	50	48/99
2017	1000	20	12	48	40	0	0	40	39/79
2022	1580	-	27	15	58	19	0	99	- / -
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	9/14
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	5200	60	7	80	13	0	0	11	19/31
2002	3320	-	4	68	28	0	1	33	14/23
2007	4040	-	3	83	14	1	0	5	21/34
2012	2180	20	4	95	1	0	0	3	19/32
2017	5720	-	6	88	6	0	0	13	19/27
2022	1900	-	1	54	45	0	0	84	- / -
Krascheninnikovia lanata^P -- (winterfat)									
1997	60	-	0	100	0	33	0	0	22/26
2002	40	-	0	50	50	0	100	50	14/28
2007	260	-	0	100	0	0	8	0	15/29
2012	380	-	63	37	0	0	0	0	18/30
2017	120	-	0	100	0	83	0	50	19/34
2022	100	-	0	100	0	20	20	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	460	-	9	87	4	0	0	4	29/46
2002	500	-	16	68	16	0	0	24	10/33
2007	520	-	0	85	15	4	0	12	12/39
2012	220	-	27	73	0	0	0	9	9/20
2017	220	-	18	73	9	0	0	9	10/22
2022	100	-	0	80	20	0	0	20	- / -

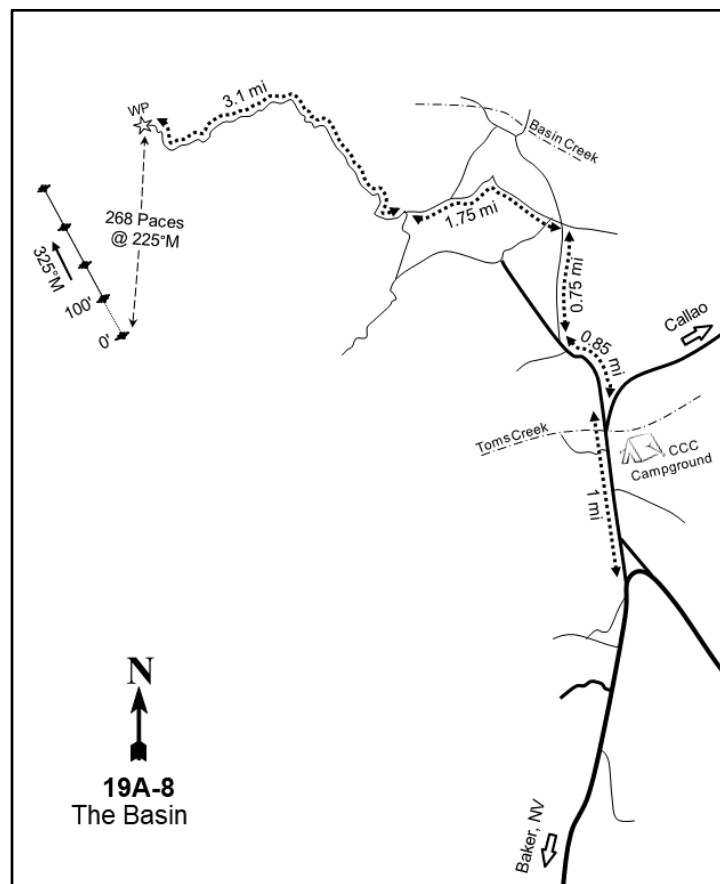
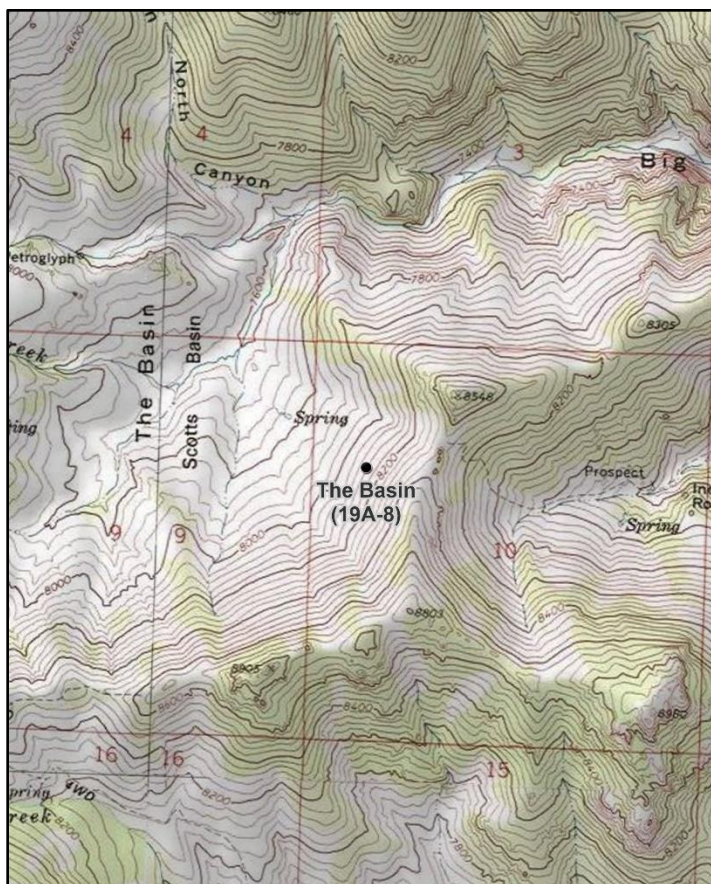
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia spinosa -- (shortspine horsebrush)									
1997	100	-	0	60	40	20	0	20	44/73
2002	100	-	0	0	100	0	0	100	48/89
2007	120	-	0	0	100	0	0	100	46/140
2012	80	-	0	50	50	0	0	75	43/73
2017	100	-	0	0	100	0	0	100	42/74
2022	100	-	0	0	100	0	0	100	- / -
Yucca -- (yucca)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	53/59
2012	-	-	-	-	-	-	-	-	38/62
2017	-	-	-	-	-	-	-	-	48/78

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-07.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	3.3	0.0	0.0	15.6	-4.6	0.2	0.0	14.5	Poor
2002	2.3	0.0	0.0	6.0	-1.5	0.0	0.0	6.8	Very Poor
2007	2.3	0.0	0.0	9.5	-6.5	0.0	0.0	5.4	Very Poor
2012	1.8	0.0	0.0	18.4	-7.7	0.2	0.0	12.6	Poor
2017	3.8	0.0	0.0	28.1	-2.4	0.1	0.0	29.6	Fair
2022	3.5	0.0	0.0	10.9	-4.4	0.0	0.0	10.0	Very Poor-Poor

THE BASIN - STUDY NO. 19A-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute Canyon SW; Township 11S, Range 18W, Section 10
NAD 83 UTM ZONE 12, 254944 East 4419083 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
325° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
No Rebar

Directions to Site

From the bridge outside of the CCC camp near Callao, proceed on the fork off of the main Snake Valley Road. Continue northwest for 0.85 miles to a fork: keep right and proceed 0.75 miles to an intersection. Turn left (toward the mountains), and after 0.1 miles keep right at another fork. Continue for 1.65 miles and keep right at the fork to Tom's Canyon. Proceed up Middle Canyon for 3.1 miles to the top, and stop where the road ends (in a saddle overlooking The Basin). Follow the lowest trail and hike southwest for 268 paces to a spot just past a small gully and the last clump of mahogany. The baseline is above the trail; walk 7 paces to the red fencepost marking the 100-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MOUNTAIN
Elevation	8,200ft (2,499m)
Aspect	West
Slope	45%
Sample Dates	07/16/1997, 06/27/2017, 07/26/2022

Wildlife Habitat and Vegetation History**Table 19A-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	summer/fall
Rocky Mountain Bighorn	crucial	spring/summer

Table 19A-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Low Sagebrush	Phase I
1997	Low Sagebrush	Phase I
2017	Low Sagebrush	Phase I
2022	Low Sagebrush	Phase I

Site Notes

Nearby mahogany and pinyon stands provide good cover and springs in the bottom of the basin (about 1/4 mile away) provide a perennial water source. The site crosses two different ecological sites, Mountain Loam (Mountain Big Sagebrush) R047XA430UT and Mountain Shallow Loam (Low Sagebrush) R047XA442UT. For summary purposes the site is being considered as Mountain Loam (Mountain Big Sagebrush).

Soils**Table 19A-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.4	61.3	22.1	16.6	3.2	10.1	176.0	0.7	07/16/1997

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Low sagebrush (*Artemisia arbuscula*) has dominated this site since the study was initiated in 1989. Mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) is also present toward the bottom of the transect, but is less abundant and provides less cover. Singleleaf pinyon (*Pinus monophylla*) has been observed on site since 1989, placing it in Phase I of woodland succession (Photos, Table 19A-08.4, Table 19A-08.12, Table 19A-08.13, Table 19A-08.14). The understory of this study site is diverse and quite abundant (Table 19A-08.7). Perennial grasses, mainly Idaho fescue (*Festuca idahoensis*), provided a majority of the herbaceous cover in each sample year; perennial forbs are also abundant. The introduced annual grass species cheatgrass (*Bromus tectorum*) was sampled for the first time in 2017, but has since remained low in cover (Table 19A-08.10, Table 19A-08.11).

Trend Summary Tables**Table 19A-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	14.5	0.3	1.7	-	-	-
2017	18.7	1.1	2.2	19.5	1.5	2.8
2022	12.1	1.4	1.9	15.4	1.9	2.7

Table 19A-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	365	137	310	-	14.4	0.6	9.3
2017	12	363	205	290	0.2	21.0	4.1	11.2
2022	26	351	149	264	0.6	15.6	2.0	6.0

Table 19A-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.0	0.1	28.9	38.9	1.9	42.1
2017	8.9	0.1	38.2	34.0	1.6	52.2
2022	13.3	0.1	25.3	43.5	1.8	36.9

Table 19A-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1997	4	13	-
2017	3	2	6
2022	2	22	9
Days Use Per Acre (ha)			
1997	-	-	-
2017	13.1 (32.3)	22.1 (54.6)	-
2022	30.5 (75.3)	40.9 (101.0)	-

Table 19A-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1997	17	-	-	2	-	241	-	-	87	120	65
2017	1	1	12	4	16	292	13	5	22	183	25
2022	2	5	26	-	2	185	-	-	137	196	71
year	Average Cover (%)										
1997	0.3	-	-	0.0	-	9.5	-	-	1.4	2.5	0.7
2017	0.0	0.0	0.2	0.0	0.5	15.7	0.2	0.1	0.3	3.4	0.8
2022	0.1	0.2	0.6	-	0.0	6.1	-	-	3.7	3.6	1.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia californica ^a (Sierra tansymustard)	Erigeron jonesii (Jones' fleabane)	Hackelia patens (spotted stickseed)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)
year	Nested Frequency																
1997	-	17	137	8	11	-	20	113	8	-	71	67	-	45	17	-	8
2017	3	2	125	6	9	4	24	200	24	2	90	18	-	26	3	5	-
2022	7	1	119	6	-	5	14	121	5	1	77	15	0	3	7	17	-
year	Average Cover (%)																
1997	-	0.0	1.7	0.1	0.0	-	0.1	0.3	0.0	-	0.9	0.4	-	0.3	0.1	-	0.1
2017	0.0	0.0	1.4	0.1	0.1	0.0	0.3	3.2	0.3	0.0	1.4	1.4	-	0.3	0.1	0.0	-
2022	0.0	0.0	1.7	0.0	-	0.0	0.1	0.6	0.0	0.0	0.5	0.7	0.0	0.0	0.0	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency															
Lomatium (desertparsley)	2	108	-	34	63	-	6	100	-	14	-	-	17	1	4	23
Lupinus arbustus ssp. calcaratus (longspur lupine)	6	62	19	19	12	6	1	63	-	1	-	40	29	32	3	26
Mertensia (bluebells)	3	36	-	2	29	-	10	101	0	-	25	-	29	57	0	8
Microsteris gracilis ^a (slender phlox)	Average Cover (%)															
Penstemon humilis (low beardtongue)	0.0	4.2	-	0.2	0.8	-	0.0	0.3	-	0.0	-	-	0.1	0.0	0.0	0.2
Petroradia pumila (rock goldenrod)	0.0	4.3	0.1	0.1	0.2	0.1	0.0	0.3	-	0.0	-	0.2	0.2	0.5	0.0	0.7
Phlox hoodii (spiny phlox)	0.0	1.5	-	0.0	0.4	-	0.1	0.7	0.0	-	0.2	-	0.1	1.2	0.0	0.0
Phlox longifolia (longleaf phlox)	Nested Frequency															
Platanthera sparsiflora (sparse-flowered bog orchid)	1997	2017	2022													
Polygonum douglasii ^a (Douglas' knotweed)	2	6	3													
Potentilla concinna (elegant cinquefoil)	2	6	3													
Potentilla diversifolia (varleaf cinquefoil)	2	6	3													
Sedum lanceolatum (spearleaf stonecrop)	2	6	3													
Senecio integerrimus ^a (lambstongue ragwort)	2	6	3													
Symphotrichum ascendens (western aster)	2	6	3													
Taraxacum officinale (common dandelion)	2	6	3													

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Artemisia arbuscula ^p (little sagebrush)	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	11.4	5.5	0.9	1.5	0.5	2.8	1.2
Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	9.4	3.9	-	1.9	0.5	2.7	1.6
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Quadrat Cover (%)						
Eriogonum microthecum ^p (slender buckwheat)	1997	2017	2022				
Pinus monophylla ^t (singleleaf pinyon)	7.6	6.3	0.0	0.3	0.5	1.7	0.1
Symphoricarpos oreophilus ^p (mountain snowberry)	11.6	5.1	0.0	1.1	0.6	2.2	1.4
	6.6	3.8	-	1.4	0.7	1.9	1.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia arbuscula^p -- (little sagebrush)									
1997	6460	140	12	68	20	25	3	6	20/46
2017	7960	120	5	89	7	23	0	4	19/44
2022	5860	-	3	70	27	20	20	56	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2360	320	12	81	7	30	0	4	59/84
2017	1980	-	5	84	11	4	0	7	46/65
2022	1460	-	8	62	30	37	0	30	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1997	-	20	0	0	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	139/169
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	340	-	0	100	0	0	0	0	37/48
2017	520	-	4	96	0	0	0	0	34/51
2022	640	-	0	91	9	13	13	34	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
1997	480	20	17	83	0	0	0	0	17/24
2017	540	-	0	100	0	0	0	0	26/37
2022	600	-	3	97	0	0	0	7	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	20	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	18/17
2022	-	-	-	-	-	-	-	-	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
1997	20	20	0	100	0	0	0	0	- / -
2017	100	-	80	20	0	0	0	20	- / -
2022	100	20	80	20	0	0	0	20	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	60	-	0	100	0	0	0	0	67/172
2017	120	-	33	67	0	0	0	0	67/108
2022	400	-	60	40	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

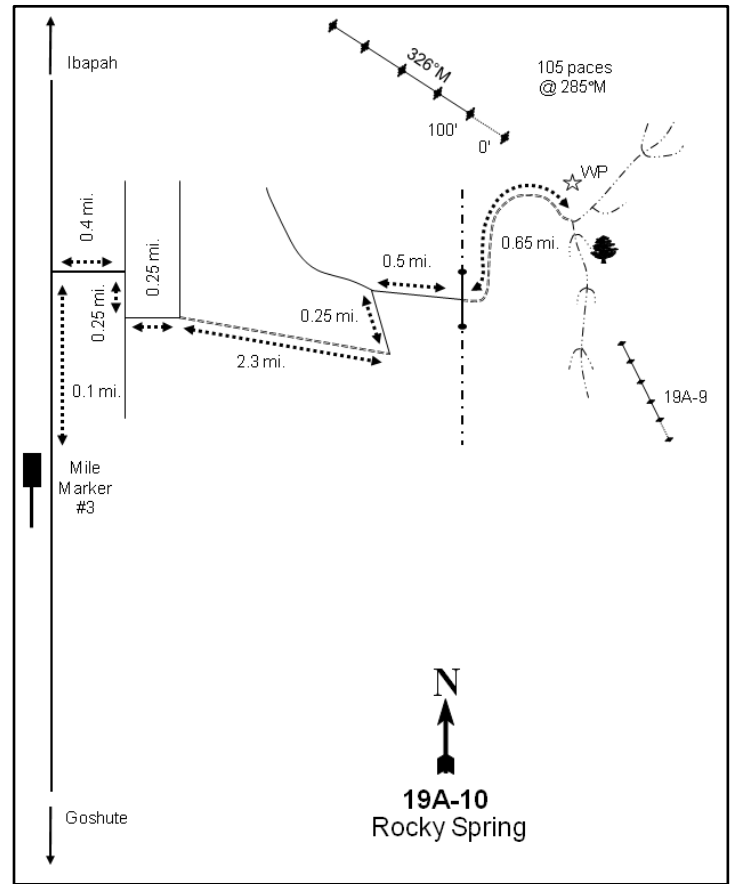
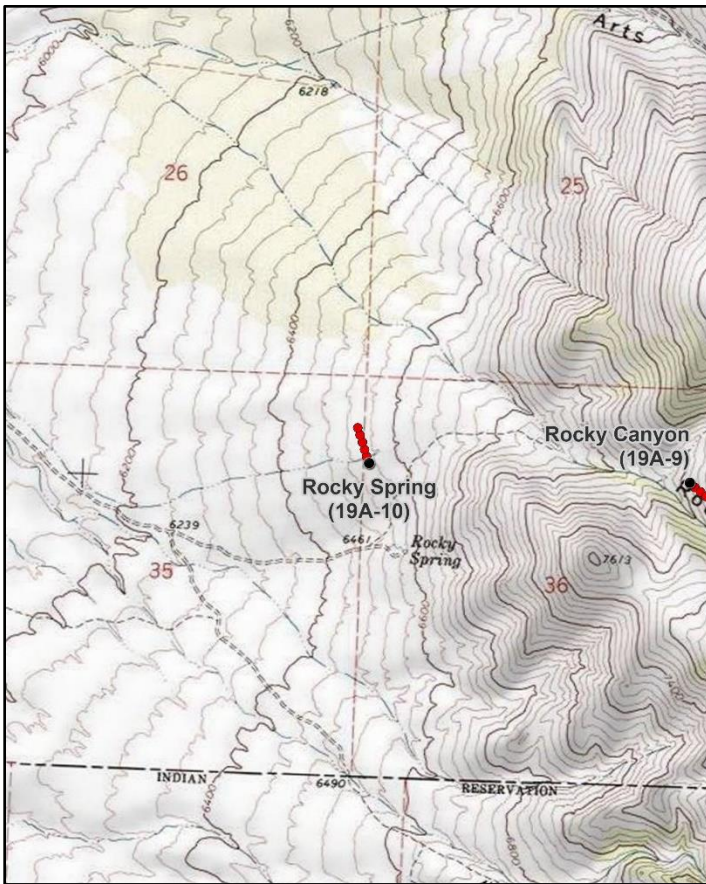
Table 19A-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	15	-	63	25	13	-	8.3
2022	17	11	56	11	22	-	8.4

Table 19A-08.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	18.1	10.9	5.9	28.8	0.0	10.0	0.0	73.8	Good
2017	24.3	12.2	3.1	30.0	-0.2	10.0	0.0	79.5	Good
2022	18.9	7.8	5.0	30.0	-0.4	10.0	0.0	71.2	Fair-Good

ROCKY SPRING - STUDY NO. 19A-10



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute SW; Township 10S, Range 19W, Section 36
NAD 83 UTM ZONE 12, 248241 East 4422725 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

111
326° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt 3: 1ft

Directions to Site

From the main road between Ibapah and Goshute, turn east onto a road that is 0.1 miles north of mile marker 3. Drive for 0.4 miles to an intersection. Turn right and proceed for 0.25 miles to another intersection. Turn left and continue for 2.3 miles on a 4WD road that is faint in places to another intersection. Turn right and drive 0.25 miles to another intersection. Turn right again and go 0.5 miles to a gate. Drive through the gate and follow the road to the left for 0.65 miles to the witness post on the left (north) side of the road. The 0-foot stake is 105 paces away from the witness post at 285 degrees magnetic and is marked with browse tag #111.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	IBAPAH
Elevation	6,550ft (1,996m)
Aspect	Southwest
Slope	11%
Sample Dates	07/17/2002, 07/11/2007, 07/18/2012, 06/26/2017, 06/28/2022

Wildlife Habitat and Vegetation History**Table 19A-10.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long
Pronghorn	crucial	year-long
Rocky Mountain Bighorn	substantial	year-long

Table 19A-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Annual Grass	Phase I

Site Notes

This study lies on an alluvial fan at the mouth of Rocky Canyon. A deer carcass was found on the site in 2012, and chukars were heard on the hillside to the east of the study in the same year. In 2017, it was noted that there may have been horses in the area.

Soils**Table 19A-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	45.3	36.7	18.0	4.6	20.4	233.6	0.8	07/17/2002

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Although a number of preferred browse species are present on this site, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the browse component since study establishment in 2002 (Table 19A-10.12, Table 19A-10.13). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have been observed each sample year, and the site has been considered to be within Phase I of woodland succession throughout the duration of the study (Photos, Table 19A-10.4, Table 19A-10.14). Annual and perennial grasses and forbs were present in similar amounts between 2012 and 2022 (Table 19A-10.7). The introduced annual grass species cheatgrass (*Bromus tectorum*) exhibited a significant increase in 2012, and annual grasses have been a co-dominant site component with sagebrush since that same year (Table 19A-10.10, Table 19A-10.11).

Trend Summary Tables

Table 19A-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	20.2	0.7	-	19.8	0.3	0.5
2007	16.3	0.2	0.0	20.4	0.2	0.9
2012	16.9	0.4	0.6	19.5	0.1	0.9
2017	13.6	0.8	1.1	19.2	0.4	1.2
2022	13.6	0.4	2.4	16.9	-	3.0

Table 19A-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	250	230	-	117	5.0	6.4	-	4.6
2007	181	277	1	121	3.8	10.1	0.0	5.8
2012	314	208	3	121	29.1	8.1	0.0	3.1
2017	408	184	16	108	27.9	6.3	0.2	5.2
2022	434	246	36	86	25.7	7.9	1.4	3.6

Table 19A-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	10.9	0.3	51.7	2.9	16.2	34.3
2007	17.8	0.0	35.3	4.0	21.6	33.7
2012	5.4	0.2	37.1	6.1	15.9	54.7
2017	8.8	0.7	39.8	3.7	20.5	50.5
2022	8.5	0.3	37.7	6.6	25.0	49.2

Table 19A-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Horse	Rabbit
	Quadrat Frequency					
2002	2	15	26	-	-	6
2007	-	13	19	-	-	26
2012	2	2	3	1	-	3
2017	2	-	2	-	-	1
2022	5	6	1	-	-	1
Year	Days Use Per Acre (ha)					
2002	3.6 (9.0)	67.0 (165.5)	33.5 (82.8)	-	-	-
2007	2.2 (5.4)	58.3 (144.0)	34.9 (86.1)	-	-	-
2012	6.5 (16.1)	4.7 (11.6)	4.0 (9.9)	-	-	-
2017	17.4 (43.0)	5.3 (13.2)	8.1 (19.9)	-	0.6 (1.4)	-
2022	0.7 (1.8)	12.1 (29.8)	8.1 (19.9)	-	-	-

Table 19A-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency								
2002	250	1	-	-	28	-	162	83	3
2007	173	19	-	8	26	26	173	90	20
2012	314	3	2	-	16	21	147	59	10
2017	407	30	3	18	17	-	112	56	10
2022	434	18	1	41	8	-	176	58	1
year	Average Cover (%)								
2002	5.0	0.1	-	-	0.3	-	2.8	3.1	0.0
2007	3.8	0.4	-	0.2	0.6	1.0	4.0	3.9	0.0
2012	29.1	0.0	0.0	-	0.2	0.2	5.5	2.2	0.0
2017	27.9	0.6	0.1	0.7	0.2	-	2.1	2.6	0.0
2022	25.7	0.2	0.0	1.1	0.1	-	4.4	2.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Asclepias asperula (spider milkweed)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Eriogonum brevicale (shortstem buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lupinus argenteus (silvery lupine)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency																
2002	-	-	8	-	18	-	3	-	-	59	-	-	20	-	21	-	-
2007	2	-	4	-	15	1	2	-	1	68	5	-	13	-	20	-	3
2012	2	-	10	-	38	-	-	-	3	53	4	-	19	-	13	-	5
2017	8	3	6	-	24	-	4	5	7	39	0	-	11	2	17	4	3
2022	12	-	0	1	24	-	1	30	-	21	5	1	12	2	14	3	3
year	Average Cover (%)																
2002	-	-	0.2	-	0.3	-	0.0	-	-	2.9	-	-	0.7	-	0.5	-	-
2007	0.0	-	0.1	-	0.3	0.0	0.0	-	0.0	3.9	0.1	-	0.7	-	0.5	-	0.1
2012	0.0	-	0.1	-	0.8	-	-	-	0.0	1.7	0.0	-	0.2	-	0.1	-	0.1
2017	0.2	0.0	0.2	-	0.5	-	0.0	0.0	0.0	3.3	0.0	-	0.6	0.0	0.4	0.1	0.0
2022	0.1	-	0.0	0.0	0.6	-	0.0	1.4	-	0.9	0.2	0.0	0.6	0.0	0.9	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)										
	year	Line Intercept Cover (%)									
Artemisia nova ^p (black sagebrush)	2002	1	18.6	-	0.3	-	-	-	0.5	-	0.2
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2007	0.1	18.8	0.8	0.2	-	0	-	0.9	-	0.7
Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	2012	-	18.2	-	0.1	-	-	-	0.9	-	1.3
Gutierrezia sarothrae (broom snakeweed)	2017	-	17.8	-	0.4	0.2	-	-	1	-	1.4
Juniperus osteosperma ⁱ (Utah juniper)	2022	-	15.8	-	-	0.3	-	0	2.7	0.2	0.9
Opuntia polyacantha (plains pricklypear)	year	Quadrat Cover (%)									
Pediocactus simpsonii (mountain ball cactus)	2002	0.0	20.1	-	0.5	-	0.1	0.1	0.0	-	0.1
Pinus monophylla ⁱ (singleleaf pinyon)	2007	0.1	15.8	0.0	0.1	-	0.1	0.0	0.0	-	0.5
Purshia tridentata ^p (antelope bitterbrush)	2012	-	16.6	-	0.2	-	0.2	0.0	0.6	-	0.3
Rosa woodsii ^p (Woods' rose)	2017	-	12.8	-	0.5	0.4	0.3	0.0	0.7	-	0.8
	2022	-	12.7	-	0.2	0.1	0.2	0.0	2.2	0.0	0.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2002	120	-	0	83	17	0	0	0	- / -
2007	80	-	0	100	0	0	0	0	22/39
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2002	2840	20	2	56	42	18	3	20	56/96
2007	2220	1300	13	51	36	33	3	28	59/113
2012	2880	80	10	63	27	26	22	39	53/101
2017	2820	-	4	73	23	23	8	18	52/85
2022	2640	-	8	65	27	5	2	32	- / -
Atriplex confertifolia^p -- (shadscale saltbush)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	25/36
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	395/390
2017	-	-	-	-	-	-	-	-	206/235
2022	20	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2002	20	-	0	100	0	100	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	21/49
2012	-	-	-	-	-	-	-	-	26/48
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	44/44
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2002	640	-	0	88	13	16	0	6	19/28
2007	200	-	0	100	0	0	0	0	17/22
2012	140	-	0	100	0	0	0	0	15/23
2017	300	-	0	100	0	0	0	0	16/23
2022	360	20	28	72	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2002	20	-	100	0	0	0	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	40	-	50	50	0	0	0	0	- / -
2022	40	-	50	50	0	0	0	0	- / -
Krascheninnikovia lanata^p -- (winterfat)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	10/59
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Linanthus pungens -- (granite prickly phlox)									
2002	120	-	0	100	0	0	0	0	17/27
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	10/36
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
2002	260	-	15	85	0	0	0	0	11/23
2007	220	-	9	91	0	18	0	18	11/29
2012	160	-	0	100	0	0	0	13	10/19
2017	100	-	0	100	0	0	0	20	10/21
2022	140	-	0	100	0	0	0	14	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2002	40	-	0	100	0	0	0	0	6/11
2007	100	-	0	100	0	0	0	0	5/15
2012	20	-	100	0	0	0	0	0	6/9
2017	20	-	0	100	0	0	0	0	- / -
2022	80	-	25	75	0	0	0	0	- / -

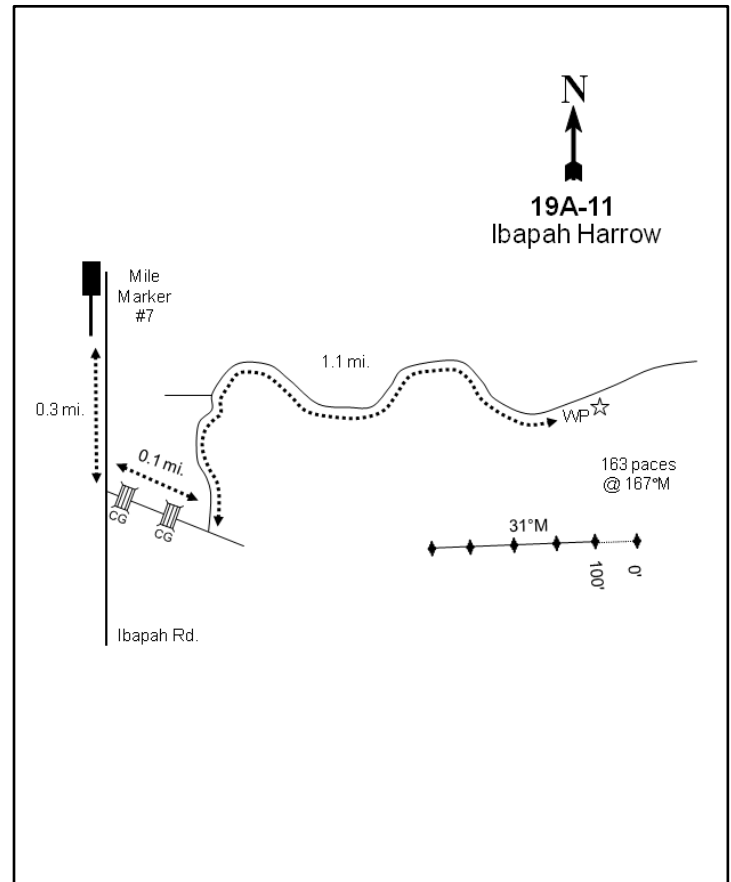
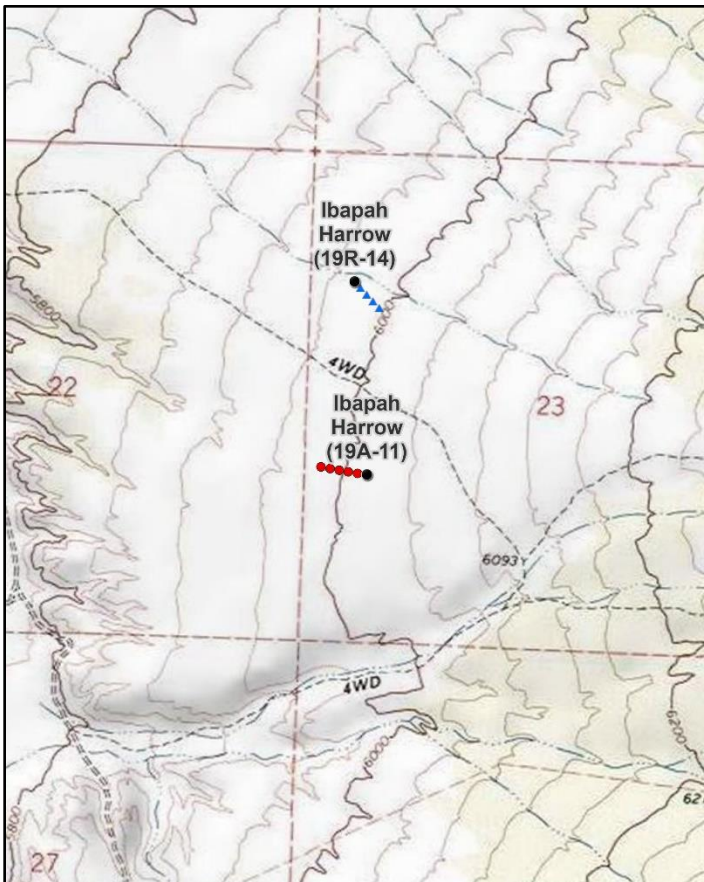
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pinus monophylla^t -- (singleleaf pinyon)									
2002	60	-	100	0	0	0	0	0	- / -
2007	40	-	50	50	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	40	-	0	100	0	0	0	0	- / -
2022	60	-	0	100	0	0	0	0	- / -
Rosa woodsii^p -- (Woods' rose)									
2002	640	-	0	100	0	0	0	0	26/30
2007	360	-	11	83	6	0	0	0	31/44
2012	560	-	86	14	0	0	0	0	51/41
2017	1780	-	0	100	0	0	0	0	25/22
2022	2740	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	24	-	-	-	-	-	5.8
2007	20	18	36	27	9	9	15.3
2012	20	17	25	33	8	17	10.6
2017	22	8	17	50	8	17	14.4
2022	27	13	7	40	27	13	17.1
Pinus monophylla (singleleaf pinyon)							
2002	41	-	-	-	-	-	5.6
2007	24	9	45	36	-	9	8.1
2012	26	-	31	38	15	15	8.8
2017	38	9	45	18	18	9	10.2
2022	35	-	31	15	23	31	13.5

IBAPAH HARROW - STUDY NO. 19A-11

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute NW; Township 10S, Range 19W, Section 23
NAD 83 UTM ZONE 12, 246912 East 4425299 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
269° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Rebar

Directions to Site

From Ibabah, proceed south just past mile marker 6; turn right onto a road 0.3 miles south of mile marker 7. Drive east for 1.3 miles, crossing two cattle guards along the way. Turn left and continue for 0.1 miles. Turn right and proceed for 1.1 miles to the witness post on the right (south) side of the road. From the witness post, walk approximately 163 paces at 167 degrees magnetic to the 0-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	IBAPAH
Elevation	6,020ft (1,835m)
Aspect	West
Slope	4%
Sample Dates	07/10/2007, 07/17/2012, 06/26/2017, 06/27/2022

Table 19A-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Ibapah Sagebrush Improvement - Year 2	1104	October 2008-April 2009	1540
Harrow - Two-Way Dixie	Ibapah Sagebrush Improvement - Year 1	730	October-November 2007	166
Seeding - Broadcast Before	Ibapah Sagebrush Improvement - Year 1	730	October-November 2007	166

Table 19A-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Ibapah Harrow			Broadcast	Oct 2007	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.98
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.00	0.84
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.70	0.64
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.25	0.23
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.94
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.81
G	Poa secunda	Sandberg Bluegrass	Mountain Home ID	0.50	0.46
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.83
G	Thinopyrum intermedium	Pubescent Wheatgrass		1.00	0.88
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Linum perenne	Blue Flax	Appar	1.00	0.92
F	Medicago sativa	Alfalfa	Ladak	1.00	0.92
F	Medicago sativa	Alfalfa	Spredor 4	1.00	0.96
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.84
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.87

Wildlife Habitat and Vegetation History**Table 19A-11.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	crucial	year-long	
Rocky Mountain Bighorn	substantial	year-long	

Table 19A-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Wyoming Big Sagebrush	Phase I
2012	Wyoming Big Sagebrush/Perennial-Annual Grass	No Encroachment
2017	Wyoming Big Sagebrush/Perennial-Annual Grass	No Encroachment
2022	Wyoming Big Sagebrush/Perennial Grass	No Encroachment

Site Notes

A herd of elk was seen and an elk carcass found on site in 2012.

Soils**Table 19A-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.5	27.4	46.0	26.6	1.5	9.2	249.6	0.5	07/10/2007

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been the dominant browse species on this site throughout the duration of the study. Cover of sagebrush had decreased as of the first post-treatment sampling, but it exhibited an increase between 2012 and 2022 (Table 19A-11.1, Table 19A-11.12, Table 19A-11.13). Although not represented by the data, site photos reveal that Utah juniper (*Juniperus osteosperma*) trees were present in 2007, but had been removed by 2012; the study site is not currently being encroached by trees (Photos, Table 19A-11.4). The herbaceous understory was not particularly abundant prior to treatment (Table 19A-11.7). However, perennial grasses -- namely the introduced species crested wheatgrass (*Agropyron cristatum*) and the native species Sandberg bluegrass (*Poa secunda*) -- and the introduced annual grass cheatgrass (*Bromus tectorum*) increased and have been co-dominant site components between 2012 and 2022. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2017 (Table 19A-11.10). Forbs have remained rare (Table 19A-11.11). This study site is expected to remain in a similar state in future years, although sagebrush cover may continue to increase.

Trend Summary Tables**Table 19A-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2007	19.8	2.0	-	22.9	2.2	-
2012	5.8	0.5	-	4.8	0.5	-
2017	6.9	0.6	-	7.0	0.5	-
2022	8.9	0.4	-	7.8	1.0	-

Table 19A-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2007	267	308	28	79	1.3	7.4	0.1	0.6
2012	357	289	-	85	20.0	14.5	-	0.7
2017	338	318	319	72	16.3	22.1	3.7	1.1
2022	289	348	418	66	4.7	19.8	9.8	0.4

Table 19A-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	40.1	6.7	25.8	2.5	0.9	32.0
2012	28.6	0.2	46.3	0.8	0.3	43.7
2017	36.2	1.5	44.6	1.6	1.0	48.5
2022	41.5	0.6	29.7	6.0	1.7	37.0

Table 19A-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2007	-	4	5	-	18
2012	-	1	6	-	1
2017	-	2	6	1	4
2022	12	11	-	-	4
Year	Days Use Per Acre (ha)				
2007	-	0.7 (1.7)	16.1 (39.7)	-	-
2012	0.7 (1.8)	4.7 (11.6)	4.0 (9.9)	43.6 (107.6)*	-
2017	5.8 (14.3)	-	14.1 (34.8)	17.4 (43.0)*	-
2022	3.6 (9.0)	2.0 (5.0)	-	-	-

*Pellets per acre (ha)

Table 19A-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
2007	3	8	267	-	-	5	303	-	5	-
2012	15	152	357	1	-	3	226	-	6	2
2017	2	181	338	2	16	7	244	0	30	6
2022	1	132	289	1	6	7	319	18	27	1
year	Average Cover (%)									
2007	0.0	0.4	1.3	-	-	0.0	6.9	-	0.0	-
2012	1.1	6.7	20.0	0.0	-	0.0	6.3	-	0.4	0.0
2017	0.1	12.5	16.3	0.0	0.5	0.1	6.7	0.0	2.1	0.0
2022	0.0	5.1	4.7	0.0	0.4	0.3	12.1	0.4	1.4	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcross)	Astragalus beckwithii (Beckwith's milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Castilleja flava (yellow Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron pumilus (shaggy fleabane)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Medicago sativa ⁱ (alfalfa)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Tragopogon dubius ^{ai} (yellow safsify)
year	Nested Frequency																
2007	3	-	4	-	16	1	27	-	2	6	-	-	-	21	34	-	1
2012	-	-	-	-	2	-	-	3	-	4	-	10	7	12	51	3	-
2017	1	10	6	5	14	2	319	-	-	0	1	-	8	15	28	-	-
2022	-	-	-	-	16	2	418	5	-	1	-	-	-	15	30	-	-
year	Average Cover (%)																
2007	0.0	-	0.0	-	0.2	0.0	0.1	-	0.0	0.1	-	-	-	0.2	0.1	-	0.0
2012	-	-	-	-	0.0	-	-	0.0	-	0.2	-	0.1	0.0	0.2	0.2	0.0	-
2017	0.0	0.5	0.0	0.0	0.1	0.1	3.7	-	-	0.0	0.0	-	0.1	0.2	0.1	-	-
2022	-	-	-	-	0.1	0.0	9.8	0.0	-	0.0	-	-	-	0.1	0.2	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	
Zigadenus paniculatus (foothill deathcamas)	
year	Nested Frequency
2007	1
2012	-
2017	0
2022	0
year	Average Cover (%)
2007	0.0
2012	-
2017	0.0
2022	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
2007	22.9	2.2	-
2012	4.8	0.5	-
2017	7	0.5	-
2022	7.8	1	-
year	Quadrat Cover (%)		
2007	19.8	1.9	0.0
2012	5.8	0.4	0.1
2017	6.9	0.6	0.0
2022	8.9	0.4	-

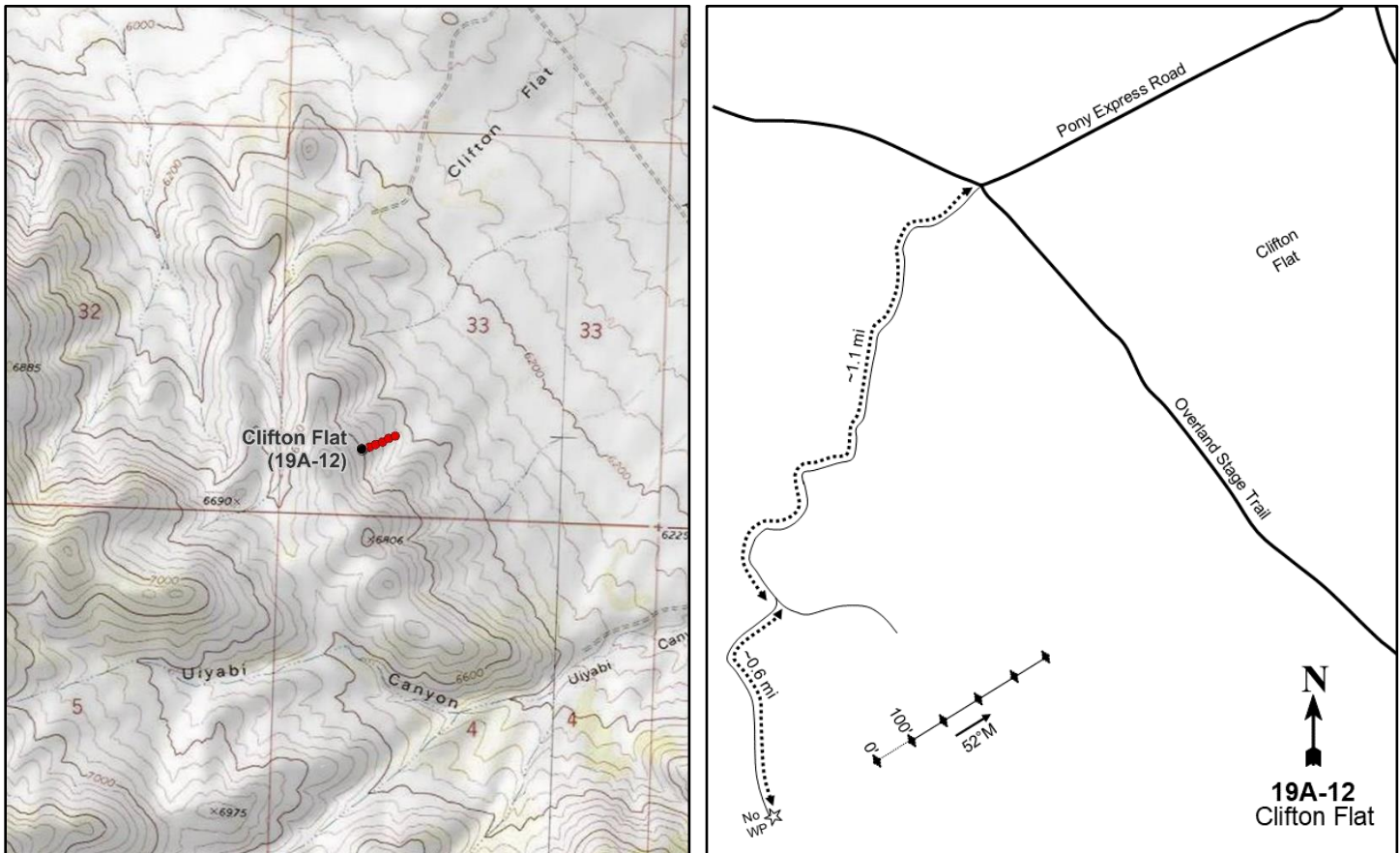
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2007	6220	380	4	41	55	36	0	28	49/78
2012	4040	100	29	64	7	7	3	6	34/49
2017	3940	-	12	78	10	0	0	20	37/52
2022	3260	40	5	66	29	4	0	33	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2007	-	-	-	-	-	-	-	-	99/136
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2007	1160	-	2	53	45	2	0	19	27/42
2012	540	20	7	78	15	0	0	59	28/46
2017	960	-	0	85	15	0	0	23	27/44
2022	760	-	3	71	26	3	0	26	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2007	-	-	-	-	-	-	-	-	19/14
2012	-	-	-	-	-	-	-	-	21/31
2017	60	-	0	33	67	0	0	67	19/20

t - Tree Species; p - Preferred Browse; i - Introduced Species

CLIFTON FLAT - STUDY NO. 19A-12

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Ibapah NE; Township 8S, Range 18W, Section 33
NAD 83 UTM ZONE 12, 253967 East 4440909 North

Transect Information

Browse Tag # (0' Stake)	1772
Transect Bearing	52° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the Overland Stage Trail and Pony Express Road, turn southwest onto a two-track road. Travel for approximately 1.1 miles to a fork in the road and turn right. Travel for another 0.6 miles and gain the top of the ridge. Park just above the site and walk down to the 0-stake while using the GPS. The 0-stake is identified by the browse tag #1772.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	OCHRE
Elevation	6,600ft (2,012m)
Aspect	Northeast
Slope	27%
Sample Dates	06/28/2022

Table 19A-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Clifton Flat Sagebrush Habitat Enhancement (Proposed)	6047	2023	2300

Wildlife Habitat and Vegetation History**Table 19A-12.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter/spring
Pronghorn	crucial	year-long

Table 19A-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Black Sagebrush/Perennial Grass	Phase I

Site Notes

No Notes

Soils**Table 19A-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.6	34.5	40.2	25.3	3.3	8.7	143.0	0.5	06/29/2022

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R025XY318UT
States and Transitions	2022 - Utah Juniper Invasion/Non-native Weed State: Community Phase 3.1

As of the time of study establishment in 2022 this site is dominated by black sagebrush (*Artemisia nova*) with Nevada jointfir (*Ephedra nevadensis*) scattered throughout the community (Table 19A-12.12, Table 19A-12.13). Young Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) are also found throughout the site to the extent that the community is considered to be in Phase I of woodland succession (Table 19A-12.4, Table 19A-12.14). The native perennial grasses bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) dominate the herbaceous understory. While forbs are diverse, they are rare and provide little cover in the community. The invasive annual grass species cheatgrass (*Bromus tectorum*) is present with low abundance and cover (Table 19A-12.7, Table 19A-12.10, Table 19A-12.11). To avoid increases in cheatgrass and further invasion, disturbance practices should be low in impact (USDA-ARS Jornada Experimental Range, 2022).

Trend Summary Tables**Table 19A-12.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	8.6	-	1.8	9.9	-	0.7

Table 19A-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	30	365	76	133	0.1	20.8	0.4	2.0

Table 19A-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	19.8	0.4	26.9	32.5	18.2	29.5

Table 19A-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2022	19	36	1
Year	Days Use Per Acre (ha)		
2022	38.9 (96.0)	32.2 (79.5)	-

Table 19A-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
2022	30	1	1	339	165
year	Average Cover (%)				
2022	0.1	0.0	0.0	11.0	9.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Astragalus beckwithii (Beckwith's milkvetch)	20	11	3	11	19	1	3	11	19	1	12	30	54	4	59	27	3	
Astragalus calycosus (Torrey's milkvetch)	Average Cover (%)																	
Balsamorhiza hookeri (Hooker's balsamroot)	0.1	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.3	0.0	0.8	0.4	0.0	
Castilleja angustifolia (northwestern Indian paintbrush)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Crepis acuminata (tapertip hawkbeard)																		
Cryptantha (cryptantha)																		
Descurainia pinnata ^a (western tansymustard)																		
Erigeron argentatus (silver fleabane)																		
Erigeron pumilus (shaggy fleabane)																		
Eriogonum umbellatum (sulphur-flower buckwheat)																		
Gilia inconspicua ^a (shy gilia)																		
Machaeranthera canescens (hoary tansyaster)																		
Phlox hoodii (spiny phlox)																		
Phlox longifolia (longleaf phlox)																		
Senecio integerrimus ^a (lambstongue ragwort)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
Artemisia nova ^p (black sagebrush)	9.7	0.2	0.5	0.2
Ephedra nevadensis ^p (Nevada jointfir)				
Juniperus osteosperma ⁱ (Utah juniper)				
Pinus monophylla ⁱ (singleleaf pinyon)				
SHRUB SPECIES	Quadrat Cover (%)			
Artemisia nova ^p (black sagebrush)	8.4	0.2	1.5	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2022	5840	-	8	20	72	49	38	75	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2022	60	-	33	33	33	0	0	33	- / -
Ephedra nevadensis^p -- (Nevada jointfir)									
2022	220	-	36	27	36	0	0	46	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2022	80	-	75	25	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2022	20	-	0	100	0	0	0	0	- / -
Pinus monophyllaⁱ -- (singleleaf pinyon)									
2022	160	20	100	0	0	13	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

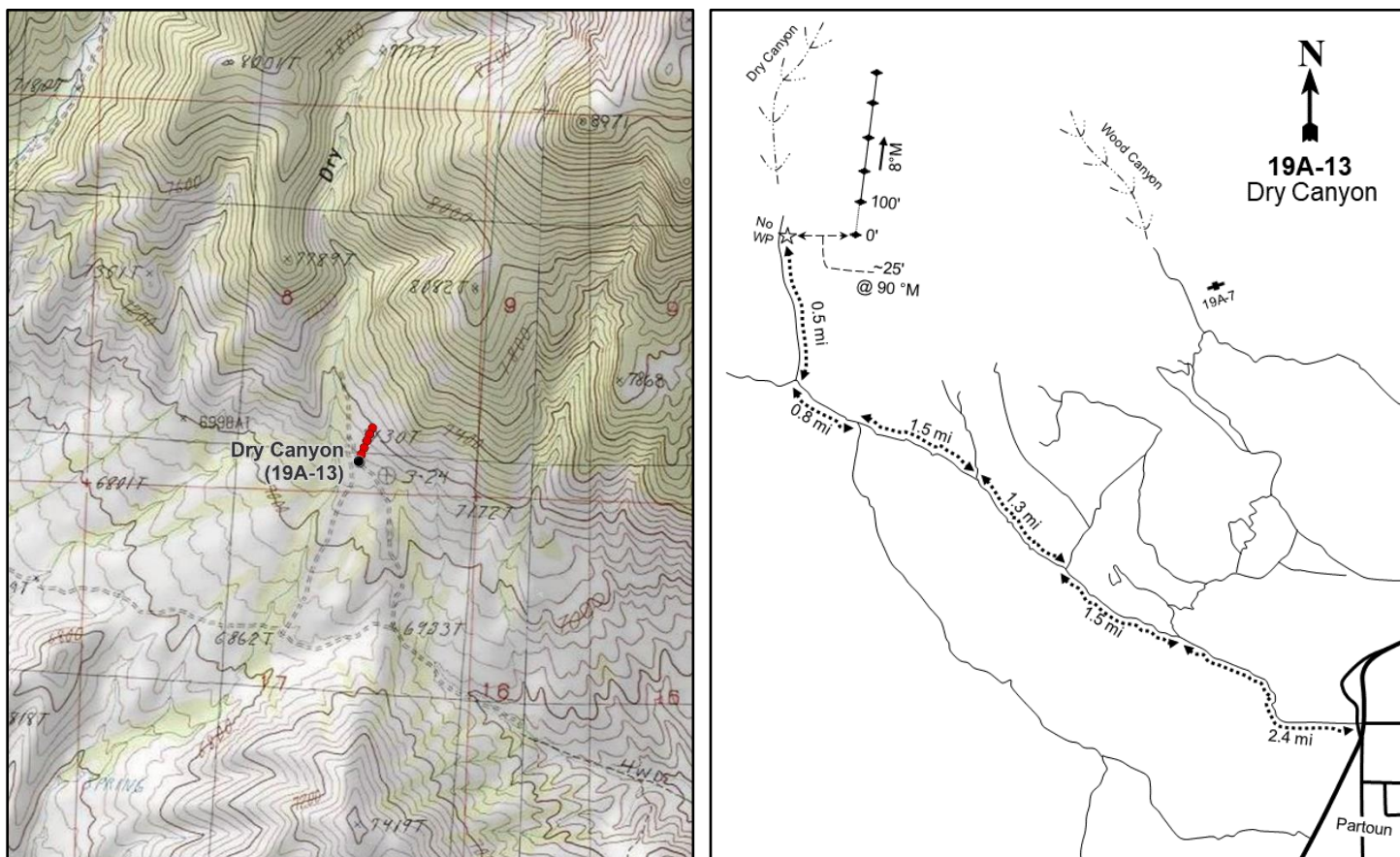
Table 19A-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2022	34	-	31	56	13	-	8.9
Pinus monophylla (singleleaf pinyon)							
2022	129	42	53	5	-	-	2.6

Table 19A-12.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	12.4	-6.5	4.4	30.0	-0.1	4.0	0.0	44.3	Poor

DRY CANYON - STUDY NO. 19A-13



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Skinner Canyon NE; Township 13S, Range 19W, Section 08
NAD 83 UTM ZONE 12, 241973 East 4398216 North

Transect Information

Browse Tag # (0' Stake)	68
Transect Bearing	8° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of School Road and Snake Valley Road, turn west and travel for 2.4 miles to an intersection. Continue straight for another 1.5 miles to another road on the right. Go straight and drive for 3.5 miles until the saddle is gained. Turn right (north) and drive 0.5 miles and find a good parking spot. Use the GPS to locate the 0-foot stake, which can be identified by browse tag #68.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PARTOUN
Elevation	7,100ft (2,164m)
Aspect	South
Slope	10%
Sample Dates	07/27/2022

Wildlife Habitat and Vegetation History

Table 19A-13.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Pronghorn	crucial	year-long
Rocky Mountain Bighorn	RMBS	year-long

Table 19A-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Black Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 19A-13.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.9	63.7	24.7	11.6	2.2	10.8	336.0	0.5	07/27/2022

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R025XY318UT
States and Transitions	2022 - Utah Juniper Invasion/Non-native Weed State: Community Phase 3.1

As of the time of establishment in 2022 this site is dominated by black sagebrush (*Artemisia nova*) with Nevada jointfir (*Ephedra nevadensis*) scattered throughout the community (Table 19A-13.12, Table 19A-13.13). Young Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) are also found throughout the site to the extent that the community is considered to be in Phase I of woodland succession (Table 19A-13.4, Table 19A-13.14). The native perennial grass Sandberg bluegrass (*Poa secunda*) dominates the herbaceous understory. Forbs are rare and provide little cover in the community. The invasive annual grass species cheatgrass (*Bromus tectorum*) is present in low abundance and cover (Table 19A-13.7, Table 19A-13.10, Table 19A-13.11). To avoid increases in cheatgrass and further invasion, disturbance practices should be low in impact (USDA-ARS Jornada Experimental Range, 2022).

Trend Summary Tables

Table 19A-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	21.7	0.4	2.8	26.7	0.6	3.7

Table 19A-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	32	265	10	18	0.1	4.2	0.1	0.1

Table 19A-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	20.5	0.3	20.1	42.7	4.4	27.8

Table 19A-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2022	1	12	11	13
Year	Days Use Per Acre (ha)			
	2022	-	4.7 (11.6)	10.7 (26.5)

Table 19A-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency			
2022	1	32	21	262
year	Average Cover (%)			
2022	0.0	0.1	0.3	3.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency				
Astragalus lentiginosus (freckled milkvetch)	3	2	10	3	10
Castilleja angustifolia (northwestern Indian paintbrush)					
Erigeron pumilus (shaggy fleabane)					
Eriogonum ovalifolium (cushion buckwheat)					
Erodium cicutarium ^{ai} (redstem stork's bill)					
year	Average Cover (%)				
2022	0.0	0.0	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Artemisia nova ^p (black sagebrush)	26.5	0.2	0.6	-	0	-	3.7
Atriplex confertifolia ^p (shadscale saltbush)							
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Opuntia (pricklypear)							
Opuntia polyacantha (plains pricklypear)							
Pinus monophylla ^t (singleleaf pinyon)							
year	Quadrat Cover (%)						
2022	21.3	0.3	0.3	0.0	0.0	0.0	2.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^P -- (black sagebrush)									
2022	17260	-	5	39	56	10	12	83	- / -
Atriplex confertifolia^P -- (shadscale saltbush)									
2022	260	-	23	69	8	0	0	23	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2022	1180	-	10	34	56	0	0	76	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2022	100	-	20	80	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2022	20	-	0	100	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2022	20	-	0	100	0	0	0	0	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
2022	380	-	79	21	0	0	0	5	- / -
Tetradymia spinosa -- (shortspine horsebrush)									
2022	40	-	0	0	100	50	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

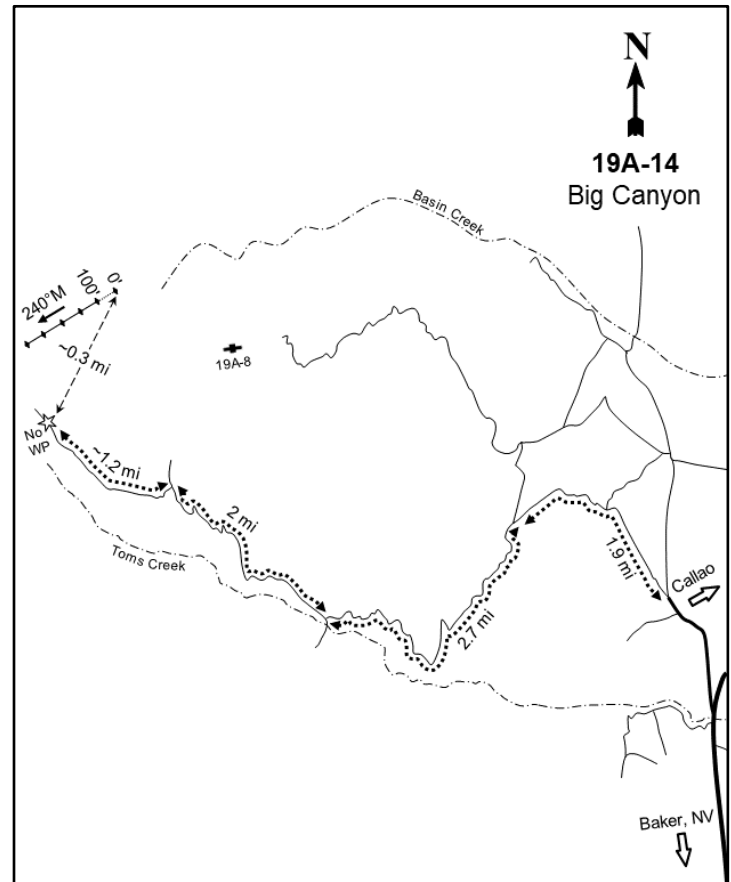
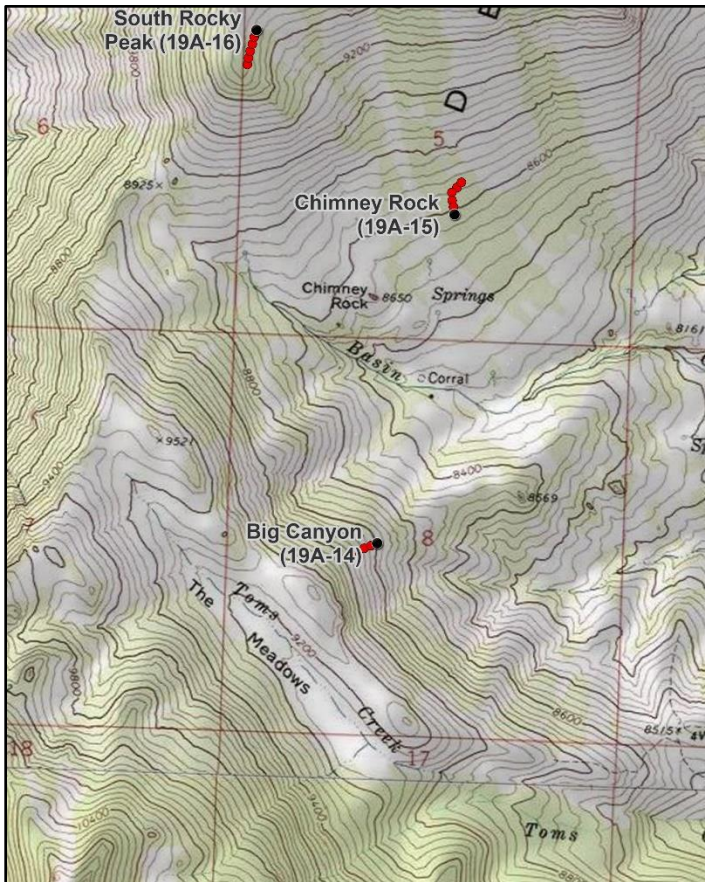
Table 19A-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2022	300	20	75	5	-	-	2.4

Table 01-02.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	30.0	-1.7	2.6	8.4	-0.1	0.2	0.0	39.3	Poor

BIG CANYON - STUDY NO. 19A-14

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute SE; Township 11S, Range 18W, Section 08
NAD 83 UTM ZONE 12, 252120 East 4418854 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
240° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From the Snake Valley Road and Weiss Highway junction, travel north and stay left on to Tom Creek Road. Drive up Tom Creek Road for 7.8 miles until it terminates at the top of the ridge. The site can be reached by walking down from the ridge and navigating to the 0-stake by GPS.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MOUNTAIN
Elevation	8,800ft (2,682m)
Aspect	Northeast
Slope	40%
Sample Dates	06/30/2022

Wildlife Habitat and Vegetation History**Table 19A-14.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer/fall
Rocky Mountain Elk	crucial	summer/fall

Table 19A-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Mountain Big Sagebrush/Perennial Forb-Grass	NA

Site Notes

No Notes

Soils**Table 19A-14.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.8	71.7	20.7	7.6	6.6	17.9	271.0	0.3	06/29/2022

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R025XY505UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of establishment in 2022 this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table 19A-14.12, Table 19A-14.13). Young subalpine fir (*Abies lasiocarpa*) were scattered throughout the site (Table 19A-14.14). The perennial grasses Idaho fescue (*Festuca idahoensis*), oniongrass (*Melica bulbosa*), and muttongrass (*Poa fendleriana*) dominated the herbaceous understory as a combined cohort. Forbs were diverse and provided ample cover in the community (Table 19A-14.7, Table 19A-14.10, Table 19A-14.11).

Trend Summary Tables

Table 19A-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	34.9	0.6	-	49.7	1.7	-

Table 19A-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	312	184	364	-	11.9	2.2	19.3

Table 19A-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	23.4	0.0	33.6	14.7	0.6	49.7

Table 19A-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
2022	11	2
Year	Days Use Per Acre (ha)	
2022	21.5 (53.0)	4.0 (9.9)

Table 19A-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus ciliatus (fringed brome)	Carex rossii (Ross' sedge)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2022	17	28	19	7	12	129	85	81	14	30	55
year	Average Cover (%)										
2022	0.2	0.4	0.1	0.1	0.1	4.2	3.0	2.1	0.0	0.3	1.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agastache urticifolia (nettleleaf giant hyssop)	9	41	221	4	9	4	54	7	1	112	24	22	26	2	37	5	11	
Agoseris glauca (pale agoseris)	Average Cover (%)																	
Allium acuminatum (tapertip onion)	0.6	0.5	2.7	0.1	0.5	0.0	2.6	0.0	0.0	0.9	0.1	0.2	1.6	0.1	0.5	0.1	0.1	
Arenaria fendleri (Fendler's sandwort)	Nested Frequency																	
Balsamorhiza sagittata (arrowleaf balsamroot)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Calochortus nuttallii (sego lily)	Average Cover (%)																	
Castilleja linarifolia (Wyoming Indian paintbrush)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Castilleja miniata (giant red Indian paintbrush)	Nested Frequency																	
Chenopodium atrovirens ^a (pinyon goosefoot)	3	10	39	2	13	80	23	72	3	71	10	39	2					
Collinsia parviflora ^a (maiden blue eyed Mary)	Average Cover (%)																	
Collomia linearis ^a (tiny trumpet)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Crepis acuminata (tapertip hawksbeard)	Nested Frequency																	
Delphinium ×occidentale (western larkspur)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Draba ^a (draba)	Average Cover (%)																	
Erigeron jonesii (Jones' fleabane)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Eriogonum jamesii (James' buckwheat)	Nested Frequency																	
Eriogonum umbellatum (sulphur-flower buckwheat)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																	
Hackelia patens (spotted stickseed)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Lomatium (desertparsley)	Average Cover (%)																	
Lupinus arbustus ssp. calcaratus (longspur lupine)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Lupinus argenteus (silvery lupine)	Nested Frequency																	
Mertensia oblongifolia (oblongleaf bluebells)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Microseris nutans (nodding microseris)	Average Cover (%)																	
Monardella glauca (pale monardella)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Penstemon watsonii (Watson's penstemon)	Nested Frequency																	
Phlox longifolia (longleaf phlox)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Polygonum douglasii ^a (Douglas' knotweed)	Average Cover (%)																	
Pseudostellaria jamesiana (tuber starwort)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Sedum lanceolatum (spearleaf stonecrop)	Nested Frequency																	
Senecio integerrimus ^a (lambstongue ragwort)	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		
Taraxacum officinale (common dandelion)	Average Cover (%)																	
Viola (violet)	0.4	0.1	4.1	0.2	1.5	0.0	0.1	0.2	0.9	0.1	2.4	0.0	1.1	0.1	0.2	0.0		
Zigadenus paniculatus (foohill deathcamas)	Nested Frequency																	
	30	14	86	10	39	2	2	13	80	23	72	3	71	10	39	2		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	31.2	-	1.4	0.8	0.3	2.9	14.8
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	22.7	0.1	0.3	0.3	0.1	0.9	11.0
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Quadrat Cover (%)						
Eriogonum microthecum ^p (slender buckwheat)	22.7	0.1	0.3	0.3	0.1	0.9	11.0
Mahonia repens (creeping barberry)	Line Intercept Cover (%)						
Prunus virginiana ^p (chokecherry)	31.2	-	1.4	0.8	0.3	2.9	14.8
Symphoricarpos oreophilus ^p (mountain snowberry)	22.7	0.1	0.3	0.3	0.1	0.9	11.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

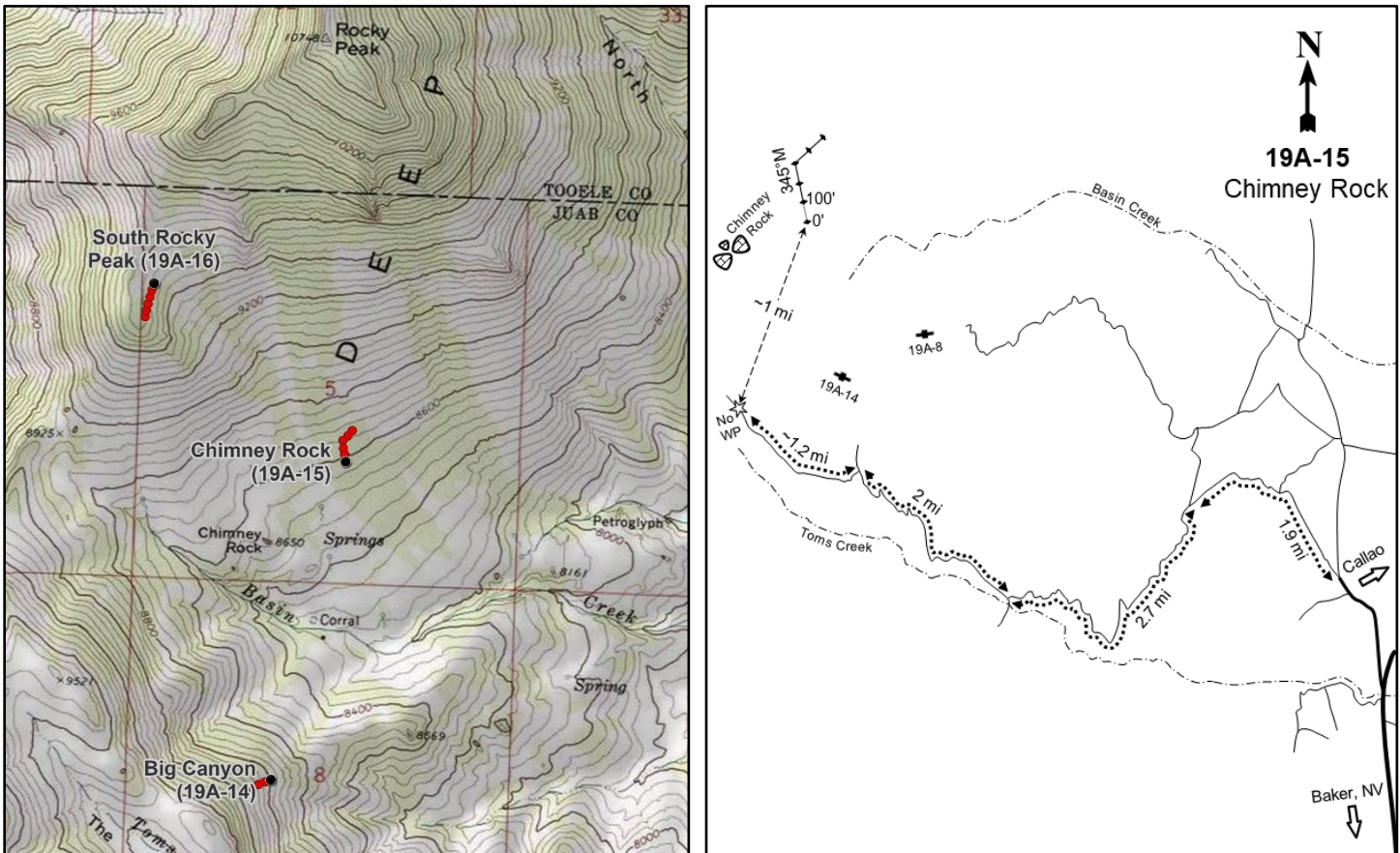
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2022	4080	540	7	78	14	7	11	17	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2022	220	-	9	91	0	0	0	0	- / -
Eriogonum microthecum ^p -- (slender buckwheat)									
2022	180	-	11	89	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2022	800	-	0	100	0	0	0	0	- / -
Prunus virginiana ^p -- (chokecherry)									
2022	1120	-	43	52	5	29	52	5	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2022	4940	20	11	88	1	25	30	1	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies lasiocarpa (subalpine fir)							
2022	3	-	50	-	-	50	8.0

CHIMNEY ROCK - STUDY No. 19A-15

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute SE; Township 11S, Range 18W, Section 05
NAD 83 UTM ZONE 12, 252432 East 4420186 North

Transect Information

Browse Tag # (0' Stake)

Not Available

Transect Bearing

345° magnetic (Lines 4-5: 40° magnetic)

Length

500ft

Belt Placement

Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)

Belt Marker Placement

Standard

Directions to Site

From the Snake Valley Road and Weiss Highway junction, travel north and stay left on to Tom Creek Road. Drive up Tom Creek Road for 7.8 miles until it terminates at the top of the ridge. The site can be reached by walking down from the ridge and navigating to the 0-stake by GPS.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MOUNTAIN
Elevation	8,600ft (2,621m)
Aspect	Southwest
Slope	28%
Sample Dates	06/29/2022

Wildlife Habitat and Vegetation History**Table 19A-15.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer/fall
Rocky Mountain Elk	crucial	summer/fall

Table 19A-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Aspen/Snowberry	NA

Site Notes

No Notes

Soils**Table 19A-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.0	57.9	24.6	17.6	9.6	16.0	1065.0	0.8	06/28/2022

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	High Mountain Stony Loam (Aspen)
NRCS Ecological Site #	F047XA531UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2022 this site was dominated by quaking aspen (*Populus tremuloides*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table 19A-15.12, Table 19A-15.13, Table 19A-15.13a). Mature white fir (*Abies concolor*) were scattered throughout the area (Table 19A-15.14). Perennial grasses dominated the understory with Kentucky bluegrass (*Poa pratensis*), slender wheatgrass (*Elymus trachycaulus*), and oniongrass (*Melica bulbosa*) providing much of the combined cover (Table 19A-15.7, Table 19A-15.10). Forbs were diverse and provided ample cover in the community with much of that cover being provided by silvery lupine (*Lupinus argenteus*) (Table 19A-15.11).

Trend Summary Tables

Table 19A-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	6.9	9.0	1.6	7.2	12.9	57.8

Table 19A-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	345	89	408	-	19.5	1.6	38.2

Table 19A-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	4.5	0.0	62.5	0.1	12.0	54.7

Table 19A-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
2022	4	3	5
Year	Days Use Per Acre (ha)		
2022	5.8 (14.3)	0.7 (1.7)	14.7 (36.4)

Table 19A-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus ciliatus (fringed brome)	Carex rossii (Ross' sedge)	Carex vallicola (valley sedge)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Poa bulbosa ¹ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ¹ (Kentucky bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2022	2	87	17	4	139	6	149	27	3	213	2
year	Average Cover (%)										
2022	0.0	2.0	0.1	0.1	3.7	0.0	4.4	0.4	0.0	8.8	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agastache urticifolia (nettleleaf giant hyssop)																	
Agoseris glauca (pale agoseris)																	
Allium acuminatum (tapertip onion)																	
Calochortus nuttallii (sego lily)																	
Claytonia perfoliata (miner's lettuce)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Delphinium ×occidentale (western larkspur)																	
Descurainia californica ^a (Sierra tansymustard)																	
Galium boreale (northern bedstraw)																	
Hackelia patens (spotted stickseed)																	
Hydrophyllum capitatum (ballhead waterleaf)																	
Lupinus arbustus ssp. calcaratus (longspur lupine)																	
Lupinus argenteus (silvery lupine)																	
Mertensia oblongifolia (oblongleaf bluebells)																	
Microseris nutans (nodding microseris)																	
Osmorhiza occidentalis (western sweetroot)																	
year	Nested Frequency																
2022	6	8	49	7	2	38	19	65	8	37	47	30	21	176	22	21	3
year	Average Cover (%)																
2022	0.3	0.0	0.4	0.0	0.0	0.2	0.4	5.4	0.2	1.1	2.6	0.3	0.6	11.8	0.8	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES										
Penstemon watsonii (Watson's penstemon)										
Phlox longifolia (longleaf phlox)										
Polygonum douglasii ^a (Douglas' knotweed)										
Pseudostellaria jamesiana (tuber starwort)										
Senecio integerrimus ^a (lambstongue ragwort)										
Symphotrichum ascendens (western aster)										
Taraxacum officinale (common dandelion)										
Tragopogon dubius ^{ai} (yellow salsify)										
Viola (violet)										
Zigadenus paniculatus (foothill deathcamas)										
year	Nested Frequency									
2022	48	8	6	299	27	16	56	9	99	7
year	Average Cover (%)									
2022	1.4	0.1	0.0	10.0	0.6	0.2	1.3	0.1	1.3	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)					
Mahonia repens (creeping barberry)					
Populus tremuloides ^t (quaking aspen)					
Prunus virginiana ^p (chokecherry)					
Symphoricarpos oreophilus ^p (mountain snowberry)					
year	Line Intercept Cover (%)				
2022	0	12.9	57.8	-	7.2
year	Quadrat Cover (%)				
2022	0.0	9.0	1.6	0.3	6.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2022	20	-	0	100	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2022	36580	-	0	100	0	0	0	0	- / -
Prunus virginiana ^p -- (chokecherry)									
2022	40	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2022	5060	-	47	53	0	20	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-15.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

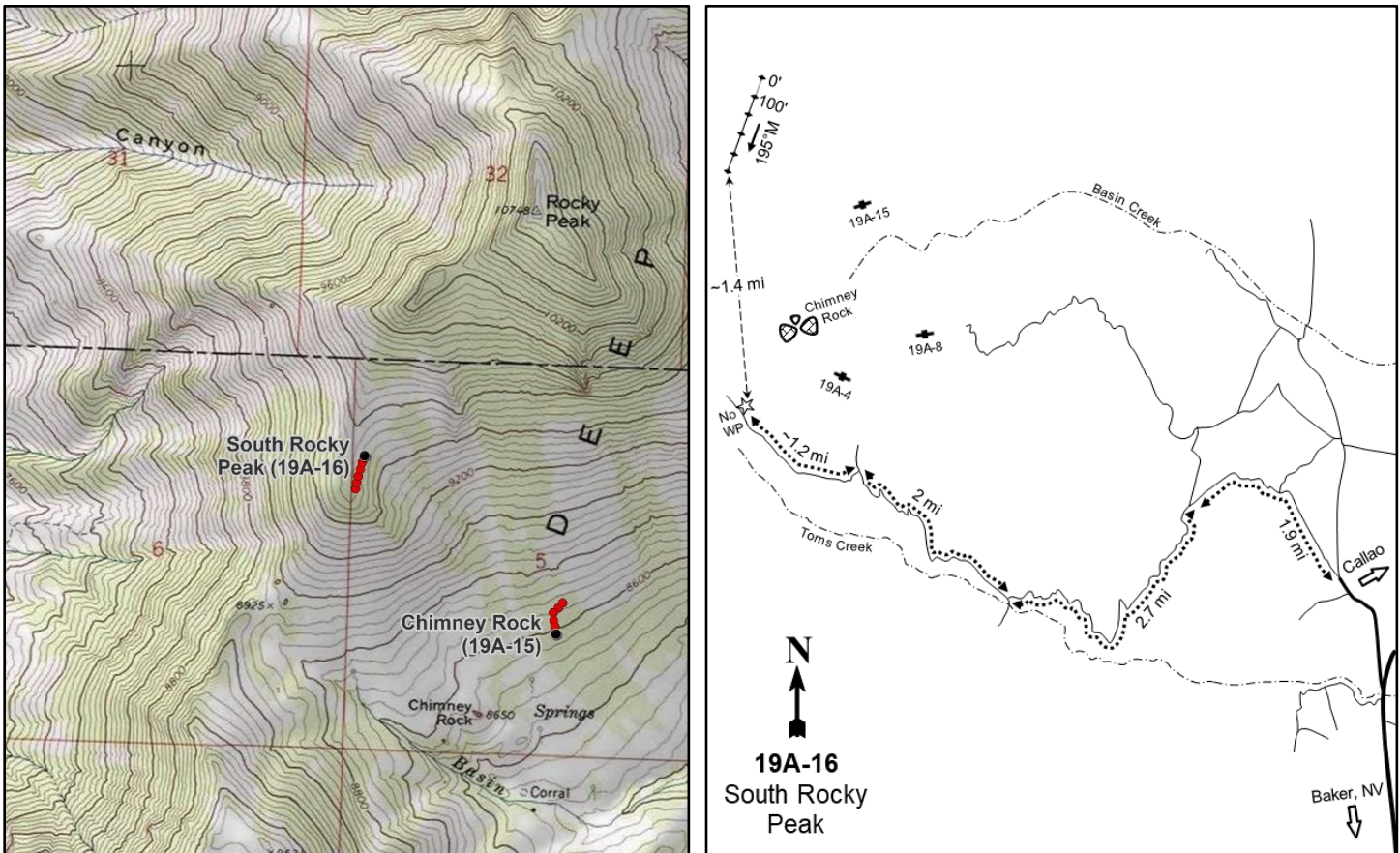
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2022	800	5	48	-	48	3	32	16

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 19A-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies concolor (white fir)							
2022	4	-	-	33	67	-	9.0
Populus tremuloides (quaking aspen)							
2022	629	5	25	-	5	65	12.3
Pseudotsuga menziesii (Douglas-fir)							
2022	1	-	-	-	-	100	18.0

SOUTH ROCKY PEAK - STUDY NO. 19A-16

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Goshute SE; Township 11S, Range 18W, Section 05
NAD 83 UTM ZONE 12, 251630 East 4420933 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
195° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the Snake Valley Road and Weiss Highway junction, travel north and stay left on to Tom Creek Road. Drive up Tom Creek Road for 7.8 miles until it terminates at the top of the ridge. The site can be reached by walking down from the ridge and navigating to the 0-foot stake by GPS.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MOUNTAIN
Elevation	9,400ft (2,865m)
Aspect	Southeast
Slope	38%
Sample Dates	06/28/2022

Wildlife Habitat and Vegetation History**Table 19A-16.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer/fall
Elk	crucial	summer/fall

Site Notes

No Notes

Soils**Table 19A-16.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.8	49.9	32.6	17.5	11.9	15.3	1493.0	0.9	06/28/2022

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	F047XA508UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2022, this site was dominated by quaking aspen (*Populus tremuloides*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table 19A-16.12, Table 19A-16.13, Table 19A-16.13a). Mature subalpine fir (*Abies lasiocarpa*) were scattered throughout the site (Table 19A-16.14). Perennial grasses dominated the understory with Kentucky bluegrass (*Poa pratensis*), fringed brome (*Bromus ciliatus*), and oniongrass (*Melica bulbosa*) providing much of the combined cover (Table 19A-16.7, Table 19A-16.10). Forbs were diverse and provided ample cover in the community with much of that cover being contributed by a perennial violet (*Viola* sp.) and the annual species lambstongue ragwort (*Senecio intergerrimus*) (Table 19A-16.11).

Trend Summary Tables

Table 19A-16.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	1.7	2.9	3.3	2.9	1.3	75.8

Table 19A-16.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	371	107	401	-	18.1	2.1	35.2

Table 19A-16.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	8.2	-	68.2	2.8	3.9	48.3

Table 19A-16.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Mule Deer	Rocky Mountain Rocky Mountain Elk
	Quadrat Frequency		
2022	1	5	12
Year	Days Use Per Acre (ha)		
2022	1.5 (3.6)	7.4 (18.2)	40.2 (99.3)

Table 19A-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus ciliatus (fringed brome)	Carex obtusata (obtusate sedge)	Carex rossii (Ross' sedge)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis' (Kentucky bluegrass)
year	Nested Frequency								
2022	5	141	1	19	53	41	209	62	122
year	Average Cover (%)								
2022	0.0	3.4	0.0	0.5	0.9	1.0	7.3	1.6	3.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19A-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Calochortus nuttallii (sego lily)	Chenopodium atrovirens ^a (pinyon goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Delphinium ×occidentale (western larkspur)	Erigeron jonesii (Jones' fleabane)	Fritillaria atropurpurea (spotted fritillary)	Galium boreale (northern bedstraw)	Hydrophyllum capitatum (ballhead waterleaf)	Lupinus arbustus ssp. calcaratus (longspur lupine)	Lupinus argenteus (silvery lupine)	Mertensia oblongifolia (oblongleaf bluebells)	Osmorhiza occidentalis (western sweetroot)	Phacelia sericea ^a (silky phacelia)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
2022	3	24	10	28	31	1	32	1	1	70	114	32	97	23	83	1	10
year	Average Cover (%)																
2022	0.0	0.2	0.0	0.4	0.3	0.0	1.9	0.0	0.0	1.6	1.3	1.4	4.7	0.4	6.7	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Platanthera dilatata var. leucostachys (Sierra bog orchid)	Polygonum douglasii ^a (Douglas' knotweed)	Pseudostellaria jamesiana (tuber starwort)	Senecio integerrimus ^a (lambstongue ragwort)	Taraxacum officinale (common dandelion)	Viola (violet)
year	Nested Frequency					
2022	8	13	279	55	100	264
year	Average Cover (%)					
2022	0.1	0.0	7.0	1.3	1.9	7.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19A-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies lasiocarpa ^t (subalpine fir)	Mahonia repens (creeping barberry)	Pinus flexilis ^t (limber pine)	Populus tremuloides ^t (quaking aspen)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)				
2022	1.9	1.3	0.3	73.6	2.9
year	Quadrat Cover (%)				
2022	1.9	2.9	0.0	1.4	1.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-16.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies lasiocarpa ^t -- (subalpine fir)									
2022	100	-	100	0	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2022	9960	-	0	100	0	0	0	0	- / -
Pinus flexilis ^t -- (limber pine)									
2022	40	-	50	50	0	0	0	0	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2022	1040	-	0	100	0	2	71	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19A-16.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

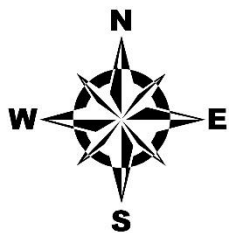
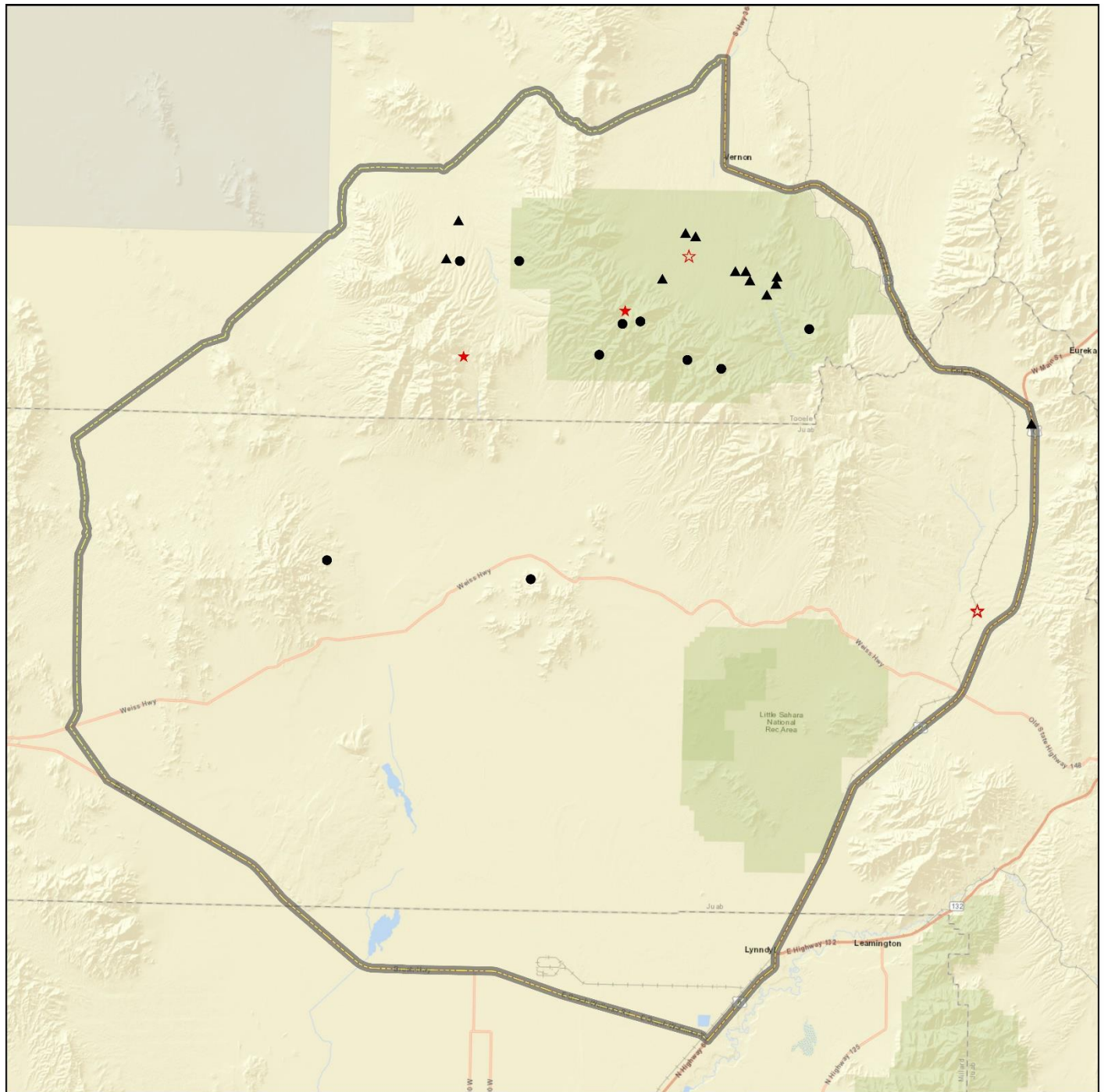
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2022	500	24	-	-	76	0	0	0

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

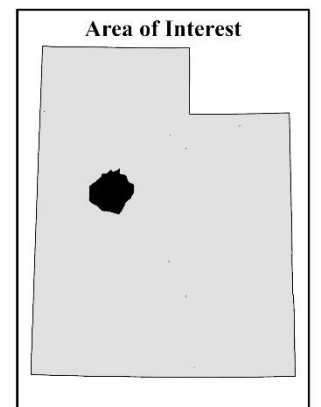
Table 19A-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies lasiocarpa (subalpine fir)							
2022	4	-	33	33	-	33	10.7
Pinus flexilis (limber pine)							
2022	7	-	14	29	-	57	10.4
Populus tremuloides (quaking aspen)							
2022	363	-	-	-	-	100	18.1

WILDLIFE MANAGEMENT UNIT 19B – WEST DESERT, VERNON

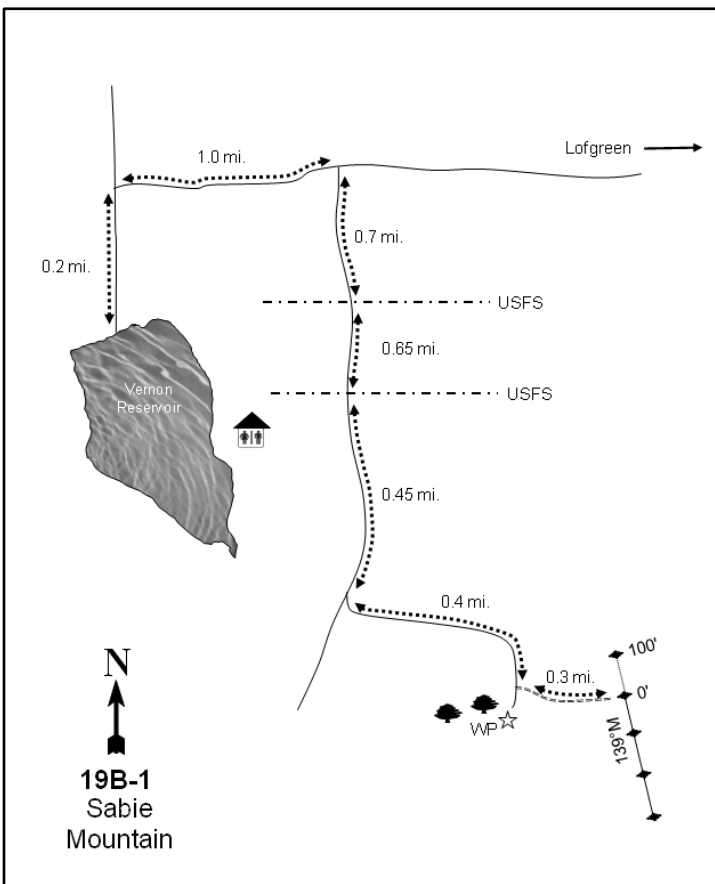


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 19B
★ RT, Suspended	
▲ WRI, Active	
★ WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

SABIE MOUNTAIN - STUDY NO. 19B-1



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Sabie Mountain NW; Township 10S, Range 5W, Section 12
NAD 83 UTM ZONE 12, 384771 East 4425572 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

418
319° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 3: 2ft, Belt 5: No Rebar

Directions to Site

From the north end of Vernon Reservoir, travel 0.2 miles north to an intersection. Turn right and proceed 1 mile on an eastbound road (road eventually goes to Lofgreen), then turn right onto a southbound road. Continue for 0.7 miles and cross a USFS fence, then proceed 0.65 miles and cross another USFS fence. Go 0.45 miles to a “Y” intersection; proceed left at the fork and drive 0.4 miles to an intersection of a 4WD footpath going off to the left. The witness post is on the right side of the road between some PIMOs and is ~12” tall. Walk 0.3 miles on the footpath to the 0-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	LITTLE VALLEY-VERNON
Elevation	6,980ft (2,128m)
Aspect	Northwest
Slope	35%
Sample Dates	08/25/1997, 07/29/2002, 07/30/2007, 06/21/2012, 06/07/2017, 06/08/2022

Table 19B-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Vernon Ecosystem Phase 4	4900	May-August 2019	7938

Table 19B-01.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
James Seeding			Aerial	Sep 1970	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron desertorum	Desert Wheatgrass		10.00	0.00
S	Atriplex canescens	Fourwing Saltbush		0.20	0.00
S	Medicago sativa	Alfalfa	Ladak	0.10	0.00

Wildlife Habitat and Vegetation History

Table 19B-01.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Greater Sage-Grouse	occupied	year-long

Table 19B-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush-Snowberry	Phase I
1989	Mountain Big Sagebrush-Snowberry	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush-Snowberry	Phase I
2012	Mountain Big Sagebrush-Snowberry	Phase I
2017	Mountain Big Sagebrush-Snowberry	Phase I
2022	Mountain Big Sagebrush-Snowberry	Phase I

Site Notes

No Notes

Soils

Table 19B-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.3	30.6	41.8	27.6	4.7	10.1	275.2	1.0	08/25/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has been co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) in most sample years since study establishment in 1983; other shrubs are present in lesser amounts (Table 19B-01.12, Table 19B-01.13). The herbaceous understory has remained plentiful and diverse with native perennial grasses and forbs contributing a majority of the cover (Table 19B-01.10, Table 19B-01.11). Singleleaf pinyon (*Pinus monophylla*) and (*Juniperus osteosperma*) have been observed on or near the study site (Photos, Table 19B-01.12, Table 19B-01.13, Table 19B-01.14), and despite a lop-and-scatter treatment in 2019 (Table 19B-01.1), the site has remained in Phase I of woodland succession since 1983 (Table 19B-01.4).

Trend Summary Tables

Table 19B-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	33.1	2.6	0.5	-	-	-
2002	38.4	0.4	2.1	35.0	0.5	1.6
2007	30.3	0.6	2.6	52.9	0.7	2.8
2012	43.9	1.0	2.1	60.3	0.6	1.6
2017	42.2	1.0	2.6	59.1	1.2	1.9
2022	37.7	0.8	0.0	47.7	1.5	-

Table 19B-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	348	44	279	-	11.1	0.3	12.6
2002	-	256	-	119	-	5.3	-	3.0
2007	3	249	200	214	0.0	5.7	1.4	4.8
2012	-	297	88	279	-	15.3	0.3	18.2
2017	-	335	296	327	-	12.7	4.0	20.5
2022	2	310	301	384	0.0	12.9	5.7	28.9

Table 19B-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	5.3	0.0	56.9	5.6	5.7	51.9
2002	16.2	0.1	44.5	6.3	7.8	47.5
2007	17.3	0.0	31.7	8.3	6.1	45.4
2012	12.7	0.0	49.0	4.5	11.8	60.0
2017	10.3	0.1	49.4	9.1	7.0	67.2
2022	13.8	0.1	43.6	4.0	6.0	60.1

Table 19B-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	8	1	6
2002	1	8	-	1
2007	4	17	2	31
2012	-	-	-	-
2017	-	6	-	4
2022	-	6	-	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	5.1 (12.6)	18.7 (46.3)	-	-
2007	10.9 (26.9)	22.1 (54.6)	14.1 (34.8)	-
2012	2.2 (5.4)	4.7 (11.6)	-	-
2017	8.0 (19.7)	11.4 (28.1)	6.0 (14.9)	-
2022	1.5 (3.6)	7.4 (18.2)	2.7 (6.6)	-

Table 19B-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Leucopoa kingii (spike fescue)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1997	-	-	5	7	3	9	3	279	62	60
2002	-	-	-	4	0	-	-	214	51	40
2007	4	3	1	16	-	12	-	196	52	33
2012	-	-	-	4	2	7	1	77	230	23
2017	-	-	-	4	2	87	5	131	198	46
2022	3	2	4	9	4	54	5	216	129	21
year	Average Cover (%)									
1997	-	-	0.0	0.2	0.4	0.1	0.0	7.6	1.1	1.6
2002	-	-	-	0.2	0.0	-	-	4.2	0.4	0.5
2007	0.1	0.0	0.0	0.2	-	0.0	-	3.7	1.2	0.5
2012	-	-	-	0.7	0.2	0.2	0.0	4.6	8.4	1.2
2017	-	-	-	0.2	0.3	1.9	0.0	3.8	5.3	1.1
2022	0.0	0.0	0.2	0.4	1.0	0.9	0.2	6.4	3.0	0.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Delphinium nuttallianum (two-lobed larkspur)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
1997	-	12	5	-	6	2	74	19	12	-	2	23	-	69	60	9	5
2002	-	-	-	-	-	-	-	16	13	-	-	-	-	54	-	-	-
2007	-	7	109	-	-	-	6	6	36	-	-	198	-	76	12	2	3
2012	-	3	8	-	-	22	14	12	36	-	-	85	2	132	50	-	-
2017	-	11	126	-	-	45	16	14	44	-	-	262	45	85	71	19	4
2022	4	75	225	2	4	41	38	20	55	4	-	245	32	89	75	70	4
year	Average Cover (%)																
1997	-	0.1	0.0	-	0.0	0.0	2.3	0.7	0.7	-	0.0	0.1	-	0.9	0.7	0.0	0.0
2002	-	-	-	-	-	-	-	0.4	0.5	-	-	-	-	1.0	-	-	-
2007	-	0.1	0.6	-	-	-	0.0	0.2	1.3	-	-	0.8	-	0.7	0.2	0.0	0.0
2012	-	0.0	0.0	-	-	0.2	0.4	0.8	3.7	-	-	0.3	0.0	2.5	1.1	-	-
2017	-	0.1	0.8	-	-	0.9	0.4	0.8	4.4	-	-	2.8	0.2	0.8	1.1	0.1	0.1
2022	0.0	0.6	1.8	0.0	0.0	0.5	0.8	0.9	4.9	0.0	-	1.6	0.2	1.7	2.2	0.4	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency																
Eriogonum racemosum (redroot buckwheat)	22	10	-	1	-	67	-	5	4	71	7	-	-	3	6	6	74
Eriogonum umbellatum (sulphur-flower buckwheat)	6	4	-	-	-	40	-	10	-	-	-	-	-	-	-	-	2
Erodium cicutarium ^{ai} (redstem stork's bill)	2	-	-	-	-	41	9	3	4	5	-	12	-	4	-	4	3
Fritillaria atropurpurea (spotted fritillary)	27	3	-	-	-	51	-	1	42	31	-	14	-	3	2	-	29
Galium aparine ^a (stickywilly)	13	3	-	-	3	36	36	-	6	85	-	59	65	6	-	-	49
Helianthella uniflora (oneflower helianthella)	13	5	5	3	1	37	56	-	13	67	-	39	44	1	5	19	95
Hydrophyllum occidentale (western waterleaf)	Average Cover (%)																
Lithospermum ruderale (western stone seed)	0.3	0.3	-	0.0	-	2.5	-	0.0	0.0	2.4	0.0	-	-	0.0	0.1	0.0	0.4
Lomatium grayi (Gray's biscuitroot)	0.0	0.0	-	-	-	0.6	-	0.2	-	-	-	-	-	-	-	-	0.0
Lupinus argenteus (silvery lupine)	0.0	-	-	-	-	0.3	0.1	0.0	0.0	0.1	-	0.2	-	0.0	-	0.0	0.1
Machaeranthera canescens (hoary tansyaster)	0.2	0.0	-	-	-	3.3	-	0.0	0.9	1.0	-	0.1	-	0.0	0.1	-	0.2
Mertensia oblongifolia (oblongleaf bluebells)	0.1	0.0	-	-	0.0	1.5	0.7	-	0.1	3.4	-	0.8	0.4	0.1	-	-	0.5
Microseris nutans (nodding microseris)	0.1	0.0	0.0	0.0	0.0	2.2	2.7	-	0.3	2.4	-	1.0	0.1	0.0	0.2	0.3	1.8
Microsteris gracilis ^a (slender phlox)	Average Cover (%)																
Packera multilobata (lobeleaf groundsel)	0.3	0.3	-	0.0	-	2.5	-	0.0	0.0	2.4	0.0	-	-	0.0	0.1	0.0	0.4
Penstemon subglaber (smooth penstemon)	0.0	0.0	-	-	-	0.6	-	0.2	-	-	-	-	-	-	-	-	0.0
Phlox longifolia (longleaf phlox)	0.0	-	-	-	-	0.3	0.1	0.0	0.0	0.1	-	0.2	-	0.0	-	0.0	0.1
	0.2	0.0	-	-	-	3.3	-	0.0	0.9	1.0	-	0.1	-	0.0	0.1	-	0.2
	0.1	0.0	-	-	0.0	1.5	0.7	-	0.1	3.4	-	0.8	0.4	0.1	-	-	0.5
	0.1	0.0	0.0	0.0	0.0	2.2	2.7	-	0.3	2.4	-	1.0	0.1	0.0	0.2	0.3	1.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency										
Platanthera aquilonis (northern green orchid)	-	7	14	-	1	-	-	19	-	24	-
Polygonum douglasii ^{ai} (Douglas' knotweed)	-	-	-	-	1	-	-	-	-	5	-
Senecio integerrimus ^a (lambstongue ragwort)	-	-	37	-	-	-	-	1	-	22	-
Silene antirrhina ^a (sleepy silene)	-	2	3	1	-	-	-	46	-	12	-
Taraxacum officinale (common dandelion)	3	-	53	10	-	-	-	75	2	17	16
Tragopogon dubius ^{ai} (yellow salsify)	1	-	141	14	-	2	2	101	2	15	14
Veronica biloba ^{ai} (two-lobed speedwell)	Average Cover (%)										
Vicia americana (American vetch)	-	0.0	0.2	-	0.0	-	-	0.1	-	1.1	-
Viola (violet)	-	-	-	-	0.0	-	-	-	-	0.2	-
Wyethia amplexicaulis (mule-ears)	-	-	0.5	-	-	-	-	0.0	-	0.9	-
Zigadenus paniculatus (foothill deathcamas)	-	0.0	0.0	0.0	-	-	-	1.2	-	2.2	-
	0.0	-	0.5	0.3	-	-	-	2.1	0.0	1.3	0.1
	0.0	-	3.3	0.5	-	0.0	0.0	2.7	0.1	1.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Mahonia repens (creeping barberry)	Pinus monophylla ^t (singleleaf pinyon)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	0.2	23.1	0.4	0.6	0.1	1	0.3	11.4
2007	-	26	0.5	1.2	0.2	1.6	1	25.9
2012	0.1	29.6	0.3	0.6	0.3	1	1.8	28.8
2017	0.6	26.8	0.5	0.8	0.7	1.1	1.2	30.5
2022	0.9	22	1.3	-	0.2	-	1	23.8
year	Quadrat Cover (%)							
1997	0.2	22.3	1.5	0.5	1.1	-	1.0	9.6
2002	0.1	25.3	0.4	0.6	0.1	1.5	1.4	11.7
2007	0.2	16.1	0.4	0.8	0.2	1.8	0.7	13.3
2012	0.3	22.2	0.6	0.8	0.4	1.2	1.8	19.5
2017	0.7	19.2	0.6	1.0	0.5	1.6	1.3	21.0
2022	0.0	19.5	0.5	-	0.4	0.0	1.2	16.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	280	-	43	43	14	29	7	7	49/45
2002	240	-	8	33	58	33	58	0	43/72
2007	80	-	0	75	25	0	75	0	50/56
2012	300	-	27	60	13	60	20	13	64/53
2017	340	-	12	82	6	24	24	6	55/61
2022	80	-	0	75	25	25	25	25	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	4220	80	1	74	25	20	1	14	67/86
2002	4580	-	1	73	26	4	25	3	62/89
2007	3220	-	0	71	29	37	17	13	67/101
2012	3500	-	2	76	22	10	2	23	68/103
2017	3660	-	1	77	22	18	1	9	69/103
2022	2960	20	3	72	25	8	0	26	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	2640	-	8	87	5	0	0	5	36/32
2002	800	-	3	25	73	5	13	25	14/19
2007	820	60	2	71	27	5	5	22	26/36
2012	620	-	0	100	0	0	0	7	28/33
2017	780	-	8	92	0	10	0	0	28/36
2022	760	-	24	76	0	0	0	3	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Juniperus osteosperma^t -- (Utah juniper)									
1997	60	-	100	0	0	0	0	0	- / -
2002	80	-	50	50	0	0	0	0	- / -
2007	80	-	50	50	0	0	0	0	- / -
2012	40	-	0	100	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
1997	2820	-	8	92	0	0	0	0	9/13
2002	420	-	0	91	10	0	0	0	10/14
2007	2400	-	7	93	0	0	0	0	6/8
2012	1980	-	2	98	0	0	0	0	8/11
2017	2000	-	0	100	0	0	0	0	9/10
2022	860	-	2	98	0	0	0	5	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
1997	20	20	100	0	0	0	0	0	- / -
2002	20	20	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	40	20	0	100	0	0	0	0	- / -
2022	-	20	0	0	0	0	0	0	- / -
Rosa woodsii^p -- (Woods' rose)									
1997	1820	-	46	54	0	0	0	0	22/23
2002	1540	-	21	69	10	0	0	1	23/21
2007	1500	-	13	87	0	7	0	0	25/21
2012	2960	-	11	88	1	0	0	3	20/19
2017	1840	-	10	90	0	23	3	0	20/16
2022	860	-	12	86	2	0	0	2	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	5060	40	5	93	2	0	0	0	34/51
2002	8360	-	1	88	12	0	1	1	31/42
2007	6600	-	3	96	2	3	0	2	34/66
2012	9620	80	17	82	1	1	0	2	34/44
2017	11000	80	12	88	1	0	0	0	33/42
2022	14180	-	32	68	0	1	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

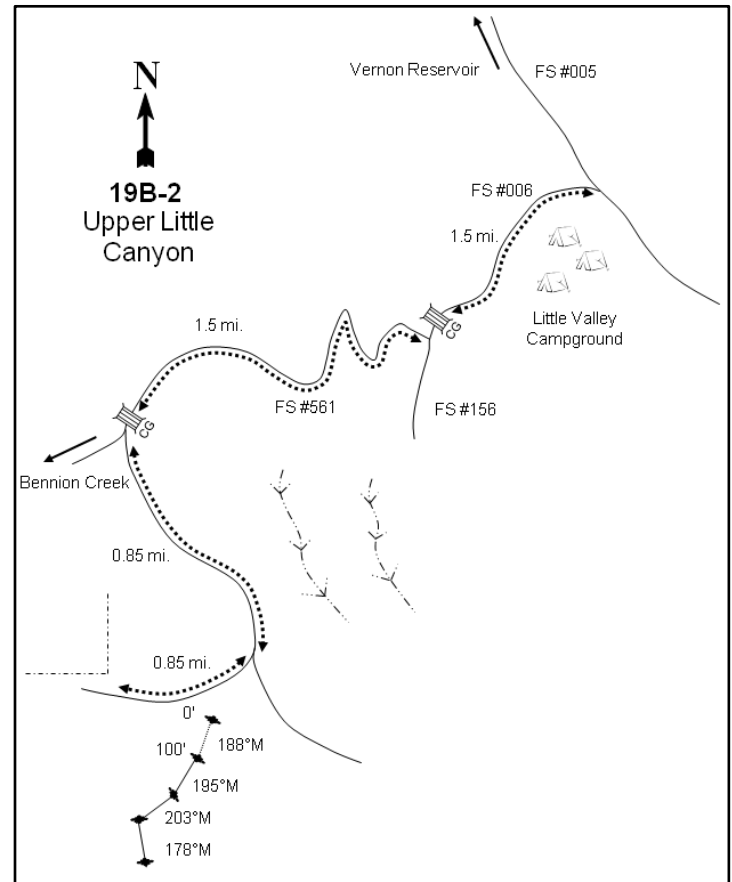
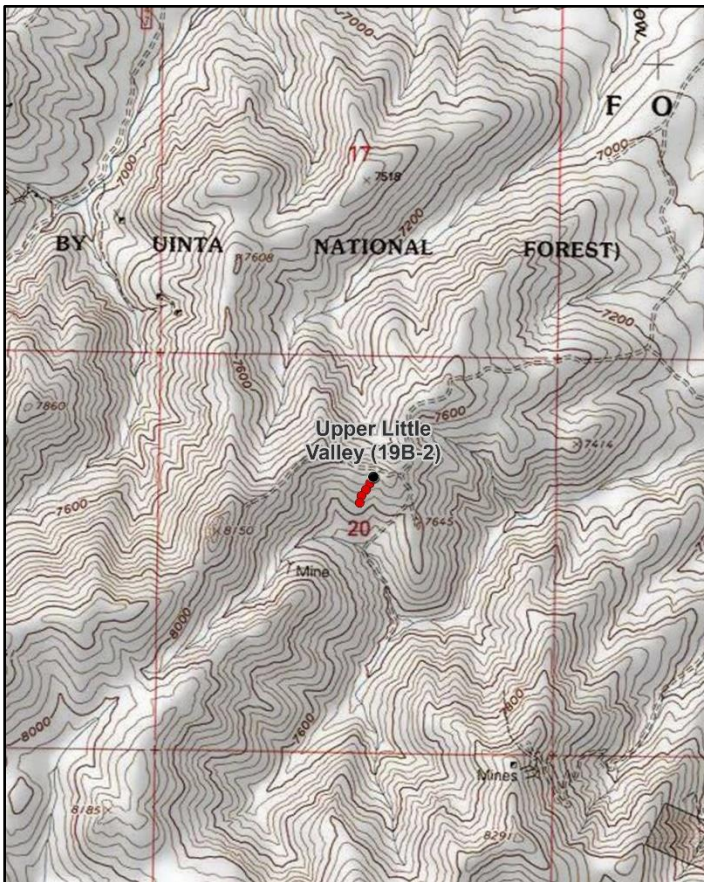
Table 19B-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	8	-	-	-	-	-	3.3
2007	10	-	75	25	-	-	6.0
2012	16	-	45	55	-	-	7.6
2017	10	-	50	50	-	-	7.3
2022	4	-	67	33	-	-	5.7
Pinus monophylla (singleleaf pinyon)							
2002	61	-	-	-	-	-	4.1
2007	44	-	15	77	8	-	8.0
2012	45	8	15	69	8	-	6.2
2017	44	-	21	71	7	-	9.7
2022	3	33	67	-	-	-	2.7

Table 19B-01.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	9.8	2.0	22.2	0.0	10.0	0.0	74.0	Good
2002	30.0	8.6	0.7	10.6	0.0	6.1	0.0	56.0	Poor-Fair
2007	30.0	10.5	0.9	11.4	0.0	9.6	0.0	62.4	Fair
2012	30.0	11.7	4.8	30.0	0.0	10.0	0.0	86.5	Good
2017	30.0	11.9	3.4	25.3	0.0	10.0	0.0	80.5	Good
2022	30.0	11.4	8.8	25.4	0.0	10.0	0.0	85.5	Good

UPPER LITTLE VALLEY - STUDY NO. 19B-2

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Dutch Peak NE; Township 10S, Range 5W, Section 20
NAD 83 UTM ZONE 12, 377780 East 4422416 North

Transect Information

Browse Tag # (0' Stake)	3928
Transect Bearing	188° magnetic (Line 2: 195° magnetic, Line 3: 203° magnetic, Line 4: 178° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 4ft

Directions to Site

The steep, rocky road leading to this study site can be reached on Little Valley Road either by traveling east for 2.5 miles from Bennion Creek or west for 2.6 miles from the Little Valley Campground. Turn south and proceed 0.85 miles to an intersection. Bear right and continue southerly up the ridge for 0.85 miles to a fence corner on the ridgeline. Continue up along the fence to the 19th fencepost. From this fencepost, the 0-foot baseline stake is 33 paces away at 169 degrees magnetic and is marked with a red browse tag #3928.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	LITTLE VALLEY-VERNON
Elevation	7,720ft (2,353m)
Aspect	South
Slope	25-30%
Sample Dates	07/31/1997, 08/05/2002, 07/30/2007, 06/07/2012, 06/05/2017, 06/06/2022

Wildlife Habitat and Vegetation History**Table 19B-02.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	spring/fall	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 19B-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment
2022	Mixed Mountain Brush	No Encroachment

Site Notes

Numerous intermittent and perennial streams in the area provide good distribution of water. However, thermal and escape cover is rare as most of the surrounding area is occupied by low-growing shrubs. Vegetation tall enough to provide thermal escape can only be found in nearby canyon bottoms. In 2017, there were many caterpillars observed on site. In 2022, rebar was only found on two belts. However, it is possible that rebar could be present on all belts and was just obscured by litter and thick grass cover in that sample year.

Soils**Table 19B-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.2	49.3	27.2	23.5	4.6	23.7	211.2	0.6	07/30/1997

Site Potential

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1983, this study site has remained dominated by mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and mountain snowberry (*Symphoricarpos oreophilus*). A number of other shrub species are also present, but contribute less cover. There was a notable decrease in mountain snowberry cover in 2022 (Table 19B-02.12). The herbaceous understory has been plentiful and diverse with native perennial forbs contributing a majority of the cover in most sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present since 1997 with fluctuations in cover in subsequent sample years, but reached a height in cover at 21% in 2022 (Table 19B-02.10, Table 19B-02.11). Encroachment by pinyon (*Pinus sp.*) and juniper (*Juniperus sp.*) is not occurring on this study site (Table 19B-02.4).

Trend Summary Tables**Table 19B-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	23.7	4.1	-	-	-	-
2002	22.0	1.5	-	29.7	1.4	-
2007	19.4	1.7	-	34.2	1.6	-
2012	27.9	3.5	-	39.0	2.5	-
2017	31.6	2.7	-	43.3	3.3	-
2022	26.5	2.9	-	34.4	3.6	-

Table 19B-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	208	188	329	255	1.7	7.6	5.5	13.0
2002	5	209	28	50	0.0	6.2	0.2	1.0
2007	295	141	365	184	13.7	3.9	10.1	8.2
2012	326	215	369	228	5.5	7.7	9.8	15.9
2017	353	185	380	275	10.6	10.2	13.0	21.8
2022	385	184	424	233	21.0	11.0	28.7	11.7

Table 19B-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.9	0.0	52.8	1.9	6.7	50.6
2002	31.9	-	38.5	10.7	10.1	27.6
2007	13.6	-	19.3	9.2	9.1	58.0
2012	11.8	-	33.8	2.7	9.6	58.8
2017	11.2	-	51.7	3.4	8.5	61.9
2022	16.7	0.1	36.5	9.6	10.0	67.2

Table 19B-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	26	2	3
2002	1	21	-	-
2007	-	18	10	1
2012	-	11	-	1
2017	-	12	1	-
2022	3	18	-	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.7 (21.5)	42.2 (104.3)	2.0 (5.0)	-
2007	1.5 (3.6)	37.5 (92.7)	14.7 (36.4)	-
2012	1.5 (3.6)	7.4 (18.2)	-	-
2017	1.5 (3.6)	9.4 (23.2)	-	-
2022	5.1 (12.6)	33.5 (82.8)	-	-

Table 19B-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency										
1997	4	55	208	28	-	8	-	55	28	69	-
2002	0	33	5	7	-	-	-	18	5	160	-
2007	-	24	292	3	1	2	-	44	17	62	3
2012	13	71	326	18	21	17	5	32	36	55	1
2017	2	30	353	13	7	45	28	61	24	57	-
2022	-	1	385	9	-	34	69	35	9	66	-
year	Average Cover (%)										
1997	0.0	1.2	1.7	0.7	-	0.3	-	3.0	0.7	1.9	-
2002	0.0	0.7	0.0	0.0	-	-	-	0.5	0.0	5.0	-
2007	-	0.2	13.7	0.0	0.1	0.0	-	1.3	0.2	2.0	0.0
2012	0.5	1.8	5.5	0.1	0.3	0.7	0.0	1.1	0.8	2.6	0.0
2017	0.1	0.7	10.6	0.4	0.1	1.0	1.3	2.7	0.8	3.1	-
2022	-	0.0	21.0	0.1	-	1.6	3.0	1.2	0.3	4.8	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arenaria fendleri (Fendler's sandwort)	Astragalus cibarius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa ^{ai} (littledrop false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
1997	26	106	296	-	7	11	13	-	3	35	98	31	52	-	-	21	-
2002	5	-	3	-	-	13	-	-	2	1	-	25	4	-	-	-	-
2007	3	4	263	-	-	8	-	2	3	254	8	14	5	-	-	-	26
2012	20	47	316	4	1	12	28	2	9	205	33	16	44	-	12	21	-
2017	39	98	169	-	15	11	9	6	11	296	174	26	16	2	8	25	5
2022	15	74	382	-	18	12	1	-	6	208	1	23	24	1	1	9	46
year	Average Cover (%)																
1997	0.5	0.5	4.3	-	0.1	0.8	0.0	-	0.2	0.1	0.4	0.4	1.2	-	-	0.1	-
2002	0.0	-	0.0	-	-	0.5	-	-	0.0	0.0	-	0.2	0.0	-	-	-	-
2007	0.0	0.0	2.9	-	-	0.4	-	0.0	0.0	3.0	0.0	0.1	0.1	-	-	-	0.7
2012	0.3	0.2	5.3	0.1	0.0	2.6	0.1	0.0	0.5	1.9	0.4	0.1	0.9	-	0.5	0.7	-
2017	0.6	0.7	1.4	-	0.2	1.3	0.0	0.0	0.3	6.7	2.5	0.4	0.3	0.0	0.3	0.5	0.0
2022	0.1	0.4	16.8	-	0.3	0.9	0.1	-	0.5	5.2	0.0	0.5	0.6	0.0	0.0	0.1	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Epilobium (willowherb)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Ligusticum porteri (Porter's licorice-root)	Lithospermum ruderale (western stone seed)	Lomatium grayi (Gray's biscuitroot)	Lupinus caudatus (tailcup lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1997	-	16	-	3	-	-	-	-	-	-	-	3	51	47	1	26	5
2002	-	23	-	-	-	-	-	-	-	3	-	4	-	-	-	-	-
2007	7	5	-	-	-	10	94	1	16	-	-	6	7	39	-	195	-
2012	-	48	-	-	-	4	70	53	54	-	-	7	26	66	1	6	-
2017	-	23	1	-	9	-	114	9	28	-	19	4	12	69	5	77	-
2022	-	-	-	3	10	26	28	-	65	4	22	3	10	60	-	207	6
year	Average Cover (%)																
1997	-	0.1	-	0.1	-	-	-	-	-	-	-	0.1	1.5	1.7	0.0	0.1	0.0
2002	-	0.1	-	-	-	-	-	-	-	0.0	-	0.2	-	-	-	-	-
2007	0.2	0.0	-	-	-	0.1	5.1	0.0	0.1	-	-	0.7	0.1	0.9	-	3.2	-
2012	-	0.1	-	-	-	0.0	4.8	0.3	0.6	-	-	0.7	1.4	3.3	0.0	0.0	-
2017	-	0.1	0.0	-	0.1	-	9.1	0.1	0.1	-	1.2	0.4	0.5	5.2	0.0	0.7	-
2022	-	-	-	0.0	0.0	0.9	0.9	-	1.7	0.0	1.1	0.1	0.3	4.7	-	3.6	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tetranneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius ^{ai} (yellow salsify)	unknown perennial forb (unknown forb)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1997	62	22	5	-	4	5	50	18	-	-	5	8
2002	-	-	-	-	-	-	-	-	1	-	-	-
2007	30	2	1	-	-	5	-	1	-	-	-	-
2012	-	-	4	1	-	10	-	9	-	2	-	-
2017	13	-	3	3	-	24	-	19	-	18	1	0
2022	39	-	2	-	-	-	-	9	-	3	-	-
year	Average Cover (%)											
1997	0.6	0.1	0.2	-	0.4	0.1	4.6	0.1	-	-	0.2	0.0
2002	-	-	-	-	-	-	-	-	0.0	-	-	-
2007	0.4	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-
2012	-	-	0.0	0.1	-	0.2	-	0.3	-	0.0	-	-
2017	0.1	-	0.1	0.6	-	0.6	-	0.3	-	0.3	0.0	0.0
2022	0.6	-	0.0	-	-	-	-	0.1	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ceanothus martinii (Martin's ceanothus)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	8	3.3	0.4	0.3	-	-	0.7	-	18.4
2007	10.8	5.2	-	0.4	-	-	1.2	-	18.2
2012	10.9	10.7	0.6	0.5	-	-	1.3	0.1	17.4
2017	13.5	14	1.2	1.3	-	-	0.8	-	15.8
2022	11.4	12.2	0.4	0.9	-	-	2.1	0.2	10.8
year	Quadrat Cover (%)								
1997	5.5	2.6	0.3	0.9	-	-	2.7	0.1	15.6
2002	4.5	3.1	0.6	0.3	-	-	0.5	0.1	14.3
2007	4.5	3.7	-	0.2	-	-	1.5	-	11.2
2012	7.0	6.2	0.4	1.1	-	-	2.0	0.0	14.7
2017	7.4	11.5	0.4	0.6	0.9	-	1.6	-	11.8
2022	7.1	12.2	1.0	0.4	-	0.2	1.5	0.0	7.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	640	-	6	91	3	50	13	6	124/136
2002	700	-	0	100	0	0	97	49	107/108
2007	480	-	0	100	0	46	50	0	129/150
2012	440	-	0	96	5	18	0	9	127/151
2017	600	-	0	93	7	23	0	10	136/148
2022	760	40	21	66	13	34	0	8	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	340	-	0	88	12	0	0	6	68/119
2002	520	-	0	81	19	15	8	4	55/101
2007	620	140	36	55	10	13	13	10	58/113
2012	860	-	2	93	5	12	0	0	71/114
2017	1080	-	0	100	0	4	0	0	62/113
2022	1240	-	2	82	16	8	0	11	- / -
Ceanothus martinii -- (Martin's ceanothus)									
1997	300	40	27	73	0	33	0	0	21/68
2002	340	-	6	94	0	0	88	0	13/30
2007	40	-	0	100	0	0	100	0	12/19
2012	160	-	0	100	0	38	0	0	20/60
2017	180	20	0	100	0	0	0	0	19/78
2022	140	-	43	57	0	0	0	0	- / -

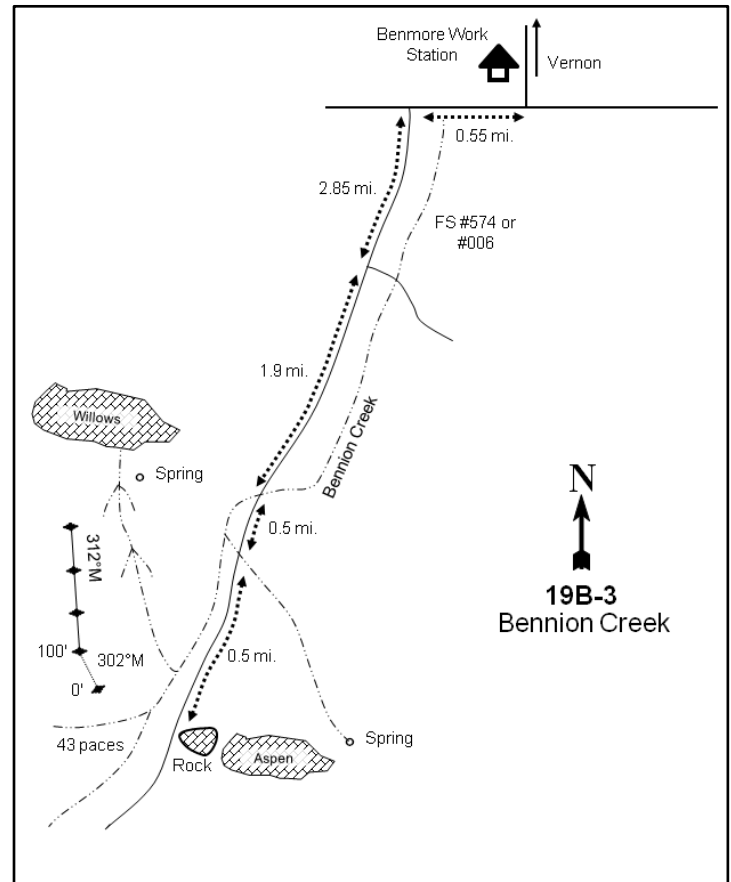
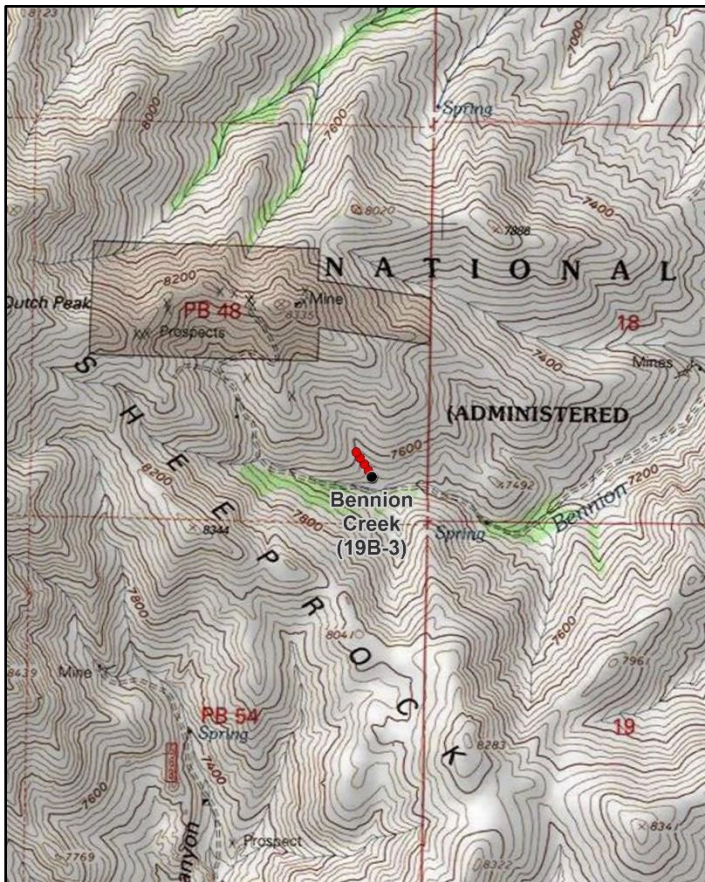
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	180	-	0	100	0	0	0	0	37/72
2002	180	-	0	11	89	0	11	44	23/47
2007	180	-	0	89	11	0	0	11	29/50
2012	200	-	0	100	0	0	0	0	28/53
2017	60	-	0	100	0	0	0	0	32/60
2022	140	-	29	71	0	0	0	0	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	61/100
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	87/131
2017	120	-	0	100	0	0	0	0	27/64
2022	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1997	7560	-	22	78	0	0	0	0	11/17
2002	1560	-	0	54	46	0	0	46	8/10
2007	8700	-	0	100	0	0	0	0	9/11
2012	6160	-	11	89	0	0	0	0	9/13
2017	7700	-	0	100	0	0	0	0	7/9
2022	7900	-	31	69	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	180	-	22	78	0	0	0	22	15/31
2002	100	-	0	100	0	0	0	0	13/30
2007	20	-	0	100	0	0	0	0	14/31
2012	20	-	0	100	0	0	0	0	13/48
2017	20	-	0	100	0	0	0	0	17/46
2022	40	-	0	100	0	0	0	50	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	3040	40	23	62	15	24	7	13	64/111
2002	2880	-	0	86	14	0	1	37	54/92
2007	2200	-	3	74	24	21	3	8	47/84
2012	2640	60	17	81	2	11	0	2	59/110
2017	2600	-	2	88	11	2	1	12	51/85
2022	2600	-	30	67	3	5	5	4	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	-	-	-	-	-	-	-	-	49/96

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-02.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	27.1	11.4	8.3	15.2	-1.3	10.0	0.0	70.7	Fair-Good
2002	25.1	11.5	0.0	12.5	0.0	2.0	0.0	51.0	Poor
2007	30.0	10.8	3.4	7.8	-10.3	10.0	0.0	51.7	Poor
2012	30.0	14.0	4.2	15.4	-4.1	10.0	0.0	69.5	Fair-Good
2017	30.0	13.2	0.3	17.8	-8.0	10.0	0.0	63.3	Fair
2022	30.0	11.7	8.5	16.1	-15.8	10.0	0.0	60.5	Fair

BENNION CREEK - STUDY NO. 19B-3

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Dutch Peak NW; Township 10S, Range 6W, Section 48
NAD 83 UTM ZONE 12, 375083 East 4423119 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3974
302° magnetic (Lines 2-4: 312° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: No Rebar, Belt 5: 4ft

Directions to Site

From the Benmore Work Station south of Vernon, travel west for 0.55 miles to the intersection with the USFS road 574 (may have been changed to road 006). Turn left and travel south for 2.85 miles to a fork. Bear right and drive for 1.7 miles to where Bennion Creek crosses the road. Proceed 0.5 miles to where a small drainage from a spring crosses the road. Continue up Bennion Creek for 0.5 miles to the study site (vehicle travel may be restricted in this last 0.5 mile). The site is located on a ridge above the point where two springs come together. From the road, the 0-foot baseline stake is 43 paces northwest. A red browse tag with the number 3974 is attached to the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BENMORE
Elevation	7,500ft (2,286m)
Aspect	Southeast
Slope	25%
Sample Dates	07/31/1997, 08/05/2002, 07/31/2007, 06/20/2012, 06/05/2017, 06/06/2022

Wildlife Habitat and Vegetation History**Table 19B-03.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	spring/fall	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 19B-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment
2022	Mixed Mountain Brush	No Encroachment

Site Notes

In 2017, it was noted that defoliator moths were present on a small number of Utah serviceberry (*Amelanchier utahensis*) plants.

Soils**Table 19B-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	43.3	30.7	26.0	4.5	12.3	307.2	0.6	08/05/2002

Site Potential

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has remained in a stable state as a mixed mountain brush plant community with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and mountain snowberry (*Symphoricarpos oreophilus*) as the dominant shrub species, although a number of other species are present in lesser amounts (Photos, Table 19B-03.12, Table 19B-03.13). The herbaceous understory has remained diverse and abundant with perennial grasses and forbs contributing a majority of the cover in most sample years. However, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed on the study site since 2007 and has been steadily increasing in both abundance and cover. Furthermore, bulbous bluegrass was the most abundant perennial grass species in 2017 and 2022 (Table 19B-03.7, Table 19B-03.10, Table 19B-03.11). Barring a major disturbance, it is likely that this site will remain in a similar state in the future, though there may be a detrimental effect on shrub recruitment and health in the future if bulbous bluegrass continues to increase.

Trend Summary Tables

Table 19B-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	20.2	2.0	-	-	-	-
2002	13.1	1.5	-	18.5	1.9	-
2007	14.9	2.9	-	25.5	3.3	-
2012	22.9	0.9	-	31.9	2.1	-
2017	24.4	1.5	-	31.1	1.7	-
2022	25.1	1.6	-	36.6	0.6	-

Table 19B-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	4	340	256	301	0.0	15.8	1.6	9.4
2002	-	304	14	113	-	9.2	0.1	3.0
2007	9	229	372	208	0.1	5.4	10.1	9.3
2012	132	322	339	280	1.4	13.5	2.4	17.8
2017	185	348	346	332	3.6	19.4	10.0	17.1
2022	55	349	396	328	0.5	20.3	7.9	25.8

Table 19B-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.0	0.2	50.1	5.5	12.0	48.8
2002	27.6	-	31.7	15.2	15.6	26.6
2007	20.4	0.0	18.0	13.2	12.1	43.6
2012	19.6	0.0	45.0	1.8	13.6	49.9
2017	8.8	0.0	41.7	13.2	11.9	63.4
2022	16.3	0.1	29.3	9.1	13.7	59.7

Table 19B-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	5	8	1	1
2002	10	5	-	-
2007	5	1	-	-
2012	1	-	-	-
2017	1	4	-	2
2022	2	5	1	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	21.1 (52.0)	11.4 (28.1)	0.7 (1.7)	-
2007	8.7 (21.5)	13.4 (33.1)	4.7 (11.6)	-
2012	1.5 (3.6)	4.7 (11.6)	0.7 (1.7)	-
2017	2.9 (7.2)	21.5 (53.0)	0.7 (1.7)	-
2022	1.5 (3.6)	16.8 (41.4)	-	-

Table 19B-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Leucopoa kingii (spike fescue)	Melica bulbosa (oniongrass)	Phleum pratense ⁱ (timothy)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
1997	5	36	4	-	-	1	154	116	3	-	129	15	34	-	74
2002	1	3	-	7	-	-	139	22	-	-	117	-	6	-	159
2007	3	93	9	4	-	-	33	57	-	11	38	1	22	3	54
2012	5	75	132	9	3	38	92	52	-	62	18	-	75	-	58
2017	6	64	185	-	3	-	31	157	3	155	30	10	20	-	66
2022	3	47	55	-	-	-	35	132	-	214	77	4	4	-	85
year	Average Cover (%)														
1997	0.1	0.4	0.0	-	-	0.0	6.8	2.3	0.0	-	3.5	0.4	0.6	-	1.9
2002	0.0	0.0	-	0.2	-	-	4.7	0.3	-	-	1.4	-	0.0	-	2.6
2007	0.0	1.9	0.1	0.0	-	-	0.8	0.6	-	0.2	0.4	0.0	0.3	0.2	1.0
2012	0.0	1.5	1.4	0.1	0.0	0.7	4.6	0.7	-	1.4	0.2	-	1.6	-	2.6
2017	0.1	2.0	3.6	-	0.0	-	1.6	4.4	0.0	6.7	1.1	0.6	0.3	-	2.5
2022	0.0	1.4	0.5	-	-	-	0.9	3.8	-	9.1	2.3	0.0	0.2	-	2.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Brassicaceae ^a (mustard family)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littletop false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1997	3	24	167	86	1	10	18	5	-	8	-	10	1	7	91	82	-
2002	-	10	-	-	-	9	-	3	-	-	-	-	-	-	-	-	20
2007	1	3	55	81	-	5	-	8	4	-	2	2	-	10	352	112	11
2012	1	5	7	292	3	5	17	4	-	-	5	-	3	3	117	86	24
2017	3	42	106	182	-	12	23	19	-	2	16	-	1	10	136	270	12
2022	1	80	82	333	5	17	33	16	-	-	-	6	1	2	287	154	14
year	Average Cover (%)																
1997	0.0	0.1	0.8	0.1	0.0	0.6	0.3	0.7	-	0.0	-	0.1	0.0	0.3	0.2	0.2	-
2002	-	0.0	-	-	-	0.2	-	0.3	-	-	-	-	-	-	-	-	0.2
2007	0.0	0.0	0.3	1.1	-	0.2	-	1.9	0.0	-	0.0	0.0	-	0.1	7.3	0.5	0.2
2012	0.0	0.0	0.0	1.3	0.0	0.2	0.4	2.6	-	-	0.0	-	0.0	0.0	0.3	0.2	0.8
2017	0.0	0.4	0.6	1.2	-	0.6	0.4	2.9	-	0.0	0.1	-	0.0	0.1	1.1	5.0	0.3
2022	0.1	0.5	0.4	3.1	0.1	0.9	1.1	2.9	-	-	-	0.0	0.1	0.2	2.2	0.7	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cymopterus longipes (longstalk springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Delphinium nuttalianum (two-lobed larkspur)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum divergens ^a (spreading fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erythronium grandiflorum (yellow avalanche-lily)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Hydrophyllum occidentale (western waterleaf)	Lactuca serriola ^{ani} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)
year	Nested Frequency																
1997	90	-	-	13	28	9	-	9	6	13	-	-	-	2	-	2	-
2002	1	-	3	-	8	-	-	19	13	3	-	-	-	-	-	-	-
2007	63	-	-	2	40	3	3	11	7	-	-	-	8	-	61	31	6
2012	100	3	-	-	18	-	4	17	13	16	-	-	-	0	109	15	-
2017	83	41	-	10	44	-	6	14	11	3	1	15	1	3	97	7	-
2022	103	56	-	15	30	-	6	31	15	-	-	-	-	3	91	-	7
year	Average Cover (%)																
1997	2.5	-	-	0.0	0.1	0.1	-	0.3	0.0	0.2	-	-	-	0.0	-	0.0	-
2002	0.0	-	0.0	-	0.0	-	-	1.3	0.3	0.0	-	-	-	-	-	-	-
2007	1.8	-	-	0.0	0.3	0.0	0.0	0.5	0.1	-	-	-	0.0	-	1.7	0.3	0.0
2012	3.5	0.1	-	-	0.1	-	0.0	1.2	0.3	0.1	-	-	-	0.0	5.6	0.0	-
2017	1.6	0.4	-	0.1	0.3	-	0.0	0.8	0.1	0.2	0.0	0.1	0.0	0.0	4.2	0.1	-
2022	4.3	0.9	-	0.0	0.1	-	0.0	1.4	0.3	-	-	-	-	0.1	4.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum lewisii (Lewis flax)	Lithophragma tenellum (slender woodland-star)	Lithospermum (stoneseed)	Lomatium (desertparsley)	Lupinus caudatus (tailcup lupine)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Orobancha uniflora ^a (oneflowered broomrape)	Phlox longifolia (longleaf phlox)	Platanthera aquilonis (northern green orchid)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarpos ascendens (western aster)
year	Nested Frequency																
1997	-	-	0	61	-	11	12	-	22	-	19	-	75	46	6	-	84
2002	-	-	2	-	-	2	-	-	-	-	-	-	-	3	-	-	42
2007	-	-	-	24	6	0	3	-	18	7	20	-	50	6	2	-	39
2012	-	-	2	58	6	-	19	-	23	-	3	-	30	10	23	1	20
2017	2	0	-	30	12	-	4	35	5	-	6	-	11	31	-	-	45
2022	2	-	-	42	21	-	4	20	-	-	25	2	4	63	-	-	42
year	Average Cover (%)																
1997	-	-	0.0	0.9	-	0.3	0.0	-	0.1	-	0.2	-	0.2	0.5	0.0	-	1.1
2002	-	-	0.0	-	-	0.1	-	-	-	-	-	-	-	0.0	-	-	0.4
2007	-	-	-	1.1	0.2	0.0	0.1	-	0.1	0.0	0.2	-	0.3	0.1	0.0	-	0.8
2012	-	-	0.2	1.9	0.0	-	0.1	-	0.0	-	0.0	-	0.1	0.1	0.1	0.0	0.5
2017	0.0	0.0	-	1.6	0.5	-	0.1	0.3	0.1	-	0.0	-	0.0	1.1	-	-	0.6
2022	0.1	-	-	2.1	1.2	-	0.2	0.2	-	-	0.3	0.1	0.0	1.3	-	-	1.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency				
1997	-	1	9	-	24
2002	-	-	-	-	1
2007	-	-	4	-	0
2012	-	1	5	3	-
2017	0	25	34	84	1
2022	2	35	-	93	7
year	Average Cover (%)				
1997	-	0.0	0.0	-	0.9
2002	-	-	-	-	0.1
2007	-	-	0.0	-	0.0
2012	-	0.1	0.0	0.0	-
2017	0.0	0.6	0.4	1.1	0.1
2022	0.0	0.6	-	1.8	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Rosa woodsii ^p (Woods' rose)	Salix bebbiana (Bebb willow)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	5.2	-	5.1	0.1	1	0	0.5	0.3	0.2	-	8
2007	6.9	-	7.9	0.5	1.2	0.2	0.8	0.4	1	0.2	9.7
2012	8.2	0.8	11.4	-	1.2	0.3	0.1	0.5	0.5	-	11
2017	8	2.2	16.4	1	-	-	0.3	0.3	-	0.1	4.5
2022	13.4	0.3	19.4	0.5	-	-	-	0.1	0.2	-	3.3
year	Quadrat Cover (%)										
1997	3.6	0.4	4.5	0.4	-	0.8	0.1	0.7	1.9	-	9.8
2002	3.2	-	3.6	0.0	0.0	0.0	0.5	0.9	0.2	-	6.2
2007	3.1	0.0	3.4	1.0	0.0	0.4	0.4	0.2	0.4	0.8	8.0
2012	4.3	0.3	9.9	0.4	0.0	0.3	0.2	0.1	0.7	-	7.7
2017	4.7	2.3	11.4	0.5	-	0.2	0.4	0.2	0.3	0.1	5.7
2022	4.6	0.7	16.2	0.7	-	0.6	0.1	0.2	0.3	-	3.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	700	-	9	54	37	49	43	34	87/96
2002	620	-	7	77	16	32	65	10	83/87
2007	460	-	4	96	0	26	52	4	107/106
2012	600	-	10	83	7	30	0	7	109/122
2017	820	-	15	83	2	10	12	5	119/134
2022	600	-	7	67	27	57	7	27	- / -
Artemisia nova^P -- (black sagebrush)									
1997	240	-	0	75	25	17	0	25	32/56
2002	60	-	0	100	0	0	0	0	21/66
2007	100	-	0	100	0	0	0	0	26/66
2012	100	-	20	80	0	60	0	0	18/62
2017	480	-	0	96	4	29	0	17	24/63
2022	160	-	0	100	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	940	-	2	68	30	21	0	23	63/97
2002	860	-	9	63	28	28	14	21	50/90
2007	1080	800	30	61	9	41	6	7	55/96
2012	2060	40	1	91	8	8	4	13	46/83
2017	2140	-	4	91	6	22	0	6	56/96
2022	2760	-	1	90	9	20	0	10	- / -
Cercocarpus ledifolius^P -- (curl-leaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	253/246
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	80	-	0	75	25	0	0	25	47/77
2002	60	-	0	100	0	0	0	33	26/39
2007	100	-	0	100	0	0	0	0	31/47
2012	80	-	0	100	0	0	0	0	27/47
2017	100	-	0	80	20	20	0	0	37/55
2022	80	-	50	50	0	0	0	0	- / -
Echinocereus -- (hedgehog cactus)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	8/9
2022	-	-	-	-	-	-	-	-	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1997	680	60	21	77	3	0	0	3	30/34
2002	980	-	0	94	6	12	8	2	14/31
2007	660	20	6	94	0	18	3	0	14/34
2012	1360	-	3	96	2	0	0	2	13/29
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

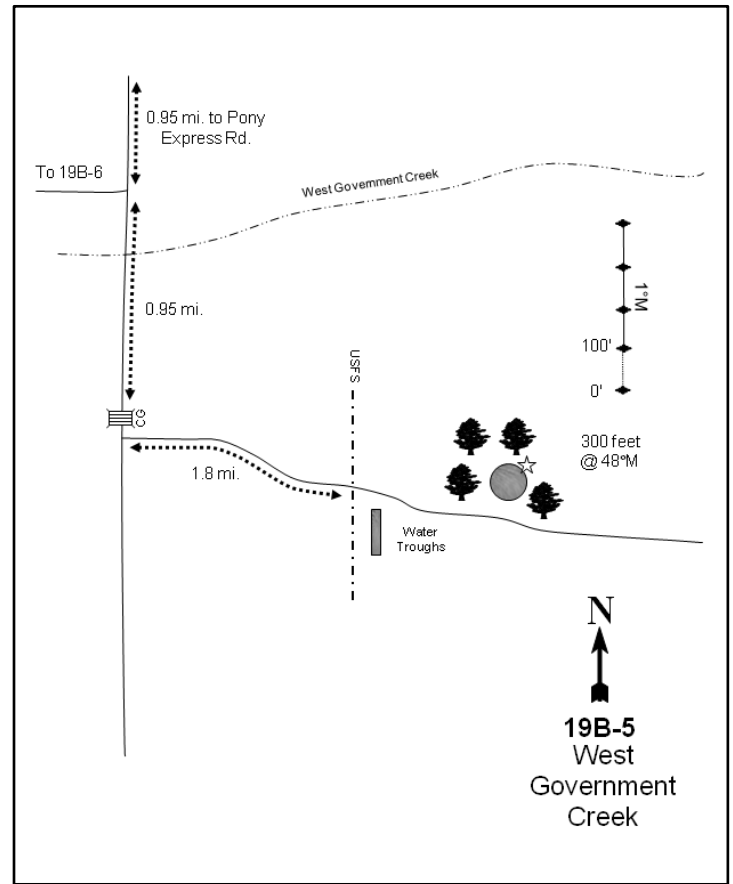
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
1997	1920	-	33	67	0	0	0	0	10/13
2002	120	-	0	100	0	0	0	0	6/8
2007	1900	-	4	96	0	11	0	0	10/12
2012	920	-	0	100	0	0	0	2	5/12
2017	2180	-	0	100	0	0	0	0	8/9
2022	1140	-	28	72	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	140	-	0	100	0	0	0	0	20/83
2002	120	-	0	100	0	0	0	0	16/86
2007	160	-	0	100	0	0	0	0	14/54
2012	280	-	0	100	0	0	0	0	14/32
2017	340	-	0	100	0	0	0	0	16/41
2022	20	-	100	0	0	0	0	0	- / -
Paxistima myrsinites -- (Oregon boxleaf)									
1997	1560	40	24	76	0	0	0	0	12/32
2002	1740	-	0	100	0	14	10	0	11/19
2007	600	60	10	90	0	13	3	0	11/27
2012	720	-	6	94	0	0	0	0	9/22
2017	620	-	10	90	0	0	3	0	10/19
2022	660	-	30	70	0	0	0	0	- / -
Rosa woodsii^p -- (Woods' rose)									
1997	1140	260	65	30	5	0	0	2	28/39
2002	820	-	12	88	0	27	0	0	13/14
2007	660	-	0	100	0	9	0	0	37/27
2012	1240	-	7	86	8	0	0	0	31/22
2017	1000	-	86	14	0	0	0	0	19/18
2022	760	-	3	97	0	0	0	0	- / -
Salix bebbiana -- (Bebb willow)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	98/86
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	3660	20	21	72	8	16	1	11	44/80
2002	2980	-	2	91	7	0	0	20	35/57
2007	1980	-	2	97	1	5	1	10	38/82
2012	2860	20	4	94	2	1	0	3	36/67
2017	3480	-	20	77	3	0	0	2	37/62
2022	2600	-	23	70	7	11	0	7	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-03.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	23.7	9.6	9.1	30.0	0.0	10.0	0.0	82.4	Good
2002	15.7	10.7	2.6	18.5	0.0	6.1	-2.0	51.5	Poor
2007	30.0	14.0	5.5	10.5	-0.1	10.0	0.0	70.0	Fair-Good
2012	30.0	13.4	2.4	24.2	-1.0	10.0	0.0	78.9	Good
2017	30.0	13.7	4.3	25.3	-2.7	10.0	0.0	80.6	Good
2022	30.0	10.4	2.5	22.5	-0.4	10.0	0.0	74.9	Good

WEST GOVERNMENT CREEK - STUDY No. 19B-5



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Lookout Pass SW; Township 9S, Range 7W, Section 22
NAD 83 UTM ZONE 12, 361722 East 4430994 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3975
4° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

Turn south off of Pony Express Road onto Erickson Pass Road. Go 4.6 miles to the turnoff to study 19B-6. Continue for 0.95 miles to a cattle guard, and then turn left 60 yards past the cattle guard. Continue for 1.8 miles to a water trough. From the northeast side of the circular trough, the 0-foot baseline stake is 300 feet away at 48 degrees magnetic and is marked with browse tag #3975.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	ONAQUI
Elevation	6,000ft (1,829m)
Aspect	Northwest
Slope	7-10%
Sample Dates	07/31/1997, 08/01/2002, 08/01/2007, 06/19/2012, 06/06/2017, 06/07/2022

Table 19B-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Western Sheeprock Sage-Grouse Habitat Improvement	4939	July 2019-June 2020	5059
Chaining - Chain Unknown	-	-	Late 1960s	-
Seeding - Seed Unknown	-	-	Late 1960s	-
Hand Crew - Lop and Scatter	West Government	2024	July 2011-May 2012	1613

Wildlife Habitat and Vegetation History**Table 19B-05.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter/spring	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 19B-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I
2022	Mountain Big Sagebrush	Phase I

Site Notes

This winter range study is located in the lower portion of the Lee's Creek drainage in an old juniper chaining area.

Soils**Table 19B-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.6	40.4	35.1	24.5	3.4	23.8	336.0	0.2	07/31/1997

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community since 1983, with other shrub species such as antelope bitterbrush (*Purshia tridentata*) as subordinate community members (Photos, Table 19B-05.12, Table 19B-05.13). The herbaceous understory has remained abundant and moderately diverse throughout the study years; much of the herbaceous cover is contributed by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) and the native species Sandberg bluegrass (*Poa secunda*). Bulbous bluegrass (*Poa bulbous*) was sampled for the first time in 2017, and was found to have increased in both cover and frequency in 2022 (Table 19B-05.10). Perennial forb cover has fluctuated from year to year. More specifically, cover of perennial forbs increased by nearly nine percent between 2012 and 2017, but remained similar in 2022 -- much of the 2012-2017 increase was due to American vetch (*Vicia americana*) (Table 19B-05.7, Table 19B-05.10, Table 19B-05.11). Utah juniper (*Juniperus osteosperma*) trees are scattered across the site, placing it in Phase I of woodland succession (Photos, Table 19B-05.4, Table 19B-05.12, Table 19B-05.13, Table 19B-05.14).

Trend Summary Tables**Table 19B-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	18.3	0.0	0.8	-	-	-
2002	21.3	0.1	1.4	31.5	0.1	2.2
2007	16.6	0.0	1.5	29.0	-	3.2
2012	20.4	-	0.3	30.1	-	-
2017	17.9	-	0.5	28.2	0.1	0.1
2022	19.4	0.1	-	20.8	-	-

Table 19B-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997								
2002								
2007								
2012								
2017								
2022								

Table 19B-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.2	4.6	42.0	6.0	0.8	41.8
2002	40.2	1.1	36.9	5.1	1.1	35.4
2007	25.9	0.5	39.3	5.7	0.4	42.6
2012	15.3	0.0	49.7	2.6	1.7	55.4
2017	19.8	0.1	53.1	6.3	0.8	57.1
2022	21.8	0.0	48.9	6.0	2.3	52.5

Table 19B-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	10	3	-	-	21
2002	10	3	-	-	12
2007	6	8	1	-	54
2012	-	6	-	-	2
2017	2	8	-	-	2
2022	2	18	2	-	1
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	33.4 (82.5)	14.1 (34.8)	-	0.6 (1.4)	-
2007	4.4 (10.8)	25.5 (62.9)	1.3 (3.3)	-	-
2012	-	4.0 (9.9)	-	-	-
2017	16.7 (41.2)	22.8 (56.3)	-	-	-
2022	16.0 (39.5)	30.2 (74.5)	2.0 (5.0)	-	-

Table 19B-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Agropyron cristatum ⁱ (crested wheatgrass)								
Bromus tectorum ^{ai} (cheatgrass)								
Elymus elymoides (squirreltail)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Poa fendleriana (muttongrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)								
year	Average Cover (%)							
1997	260	13	-	-	-	186	8	153
2002	195	3	4	-	-	197	10	154
2007	220	11	-	-	-	245	13	126
2012	233	-	-	-	-	290	9	159
2017	307	-	-	42	7	279	27	188
2022	301	3	-	78	15	246	21	210
year	Average Cover (%)							
1997	8.5	0.0	-	-	-	3.9	0.2	3.6
2002	5.7	0.0	0.0	-	-	2.7	0.4	3.0
2007	8.0	0.1	-	-	-	9.1	0.5	3.6
2012	11.9	-	-	-	-	9.4	0.4	5.9
2017	18.6	-	-	1.2	0.3	12.0	1.3	6.6
2022	16.7	0.0	-	2.8	0.3	7.1	1.5	9.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Antennaria dimorpha (low pussytoes)																	
Arabis (rockcress)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium neomexicanum ^a (New Mexico thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cymopterus longipes (longstalk springparsley)																	
Draba ^a (draba)																	
Erigeron pumilus (shaggy fleabane)																	
year	Average Cover (%)																
1997	2	282	3	6	26	3	1	1	232	3	2	49	3	15	10	-	9
2002	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	4	77	-	-	49	2	7	-	171	-	-	68	2	15	3	5	-
2012	25	132	-	-	51	4	-	-	76	-	2	16	5	6	6	-	-
2017	35	236	-	-	72	7	28	3	41	4	1	34	10	19	32	-	3
2022	30	192	3	1	91	9	21	6	145	-	1	17	14	23	33	1	-
year	Average Cover (%)																
1997	0.0	0.6	0.0	0.0	1.1	0.0	0.0	0.0	1.0	0.0	0.0	0.1	0.0	0.2	0.0	-	0.0
2002	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	0.1	0.2	-	-	1.7	0.0	0.0	-	0.6	-	-	0.2	0.0	0.1	0.0	0.0	-
2012	0.3	0.3	-	-	0.7	0.2	-	-	0.1	-	0.0	0.1	0.1	0.1	0.0	-	-
2017	0.5	0.9	-	-	3.6	0.1	0.1	0.0	0.1	0.0	0.0	0.2	0.1	0.4	0.3	-	0.0
2022	0.4	0.7	0.0	0.0	4.1	0.1	0.1	0.1	0.7	-	0.0	0.0	0.2	0.7	0.5	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum (buckwheat)	Galium boreale (northern bedstraw)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Silene antirrhina ^a (sleepy silene)	Tragopogon dubius ^{ai} (yellow salsify)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency									
1997	1	4	13	25	19	73	-	-	128	-
2002	-	-	-	-	12	-	-	-	11	-
2007	-	5	-	11	10	58	5	2	84	1
2012	-	-	-	2	13	69	1	-	125	-
2017	-	-	3	5	25	33	-	-	168	-
2022	-	-	2	2	10	43	-	-	188	1
year	Average Cover (%)									
1997	0.0	0.2	1.7	0.0	0.3	0.7	-	-	0.9	-
2002	-	-	-	-	0.3	-	-	-	0.0	-
2007	-	0.0	-	0.0	0.2	0.4	0.0	0.0	0.4	0.0
2012	-	-	-	0.0	0.5	0.4	0.0	-	1.4	-
2017	-	-	0.6	0.0	0.7	0.2	-	-	6.0	-
2022	-	-	0.1	0.0	0.4	0.4	-	-	6.5	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	31.4	-	0.1	2.2	0.1
2007	28.7	-	-	3.2	0.3
2012	28.5	-	-	-	1.6
2017	25.1	-	0.1	0.1	3.1
2022	18.8	-	-	-	2
year	Quadrat Cover (%)				
1997	17.5	-	0.0	0.8	0.7
2002	20.5	0.4	0.1	1.4	0.4
2007	16.3	-	0.0	1.5	0.3
2012	18.7	-	-	0.3	1.7
2017	15.5	-	0.0	0.5	2.4
2022	16.9	-	0.1	-	2.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
ARTRV									
1997	2300	20	16	76	9	40	0	12	84/136
2002	3160	-	3	73	24	30	3	6	75/119
2007	2320	-	1	60	39	30	21	29	79/124
2012	2420	-	0	76	24	37	2	27	92/116
2017	2380	-	0	66	34	25	9	37	80/119
2022	2240	-	0	59	41	0	0	46	- / -
GUSA2									
1997	240	20	25	75	0	0	0	0	34/27
2002	440	-	5	91	5	0	0	0	18/23
2007	140	-	0	57	43	0	0	43	13/12
2012	-	-	-	-	-	-	-	-	20/21
2017	40	-	0	100	0	0	0	0	23/20
2022	20	-	0	100	0	0	0	0	- / -
JUOS									
1997	20	-	100	0	0	0	0	0	- / -
2002	60	-	33	67	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	0	- / -
2012	60	-	0	33	67	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
PUTR2									
1997	100	-	20	80	0	20	40	0	35/106
2002	120	-	17	83	0	0	83	0	48/132
2007	80	-	0	100	0	0	75	0	60/135
2012	120	20	0	100	0	50	50	0	81/145
2017	260	-	0	100	0	39	39	8	86/137
2022	140	-	0	100	0	43	43	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

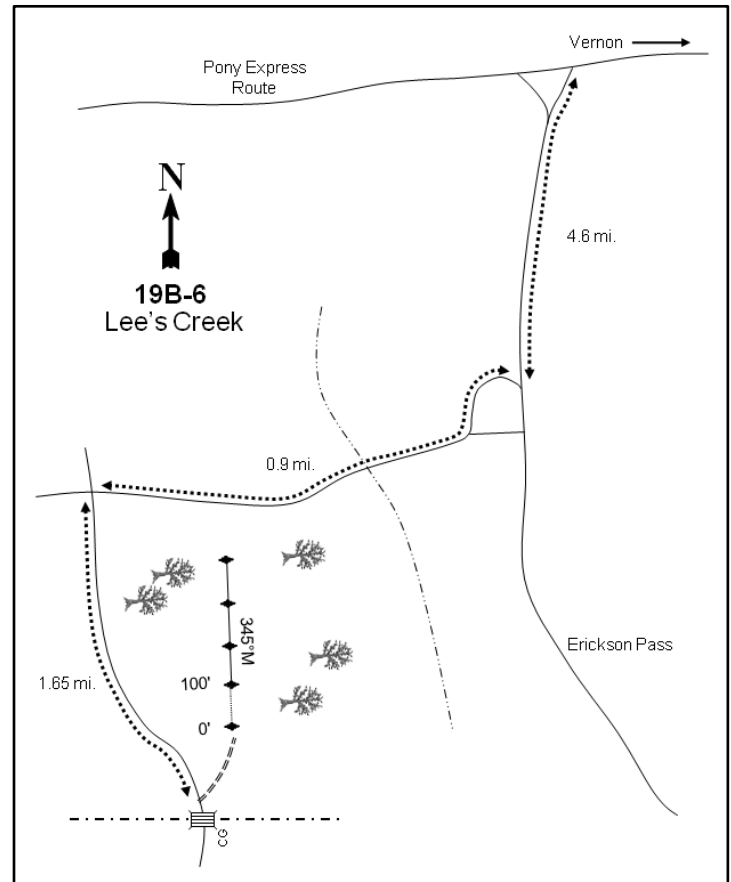
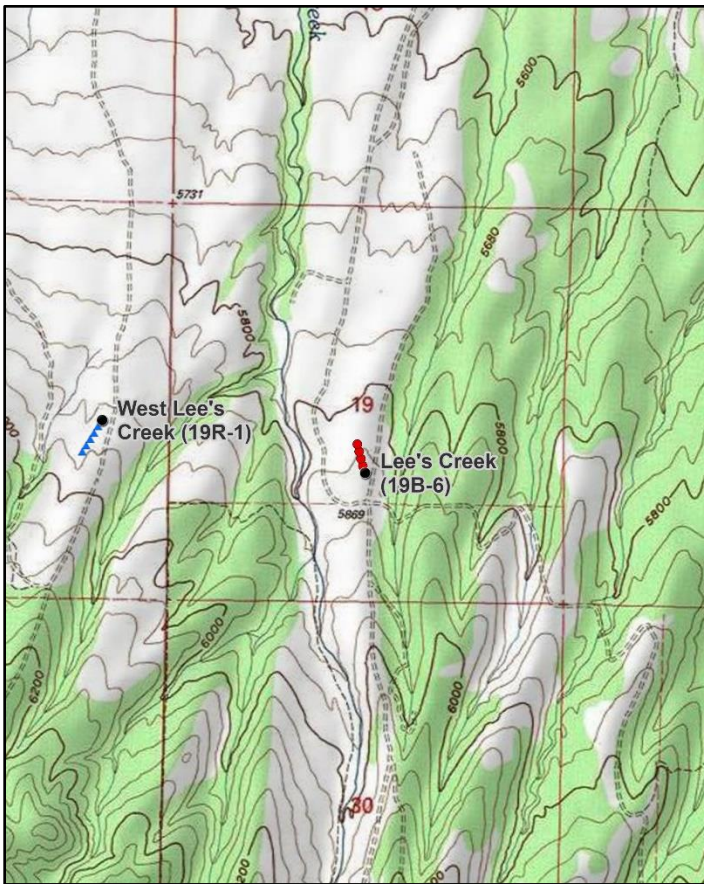
Table 19B-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	20	-	-	-	-	-	9.5
2007	21	-	10	60	20	10	9.8
2012	6	-	100	-	-	-	14.6
2017	14	13	75	13	-	-	5.4
2022	9	-	100	-	-	-	3.5

Table 01-02.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	23.0	12.5	7.9	30.0	0.0	10.0	0.0	83.3	Excellent
2002	26.7	7.8	1.7	23.8	0.0	0.7	0.0	60.6	Fair
2007	30.0	3.5	0.4	30.0	0.0	6.0	0.0	69.8	Good
2012	30.0	8.2	0.0	30.0	0.0	7.5	0.0	75.7	Good
2017	30.0	6.0	0.0	30.0	0.0	10.0	0.0	76.0	Good
2022	26.5	3.9	0.0	30.0	0.0	10.0	0.0	70.3	Good

LEE'S CREEK - STUDY NO. 19B-6

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Indian Peaks SE; Township 9S, Range 7W, Section 19
NAD 83 UTM ZONE 12, 357007 East 4430989 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
345° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

Starting at the intersection of the Erickson Pass and Pony Express Roads, proceed south on Erickson Pass Road for 4.6 miles to an intersection. Turn right at the intersection and proceed west for 0.9 miles to another intersection. Turn left at the intersection and continue south for 1.65 miles to a cattle guard and gate. From the cattle guard, the 0-foot stake is 70 paces away at 12 degrees magnetic. The study is located just inside the chaining area that is adjacent to the burned area. The 0-foot stake is marked with a red browse tag numbered 121.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	GOVERNMENT CREEK
Elevation	5,850ft (1,783m)
Aspect	North
Slope	5%
Sample Dates	07/30/1997, 08/06/2002, 06/05/2007, 06/19/2012, 06/05/2017, 06/07/2022

Table 19B-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	James Seeding	-	August-December 1970	1500
Seeding - Aerial Before	James Seeding	-	August-December 1970	1500

Table 19B-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
James Seeding			Aerial	Oct 1970	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron desertorum	Desert Wheatgrass		10.00	0.00
F	Medicago sativa	Alfalfa	Ladak	0.10	0.00
S	Atriplex canescens	Fourwing Saltbush		0.20	0.00

Wildlife Habitat and Vegetation History**Table 19B-06.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter/spring	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	crucial	year-long	

Table 19B-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I transitioning to Phase II
2002	Mountain Big Sagebrush	Phase I transitioning to Phase II
2007	Mountain Big Sagebrush	Phase I transitioning to Phase II
2012	Mountain Big Sagebrush	Phase I transitioning to Phase II
2017	Mountain Big Sagebrush	Phase I transitioning to Phase II
2022	Mountain Big Sagebrush	Phase I transitioning to Phase II

Site Notes

This winter range study samples an old Utah juniper (*Juniperus osteosperma*) chaining that is located in the lower portion of the Lee's Creek drainage: it is situated on a ridge that runs north-south, and the perennial stream Lee's Creek is located 900 feet to the west. The 200- and 300-foot stakes and rebar for belts 2, 3, and 4 were missing and replaced in 2022.

Soils**Table 19B-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.0	38.0	36.1	25.9	3.0	6.3	182.4	0.7	07/30/1997

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with other shrub species scattered throughout (Photos, Table 19B-06.12, Table 19B-06.13). The herbaceous understory is abundant, with a majority of the cover provided by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and the native perennial grass species Sandberg bluegrass (*Poa secunda*). Bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2022 (Table 19B-06.7, Table 19B-06.10). Forbs are moderately diverse with the native perennial species browse milkvetch (*Astragalus cibarius*) contributing the most cover of any one species. In addition, introduced annual species such as desert madwort (*Alyssum desertorum*) and curvseed butterwort (*Ceratocephala testiculata*) are abundant (Table 19B-06.11). This site is considered to be within Phase I transitioning to Phase II of woodland succession, with line intercept cover of Utah juniper (*Juniperus osteosperma*) increasing each sample year since 2002, except in 2022 where cover had slightly decreased (Table 19B-06.4, Table 19B-06.12). Without a tree-removing disturbance, this site is expected to continue to progress further in the phases of woodland succession.

Trend Summary Tables**Table 19B-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	4.6	0.3	9.6	-	-	-
2002	5.1	1.2	9.3	7.1	0.5	14.4
2007	4.6	0.0	12.6	10.6	0.1	16.8
2012	8.8	-	12.9	8.7	-	18.5
2017	6.6	0.0	9.1	9.4	-	19.8
2022	5.1	-	8.5	6.7	-	19.0

Table 19B-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	23	368	206	67	0.2	14.5	0.6	1.9
2002	-	352	-	52	-	12.1	-	0.9
2007	12	363	261	41	0.0	14.2	1.0	0.6
2012	9	371	259	80	0.0	18.4	1.0	1.0
2017	6	368	315	151	0.0	19.2	2.2	4.5
2022	4	329	403	107	0.0	19.0	4.3	3.8

Table 19B-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.0	5.2	31.9	11.5	1.9	26.2
2002	24.9	0.6	31.7	23.3	2.6	27.6
2007	33.8	0.3	33.4	14.4	1.4	32.9
2012	24.2	0.4	39.2	10.4	2.5	41.9
2017	30.2	2.0	36.2	23.1	1.1	33.2
2022	23.1	1.3	36.8	21.7	4.0	38.0

Table 19B-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	22	-	14	-	27
2002	14	-	3	-	8
2007	7	-	10	1	60
2012	2	-	2	-	8
2017	3	-	2	-	18
2022	3	-	1	-	4
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	21.1 (52.0)	-	0.7 (1.7)	-	-
2007	15.3 (37.7)	-	8.7 (21.5)	1.3 (3.3)	-
2012	-	8.7 (21.5)*	-	-	-
2017	53.7 (132.7)	-	5.3 (13.2)	-	-
2022	2.9 (7.2)	-	0.7 (1.7)	-	-

*Pellets per acre (ha)

Table 19B-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1997	0	1	325	23	2	-	239	-
2002	-	-	270	-	5	-	238	3
2007	-	-	278	12	0	-	278	5
2012	-	-	193	9	-	-	345	6
2017	-	-	246	6	4	-	319	7
2022	-	-	233	4	5	2	253	20
year	Average Cover (%)							
1997	0.0	0.0	10.0	0.2	0.0	-	4.4	-
2002	-	-	8.9	-	0.2	-	3.0	0.0
2007	-	-	8.0	0.0	0.0	-	6.1	0.1
2012	-	-	4.8	0.0	-	-	13.5	0.0
2017	-	-	8.3	0.0	0.0	-	10.7	0.2
2022	-	-	11.9	0.0	0.2	0.0	6.1	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (tesser rushy milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata ^a (western tansymustard)	Lactuca serriola ^{ai} (prickly lettuce)	Microsteris gracilis ^a (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
1997	131	-	8	-	0	-	110	6	-	4	-	-	-	-	1	29	25
2002	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	33	17
2007	45	10	9	-	-	-	251	-	-	-	-	-	1	5	-	16	8
2012	151	20	12	7	3	-	219	3	-	3	-	-	-	-	2	28	13
2017	245	30	74	1	3	13	246	-	-	0	7	-	-	-	3	38	33
2022	327	27	61	1	-	-	365	-	3	0	6	3	-	-	1	14	19
year	Average Cover (%)																
1997	0.3	-	0.2	-	0.0	-	0.3	0.0	-	0.0	-	-	-	-	0.0	1.3	0.3
2002	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	0.8	0.1
2007	0.1	0.0	0.1	-	-	-	0.8	-	-	-	-	-	0.0	0.0	-	0.4	0.0
2012	0.3	0.1	0.1	0.1	0.1	-	0.7	0.0	-	0.0	-	-	-	-	0.0	0.5	0.1
2017	1.1	0.3	2.6	0.0	0.0	0.0	1.1	-	-	0.0	0.1	-	-	-	0.0	1.1	0.4
2022	1.6	0.2	2.7	0.1	-	-	2.7	-	0.0	0.0	0.0	0.0	-	-	0.0	0.4	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1997	2	0
2002	-	-
2007	6	1
2012	10	3
2017	1	-
2022	-	4
year	Average Cover (%)	
1997	0.0	0.0
2002	-	-
2007	0.0	0.0
2012	0.0	0.0
2017	0.0	-
2022	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	7	0.1	0.5	14.4	-
2007	10.6	-	0.1	16.8	-
2012	8.7	-	-	18.5	-
2017	9.4	-	-	19.8	-
2022	6.7	-	-	19	-
year	Quadrat Cover (%)				
1997	4.6	0.0	0.3	9.6	-
2002	5.1	0.0	1.2	9.3	-
2007	4.6	-	0.0	12.6	-
2012	8.8	-	-	12.9	-
2017	6.4	-	0.0	9.1	0.1
2022	5.1	-	-	8.5	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	2260	1760	72	28	0	6	1	5	58/88
2002	3260	20	23	69	7	7	0	7	53/77
2007	2200	20	19	62	19	46	6	56	61/81
2012	1660	100	5	88	7	31	0	22	62/91
2017	1660	-	10	78	12	7	0	6	64/101
2022	1440	20	13	40	47	0	0	50	- / -
Atriplex canescens^p -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	40	-	0	100	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	140	60	100	0	0	14	29	14	- / -
2002	20	-	0	0	100	0	100	0	28/42
2007	-	-	-	-	-	-	-	-	24/36
2012	-	-	-	-	-	-	-	-	29/60
2017	-	-	-	-	-	-	-	-	31/35
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1997	240	-	17	83	0	0	0	0	19/26
2002	480	-	4	58	38	0	0	13	19/28
2007	140	-	0	43	57	0	0	29	19/21
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	0	100	0	0	0	0	19/35
2022	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1997	120	-	0	100	0	0	0	0	-/-
2002	160	-	0	100	0	0	0	0	-/-
2007	180	-	0	100	0	0	0	0	-/-
2012	140	20	0	100	0	0	0	14	-/-
2017	200	-	10	90	0	0	0	0	-/-
2022	160	-	0	88	13	0	0	25	-/-
Opuntia -- (pricklypear)									
1997	-	-	-	-	-	-	-	-	15/54
2002	-	-	-	-	-	-	-	-	12/45
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	18/36
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1997	20	-	100	0	0	0	100	0	22/61
2002	40	-	100	0	0	0	0	0	30/131
2007	20	-	100	0	0	100	0	0	42/127
2012	20	20	0	100	0	100	0	0	49/111
2017	60	-	0	100	0	0	67	0	58/123
2022	20	-	0	100	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

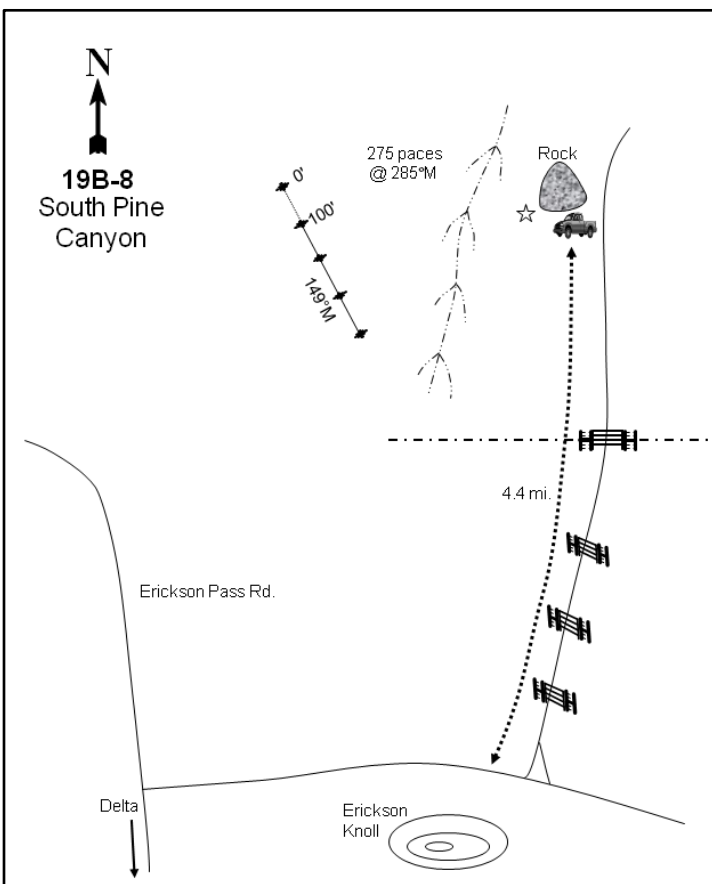
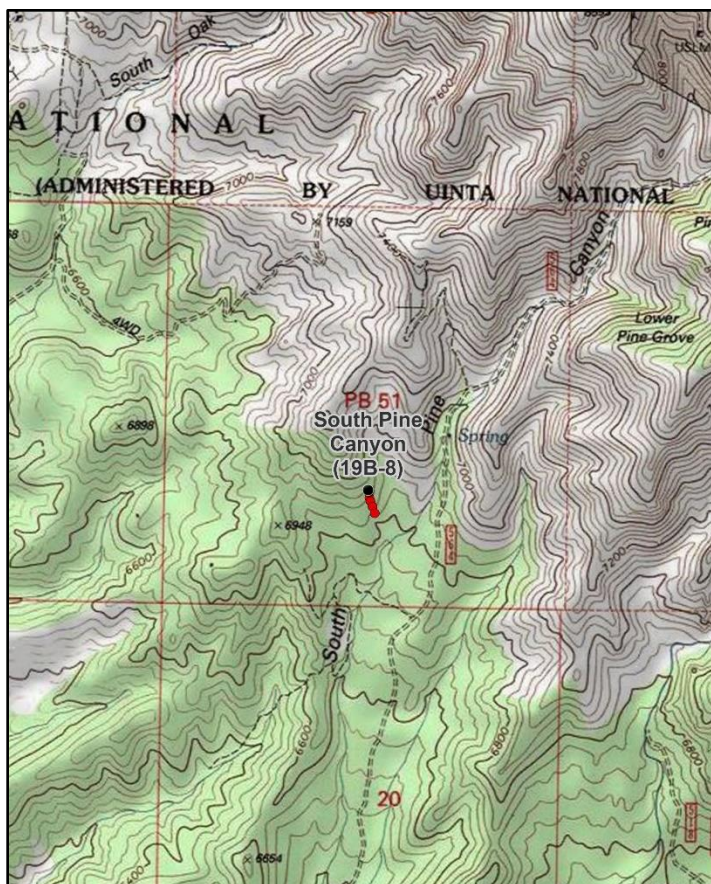
Table 19B-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	97	-	-	-	-	-	12.8
2007	91	-	-	42	53	5	20.1
2012	81	-	11	32	42	16	26.5
2017	69	-	-	24	71	6	27.9
2022	82	-	11	17	11	61	24.3

Table 19B-06.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	5.8	0.0	0.0	29.0	-0.2	3.8	0.0	38.4	Poor
2002	6.4	12.8	11.7	24.3	0.0	1.7	0.0	56.9	Fair
2007	13.3	9.3	9.6	28.5	0.0	1.1	0.0	61.6	Fair
2012	10.9	12.8	2.4	30.0	0.0	2.0	0.0	58.1	Fair
2017	11.8	11.4	4.8	30.0	0.0	9.1	0.0	67.0	Good
2022	8.4	0.8	6.3	30.0	0.0	7.6	0.0	53.0	Fair

SOUTH PINE CANYON - STUDY NO. 19B-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Erickson Knoll NE; Township 10S, Range 6W, Section 51
NAD 83 UTM ZONE 12, 368086 East 4423524 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

3976
149° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard; Line 3: 80ft Long

Directions to Site

Starting on the road north of Erickson Knoll (road 564), travel north on South Pine Canyon Road for 4.4 miles. Pass through a series of four gates and the National USFS boundary line. Stop next to a huge rock on the west side of the road. From the west side of the road, the 0-foot baseline stake is 250 paces away at 285 degrees magnetic (across South Pine wash). The 0-foot baseline stake is marked by browse tag #3976.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	WEST COTTONWOOD
Elevation	6,930ft (2,112m)
Aspect	South
Slope	20-22%
Sample Dates	08/06/2002, 08/02/2007, 06/20/2012, 06/07/2017, 06/07/2022

Table 19B-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	East Harker (Vernon Complex)	-	1994	8197

Wildlife Habitat and Vegetation History**Table 19B-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Greater Sage-Grouse	occupied	year-long

Table 19B-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
2002	Annual Grass/Utah Serviceberry/Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment
2022	Mountain Big Sagebrush	No Encroachment

Site Notes

This study is located on a small ridgeline that samples important winter range for mule deer; an ephemeral stream is located 750 feet east of the site.

Soils**Table 19B-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.1	69.3	16.7	14.0	2.5	13.8	227.2	0.6	08/06/2002

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was in a stable state as a mixed mountain brush plant community when established in 1983. A fire sometime between 1989 and 1997 (Table 19B-08.1) removed a majority of the browse component, and when the site was sampled in 2002 it had transitioned into a community dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) with a small component of Utah serviceberry (*Amelanchier utahensis*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) in the overstory. Mountain big sagebrush has continued to recover and has been the dominant vegetation component since the 2007 sample year (Photos, Table 19B-08.12, Table 19B-08.13). The herbaceous understory was dominated by the perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) prior to the wildfire, but has been mainly comprised of cheatgrass in subsequent sample years (Table 19B-08.10). Annual forbs such as desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) have been more abundant than perennial forbs following the fire (Pre-1992 Data, Table 19B-08.11). Finally, Utah juniper (*Juniperus osteosperma*) trees were present during the 1987 and 1989 samplings (Photos), but burned in the wildfire; infilling has not occurred as of the 2022 sample year (Table 19B-08.12, Table 19B-08.13).

Trend Summary Tables**Table 19B-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	2.1	0.6	-	4.2	0.9	-
2007	16.8	4.5	-	20.2	5.3	-
2012	31.5	6.6	-	33.8	8.4	-
2017	36.2	3.3	-	39.4	3.4	-
2022	31.1	4.0	-	40.8	3.5	-

Table 19B-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	340	42	34	13	9.8	1.8	0.8	0.3
2007	374	16	288	113	10.1	0.9	3.4	1.4
2012	372	34	269	67	11.2	0.8	3.1	1.3
2017	293	60	324	92	6.0	2.0	6.0	1.6
2022	328	74	358	83	7.7	2.6	10.4	0.7

Table 19B-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	26.7	-	27.0	24.7	13.5	15.0
2007	21.9	0.0	15.9	21.0	13.4	34.9
2012	16.7	0.1	44.9	8.5	12.8	51.4
2017	27.4	0.2	39.9	16.0	12.0	47.8
2022	20.6	0.4	36.7	23.2	14.3	46.2

Table 19B-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
2002	5	-	20	-	-	1
2007	1	-	17	5	-	6
2012	-	-	6	-	-	1
2017	-	-	11	-	-	-
2022	1	-	21	-	-	4
Year	Days Use Per Acre (ha)					
2002	7.2 (17.9)	-	54.9 (135.7)	-	-	-
2007	-	-	27.5 (67.9)	2.7 (6.6)	-	-
2012	0.7 (1.8)	-	10.0 (24.8)	-	-	-
2017	-	8.7 (21.5)*	20.1 (49.7)	0.7 (1.7)	0.6 (1.4)	-
2022	-	-	35.5 (87.7)	-	-	-

*Pellets per acre (ha)

Table 19B-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency						
2002	340	-	-	3	1	36	2
2007	374	-	-	-	0	13	3
2012	372	-	-	-	17	18	-
2017	293	0	-	3	15	47	3
2022	328	18	5	1	13	39	-
year	Average Cover (%)						
2002	9.8	-	-	0.0	0.0	1.7	0.0
2007	10.1	-	-	-	0.0	0.8	0.1
2012	11.2	-	-	-	0.2	0.6	-
2017	6.0	0.0	-	0.1	0.7	1.3	0.0
2022	7.7	0.7	0.0	0.0	0.1	1.8	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2002	-	-	-	-	-	-	1	9	-	-	-	-	2	-	-	-	-
2007	-	197	1	-	-	3	32	2	92	4	-	-	4	10	71	3	13
2012	-	262	-	3	-	-	22	1	11	-	-	-	-	4	5	-	17
2017	8	288	3	1	2	-	9	8	18	2	2	5	-	14	6	2	10
2022	1	354	-	7	-	-	0	2	51	-	8	1	1	12	3	-	13
year	Average Cover (%)																
2002	-	-	-	-	-	-	0.0	0.5	-	-	-	-	0.0	-	-	-	-
2007	-	0.9	0.0	-	-	0.0	0.2	0.3	0.3	0.0	-	-	0.0	0.0	0.7	0.0	0.2
2012	-	2.7	-	0.0	-	-	0.4	0.1	0.1	-	-	-	-	0.1	0.0	-	0.2
2017	0.0	4.9	0.0	0.2	0.0	-	0.1	0.3	0.0	0.0	0.0	0.2	-	0.2	0.0	0.0	0.2
2022	0.0	9.0	-	0.1	-	-	0.0	0.0	0.1	-	0.1	0.0	0.0	0.1	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Erodium cicutarium ^{ai} (redstem stork's bill)												
Hackelia patens (spotted stickseed)												
Lactuca serriola ^{ai} (prickly lettuce)												
Lappula occidentalis ^a (flatspine stickseed)												
Lithospermum ruderale (western stoneseed)												
Lomatium grayi (Gray's biscuitroot)												
Machaeranthera canescens (hoary tansyaster)												
Microsteris gracilis ^a (slender phlox)												
Phlox longifolia (longleaf phlox)												
Sanguisorba minor ^r (small burnet)												
Tragopogon dubius ^{ai} (yellow salsify)												
Vicia americana (American vetch)												
year	Nested Frequency											
2002	14	-	11	-	5	-	-	-	3	2	-	-
2007	77	3	2	55	9	7	8	4	47	-	-	2
2012	35	-	4	-	4	2	2	-	10	-	-	8
2017	75	-	4	-	9	-	-	1	31	-	-	11
2022	43	-	-	-	2	-	-	-	33	-	1	16
year	Average Cover (%)											
2002	0.2	-	0.1	-	0.2	-	-	-	0.0	0.0	-	-
2007	0.8	0.0	0.0	0.3	0.5	0.0	0.1	0.0	0.3	-	-	0.0
2012	0.2	-	0.0	-	0.5	0.0	0.0	-	0.0	-	-	0.1
2017	0.7	-	0.0	-	0.4	-	-	0.0	0.1	-	-	0.2
2022	1.2	-	-	-	0.0	-	-	-	0.2	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Amelanchier utahensis ^p (Utah serviceberry)							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)							
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)							
Ericameria nauseosa (rubber rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Mahonia repens (creeping barberry)							
Purshia tridentata ^p (antelope bitterbrush)							
year	Line Intercept Cover (%)						
2002	2.7	1.1	0.9	-	-	-	0.4
2007	5.1	12.9	4	1	-	0.3	2.2
2012	6.4	24.7	7	1.3	-	0.1	2.7
2017	6.8	30.2	2.7	0.6	-	0.1	2.4
2022	8.6	29	2.7	0.6	-	0.2	3.2
year	Quadrat Cover (%)						
2002	1.4	0.3	0.6	-	-	0.1	0.4
2007	3.5	11.9	3.4	0.8	-	0.3	1.3
2012	4.1	25.3	4.9	1.4	-	0.3	2.1
2017	6.0	28.0	2.3	0.7	0.1	0.2	2.2
2022	6.2	23.8	3.0	0.8	-	0.2	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
2002	320	-	0	69	31	0	63	38	50/107
2007	200	-	0	100	0	70	10	10	79/144
2012	280	-	0	100	0	14	0	0	87/144
2017	320	300	0	81	19	19	6	0	88/144
2022	320	40	6	88	6	19	6	13	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
2002	100	-	40	60	0	40	0	0	50/85
2007	10620	4060	56	44	0	9	2	1	39/64
2012	10480	20	3	86	12	13	2	25	26/57
2017	9720	20	9	76	15	29	20	7	35/66
2022	7760	180	2	80	18	2	0	20	- / -
Atriplex canescens^P -- (fourwing saltbush)									
2002	-	-	-	-	-	-	-	-	26/56
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2002	220	-	0	100	0	9	0	0	38/79
2007	4980	240	29	64	7	16	0	11	33/69
2012	4800	-	4	95	1	0	0	1	25/48
2017	4860	240	15	79	6	0	0	2	22/39
2022	4020	100	68	30	2	0	0	3	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2002	-	-	-	-	-	-	-	-	- / -
2007	540	-	7	93	0	26	4	4	40/51
2012	680	-	0	88	12	3	0	6	57/62
2017	380	-	0	53	47	0	5	58	59/64
2022	300	-	7	73	20	20	0	27	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	60	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
2002	200	-	10	90	0	0	0	80	6/14
2007	960	-	0	77	23	0	0	88	13/19
2012	520	-	0	100	0	0	0	0	8/13
2017	1340	-	0	100	0	0	0	0	7/8
2022	300	-	0	100	0	0	0	0	- / -

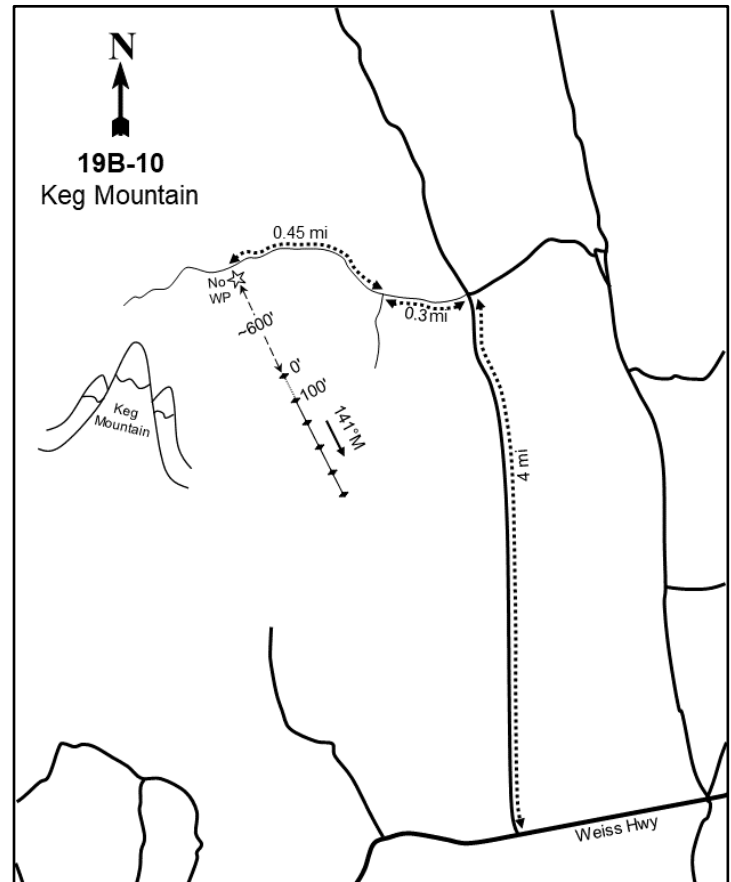
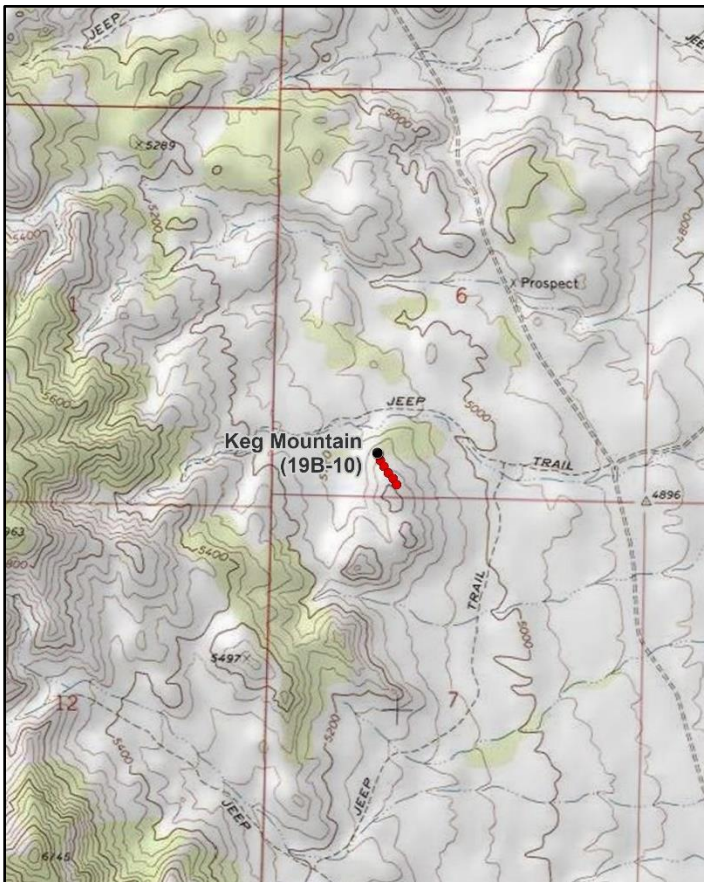
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
2002	20	-	0	100	0	0	0	0	16/50
2007	60	-	0	100	0	0	0	33	14/69
2012	40	-	0	100	0	0	0	0	10/32
2017	20	-	0	100	0	0	0	0	13/29
2022	40	-	0	100	0	0	0	50	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2002	60	-	0	100	0	0	100	0	23/65
2007	60	-	0	67	33	0	100	0	38/159
2012	60	-	0	100	0	67	33	0	55/178
2017	100	20	0	100	0	20	60	0	55/158
2022	200	-	10	90	0	40	30	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	54/103
2012	-	-	-	-	-	-	-	-	34/96
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Tetradymia canescens -- (spineless horsebrush)									
2002	20	-	100	0	0	100	0	0	- / -
2007	-	-	-	-	-	-	-	-	43/175

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-08.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.5	6.2	15.0	12.8	-2.4	3.4	0.0	52.5	Good
2001	23.0	9.7	11.3	18.4	-2.7	3.7	0.0	63.3	Good-Excellent
2006	22.5	4.5	3.6	11.4	-4.0	1.9	0.0	39.9	Fair
2011	24.1	7.7	3.9	22.3	-8.5	3.8	0.0	53.4	Good
2016	21.5	7.3	3.2	6.6	-6.9	3.5	0.0	35.1	Fair
2021	23.4	4.4	9.0	15.8	-0.2	4.7	0.0	57.0	Good

KEG MOUNTAIN - STUDY NO. 19B-10

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Keg Mountain Ranch S; Township 12S, Range 8W, Section 06
NAD 83 UTM ZONE 12, 346452 East 4407197 North

Transect Information

Browse Tag # (0' Stake)	76
Transect Bearing	141° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Weiss Highway and Slow Rocky Mountain Elk Road, turn north and travel along the foothills of Keg Mountain for about 5.2 miles to an intersection. Turn left (west), and travel another 0.84 miles to wide turn-around spot and park. From here, and under the guidance of a GPS, cross the ravine to the south and hike up to the hill to the site. The 0-foot stake is marked by browse tag #141.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	DEATH CANYON
Elevation	No data
Aspect	Northeast
Slope	7%
Sample Dates	05/31/2022

Wildlife Habitat and Vegetation History**Table 19B-10.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Pronghorn	crucial	year-long

Table 19B-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Black Sagebrush	Phase I

Site Notes

No Notes

Soils**Table 19B-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.9	36.4	40.3	23.3	2.2	3.4	300.0	0.6	05/31/2022

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R047XA316UT
States and Transitions	No state and transition model is available for this ecological site.

As of study establishment in 2022, the plant community on this site is dominated by a dense mixture of shrubs comprised of black sagebrush (*Artemisia nova*), Nevada jointfir (*Ephedra nevadensis*), and horsebrush species (*Tetradymia* sp.) (Table 19B-10.12, Table 19B-10.13). The herbaceous understory is limited with much of it made up of the native perennial grass species Sandberg bluegrass (*Poa secunda*) (Table 19B-10.7, Table 19B-10.10, Table 19B-10.11). Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) trees are present and the site is considered to be in Phase I of woodland succession (Table 19B-10.4, Table 19B-10.14).

Trend Summary Tables

Table 19B-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	24.8	2.7	1.5	23.9	2.6	1.8

Table 19B-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	80	312	35	23	0.5	7.7	0.1	0.4

Table 19B-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	13.6	1.7	18.6	40.7	14.2	33.6

Table 19B-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2022	14	1	12
Year	Days Use Per Acre (ha)		
2022	6.7 (16.6)	2.7 (6.6)	-

Table 19B-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus rubens ^{ai} (red brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency						
2022	20	21	50	1	302	35	16
year	Average Cover (%)						
2022	0.3	0.2	0.2	0.0	6.4	0.9	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES									
Arabis (rockcress)									
Castilleja angustifolia (northwestern Indian paintbrush)									
Ceratocephala testiculata ^{ai} (curvseed butterwort)									
Cryptantha ^a (annual cryptantha)									
Eriogonum ovalifolium (cushion buckwheat)									
Phlox austromontana (mountain phlox)									
Phlox longifolia (longleaf phlox)									
Sisymbrium altissimum ^{ai} (tall tumbledustard)									
Stenotus acaulis (stemless mock goldenweed)									
year	Nested Frequency								
2022	1	3	34	6	4	8	8	4	2
year	Average Cover (%)								
2022	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES									
Artemisia nova ^p (black sagebrush)									
Atriplex confertifolia ^p (shadscale saltbush)									
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)									
Ephedra nevadensis ^p (Nevada jointfir)									
Gutierrezia sarothrae (broom snakeweed)									
Juniperus osteosperma ⁱ (Utah juniper)									
Purshia stansburiana ^p (Stansbury cliffrose)									
Tetradymia nuttallii (Nuttall's horsebrush)									
Tetradymia spinosa (shortspine horsebrush)									
year	Line Intercept Cover (%)								
2022	22.3	0.2	2	0.5	0.1	1.8	0.9	0.4	0.1
year	Quadrat Cover (%)								
2022	24.7	0.0	1.9	0.1	0.0	1.5	0.0	0.4	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova ^P -- (black sagebrush)									
2022	6780	40	4	78	18	15	17	22	- / -
Atriplex confertifolia ^P -- (shadscale saltbush)									
2022	20	-	0	0	100	0	0	100	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2022	1720	20	14	54	33	2	0	31	- / -
Ephedra nevadensis ^P -- (Nevada jointfir)									
2022	260	-	0	92	8	0	0	8	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2022	40	-	0	100	0	0	0	0	- / -
Juniperus osteosperma ^I -- (Utah juniper)									
2022	20	-	0	100	0	0	0	0	- / -
Purshia stansburiana ^P -- (Stansbury cliffrose)									
2022	80	-	0	100	0	0	0	25	- / -
Tetradymia nuttallii -- (Nuttall's horsebrush)									
2022	60	-	0	33	67	0	0	67	- / -
Tetradymia spinosa -- (shortspine horsebrush)									
2022	300	-	13	40	47	7	13	53	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

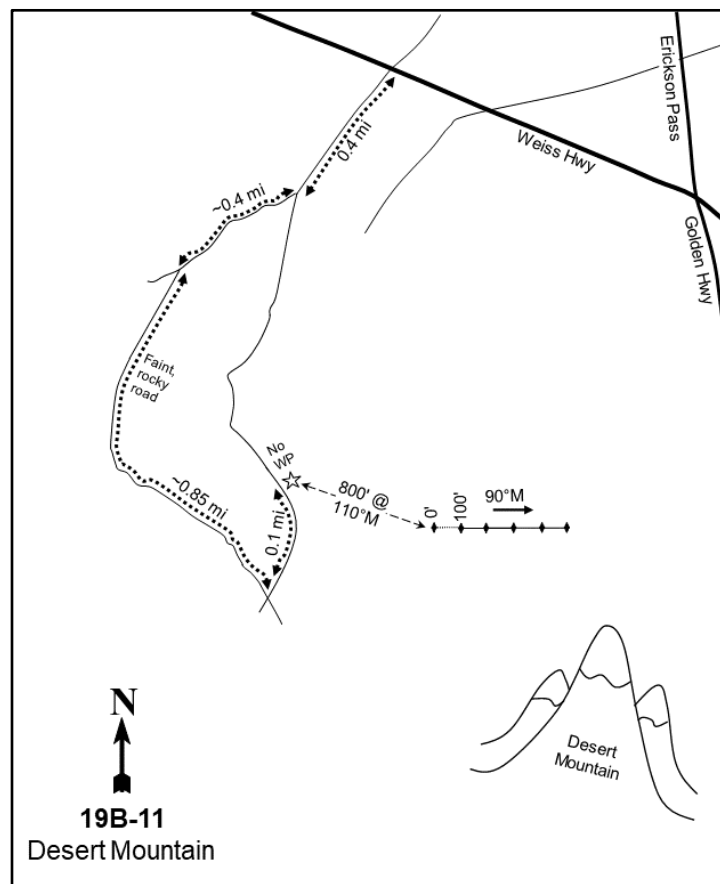
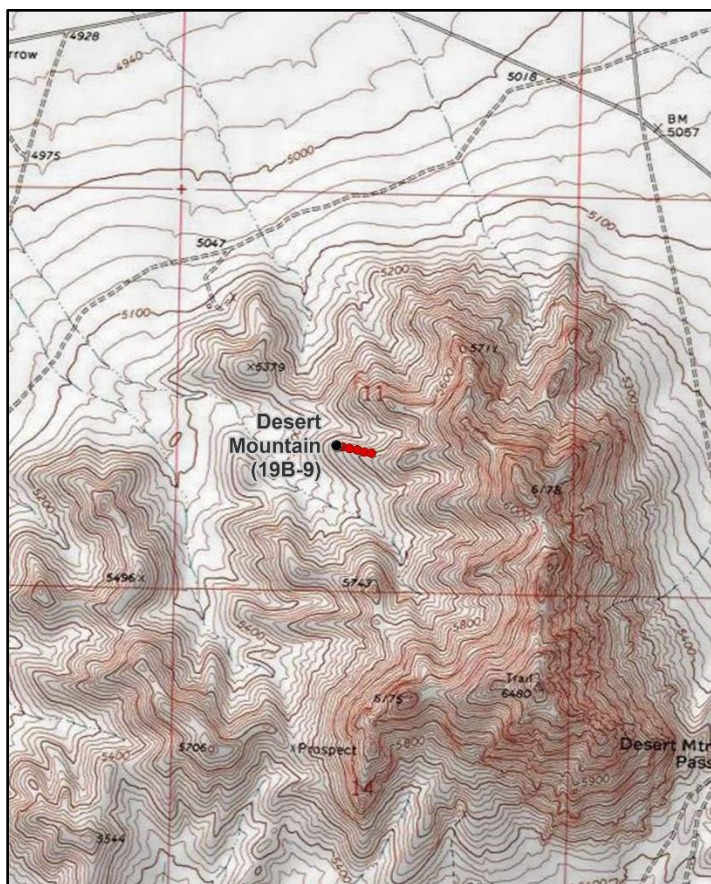
Table 19B-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2022	26	-	25	33	33	8	26.3
Pinus monophylla (singleleaf pinyon)							
2022	3	100	-	-	-	-	0.5

Table 19B-10.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	30.0	9.7	2.1	15.3	-0.3	0.8	0.0	57.6	Fair

DESERT MOUNTAIN - STUDY NO. 19B-11



19B-11
Desert Mountain

Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Desert Mountain Pass; Township 12S, Range 7W, Section 11
NAD 83 UTM ZONE 12, 362642 East 4405683 North

Transect Information

Browse Tag # (0' Stake)	77
Transect Bearing	90° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Golden/Ericson Pass Highway and Weiss Highway, drive about 0.5 miles to a faint intersecting road. Turn left (southwest), and travel along this faint road for 1.61 miles until a parking spot is found. Walk to the site using the GPS. The 0-foot stake is identified by the browse tag #77.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MEADOW CREEK
Elevation	No data
Aspect	West
Slope	20%
Sample Dates	05/31/2022

Wildlife Habitat and Vegetation History**Table 19B-11.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter/spring
Pronghorn	crucial	year-long

Table 19B-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils**Table 19B-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	8.4	59.9	24.6	15.6	1.9	3.9	910.0	0.8	05/31/2022

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Bouldery Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY208UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2022, the plant community on this site was dominated by a dense mixture of shrubs comprised of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), Nevada jointfir (*Ephedra nevadensis*), and horsebrush species (*Tetradymia* sp.) (Table 19B-11.12, Table 19B-11.13). The herbaceous understory was limited with much of it made up of the native perennial grass species Sandberg bluegrass (*Poa secunda*) (Table 19B-11.7, Table 19B-11.10, Table 19B-11.11). Utah juniper (*Juniperus osteosperma*) trees were present and the site was considered to be in Phase I of woodland succession (Table 19B-11.4, Table 19B-11.14).

Trend Summary Tables**Table 19B-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	10.4	5.2	-	10.2	3.2	-

Table 19B-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	384	202	219	25	8.8	5.3	5.8	0.3

Table 19B-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	8.6	0.6	17.1	32.1	34.2	31.8

Table 19B-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2022	13	-	5
Year	Days Use Per Acre (ha)		
2022	34.2 (84.4)	6.0 (14.9)	-

Table 19B-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES								
Achnatherum hymenoides (Indian ricegrass)								
Bromus rubens ^{ai} (red brome)								
Bromus tectorum ^{ai} (cheatgrass)								
Elymus elymoides (squirreltail)								
Pleuraphis jamesii (James' galleta)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
year	Nested Frequency							
2022	8	11	381	11	46	156	14	
year	Average Cover (%)							
2022	0.2	0.1	8.8	0.1	1.2	3.4	0.4	

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES								
Astragalus eurekaensis (Eureka milkvetch)								
Ceratocephala testiculata ^{ai} (curvseed butterwort)								
Erigeron pumilus (shaggy fleabane)								
Eriogonum ovalifolium (cushion buckwheat)								
Erodium cicutarium ^{ai} (redstem stork's bill)								
Gilia inconspicua ^a (shy gilia)								
Phlox longifolia (longleaf phlox)								
Sisymbrium altissimum ^{ai} (tall tumblemustard)								
year	Nested Frequency							
2022	6	5	2	5	215	2	12	6
year	Average Cover (%)							
2022	0.0	0.0	0.0	0.2	5.8	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	5.9	1.7	4.2	0.1	1.1	0.3	0.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	6.5	2.5	3.9	0.0	0.3	1.1	1.3
Ephedra nevadensis ^p (Nevada jointfir)	Quadrat Cover (%)						
Ephedra viridis ^p (mormon tea)	6.5	2.5	3.9	0.0	0.3	1.1	1.3
Grayia spinosa (spiny hopsage)	Quadrat Cover (%)						
Tetradymia nuttallii (Nuttall's horsebrush)	6.5	2.5	3.9	0.0	0.3	1.1	1.3
Tetradymia spinosa (shortspine horsebrush)	Quadrat Cover (%)						
	6.5	2.5	3.9	0.0	0.3	1.1	1.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis ^p -- (Wyoming big sagebrush)									
2022	1880	-	1	37	62	40	34	61	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2022	1400	-	4	74	21	0	0	23	- / -
Ephedra nevadensis ^p -- (Nevada jointfir)									
2022	1040	-	29	54	17	4	0	25	- / -
Ephedra viridis ^p -- (mormon tea)									
2022	60	-	0	67	33	0	0	33	- / -
Grayia spinosa -- (spiny hopsage)									
2022	240	-	8	75	17	0	0	25	- / -
Tetradymia nuttallii -- (Nuttall's horsebrush)									
2022	160	-	0	88	13	0	0	13	- / -
Tetradymia spinosa -- (shortspine horsebrush)									
2022	280	-	0	50	50	0	0	43	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

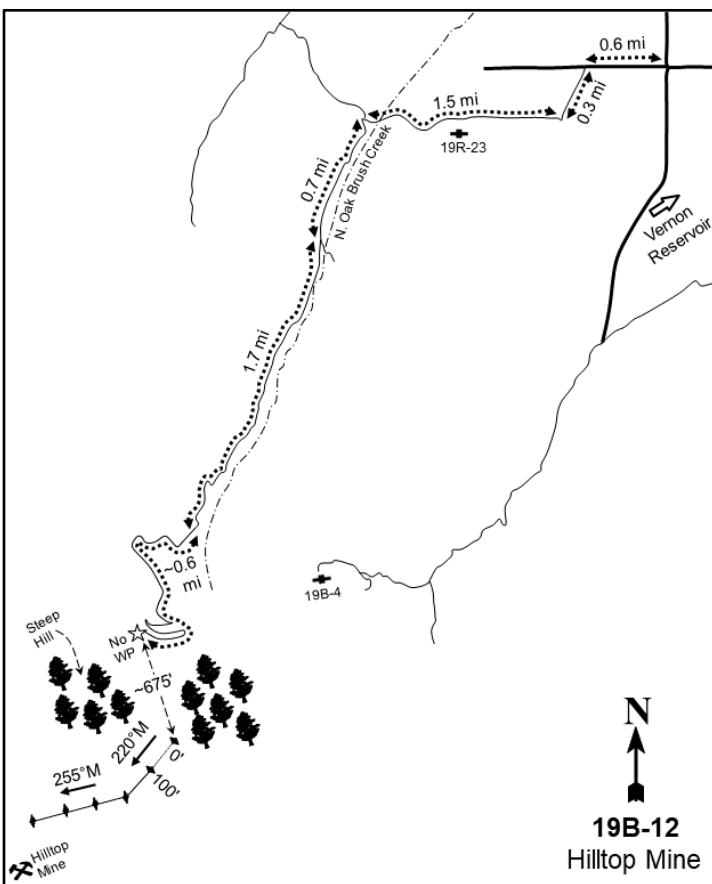
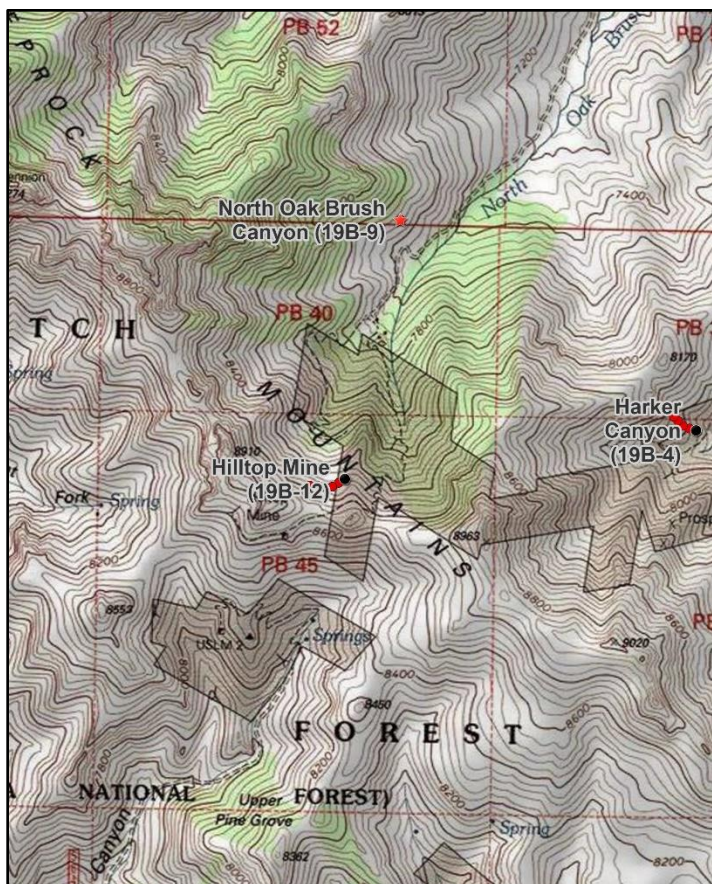
Table 19B-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2022	1	-	100	-	-	-	3.0

Table 19B-11.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	12.8	2.1	6.2	10.5	-6.6	0.6	0.0	25.5	Poor-Fair

HILLTOP MINE - STUDY NO. 19B-12



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Erickson Knoll NE; Township 10S, Range 6W, Section null
NAD 83 UTM ZONE 12, 369932 East 4425988 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
(95ft)
Belt Marker Placement

75
220° magnetic (Lines 3-5: 255° magnetic)
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5
No Rebar

Directions to Site

From the junction of Twelve Mile Road and Old Baldy Guard Station Road, turn right on to Old Baldy and travel 1.3 miles to Deep Lake Road. Turn right again and travel for a brief moment to Cowboy Camp Road and turn left. Travel along this road for another 0.9 miles and park. The 0-foot stake location is approximately 300 feet up hill. Use the GPS to find to determine the permanent location of the 0-stake.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	VERNON
Elevation	No data
Aspect	North
Slope	35-45%
Sample Dates	06/08/2022

Table 19B-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	East Harker (Vernon Complex)	-	1994	8197

Wildlife Habitat and Vegetation History

Table 19B-12.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Greater Sage-Grouse		

Table 19B-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Mountain Big Sagebrush/Perennial Forb-Grass	NA

Site Notes

The 500-foot stake is a piece of rebar.

Soils

Table 19B-12.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.7	53.7	28.8	17.5	13.6	29.6	739.0	1.6	06/09/2022

Site Potential

1981 - 2010 Average Annual Precipitation	30 inches
NRCS Ecological Site	High Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA530UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2022, the plant community on this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a mixture of other preferred shrubs -- Utah serviceberry (*Amelanchier utahensis*) and chokecherry (*Prunus virginiana*) -- that also provide valuable forage for wildlife (Table 19B-12.12, Table 19B-12.13). The herbaceous component of the community was diverse and abundant. Perennial grasses were abundant with the majority of the cover being contributed by the introduced perennial grass rescuegrass (*Bromus catharticus*) and the native perennial muttongrass (*Poa fendleriana*) (Table 19B-12.7, Table 19B-12.10). Perennial forbs were also abundant with parsnipflower buckwheat (*Eriogonum heracleoides*), silvery lupine (*Lupinus argenteus*), and oblongleaf bluebells (*Mertensia oblongifolia*) providing much of the community's production (Table 19B-12.7, Table 19B-12.11). Without disturbance this community will likely remain in this current state with no transitions in species composition.

Trend Summary Tables

Table 19B-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	16.2	8.3	-	16.6	5.4	-

Table 19B-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	406	16	386	-	27.6	0.0	29.2

Table 19B-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	3.4	0.6	52.4	0.7	13.8	59.2

Table 19B-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Yellow-bellied Marmot
	Quadrat Frequency		
2022	2	20	-
Year	Days Use Per Acre (ha)		
	2022	1.5 (3.6)	82.4 (203.6)

*Pellets per acre (ha)

Table 19B-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus catharticus ⁱ (rescuegrass)	Carex vallicola (valley sedge)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency				
2022	80	346	43	127	22
year	Average Cover (%)				
2022	1.5	18.8	1.1	5.6	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19B-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria rosea (rosy pussytoes)	Arabis holboellii ^a (Holboell's rockcress)	Arenaria fendleri (Fendler's sandwort)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Cerastium (mouse-ear chickweed)	Chenopodium atrovirens ^a (pinyon goosefoot)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Erigeron (fleabane)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erythronium grandiflorum (yellow avalanche-lily)	Eurybia glauca (gray aster)	Fritillaria atropurpurea (spotted fritillary)	Gayophytum ramosissimum ^a (pinyon groundsmoke)
year	Nested Frequency																
2022	10	15	9	42	29	4	150	4	31	2	4	150	72	7	5	23	3
year	Average Cover (%)																
2022	0.0	0.1	0.0	1.3	0.2	0.1	3.1	0.0	0.4	0.0	0.2	6.7	1.2	0.0	0.0	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Helianthella uniflora (oneflower helianthella)	Helioneris multiflora (showy goldeneye)	Heuchera parvifolia (litttleleaf alumroot)	Lupinus argenteus (silvery lupine)	Mertensia oblongifolia (oblongleaf bluebells)	Phlox longifolia (longleaf phlox)	Zigadenus elegans (mountain deathcamas)
year	Nested Frequency						
2022	5	4	55	92	194	243	66
year	Average Cover (%)						
2022	0.0	0.1	1.6	4.5	4.2	3.7	1.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19B-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Rhus glabra ^p (smooth sumac)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)							
2022	1.1	14.9	4.6	0.8	0.2	0.2	0.2	-
year	Quadrat Cover (%)							
2022	0.4	15.0	7.0	1.3	0.2	0.0	0.3	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19B-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2022	600	280	43	20	37	17	0	40	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2022	5980	40	19	64	17	2	0	16	- / -
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
2022	4560	700	14	69	17	0	0	16	- / -
Mahonia repens -- (creeping barberry)									
2022	6720	220	11	78	11	0	0	13	- / -
Prunus virginiana^p -- (chokecherry)									
2022	540	-	59	30	11	0	0	11	- / -
Rosa woodsii^p -- (Woods' rose)									
2022	820	-	24	59	17	0	5	12	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2022	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

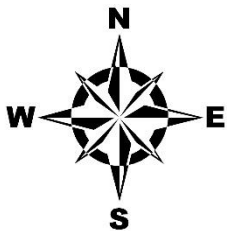
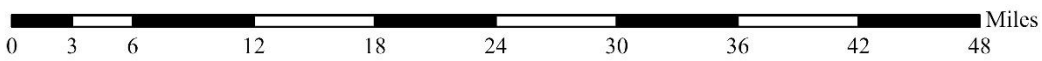
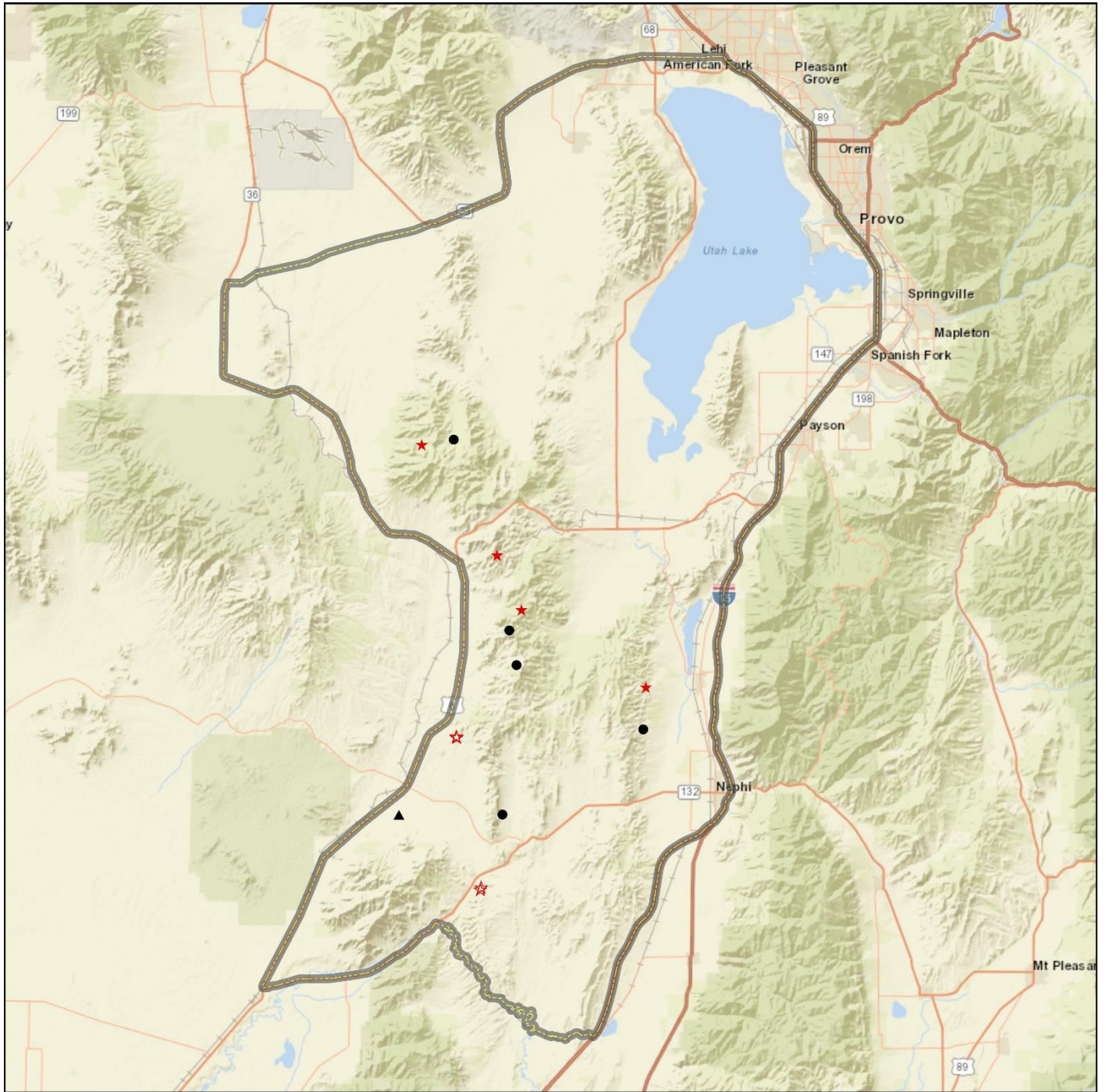
Table 19B-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pseudotsuga menziesii (Douglas-fir)							
2022	2	50	-	-	-	50	18.8

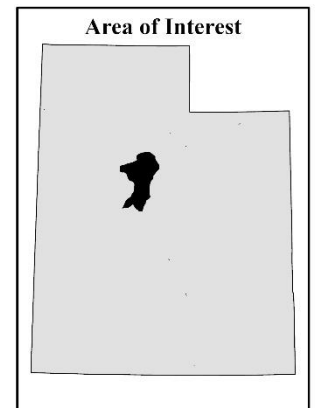
Table 19B-12.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2022	21.0	9.5	10.5	30.0	0.0	10.0	0.0	81.0	Good

WILDLIFE MANAGEMENT UNIT 19C – WEST DESERT, TINTIC

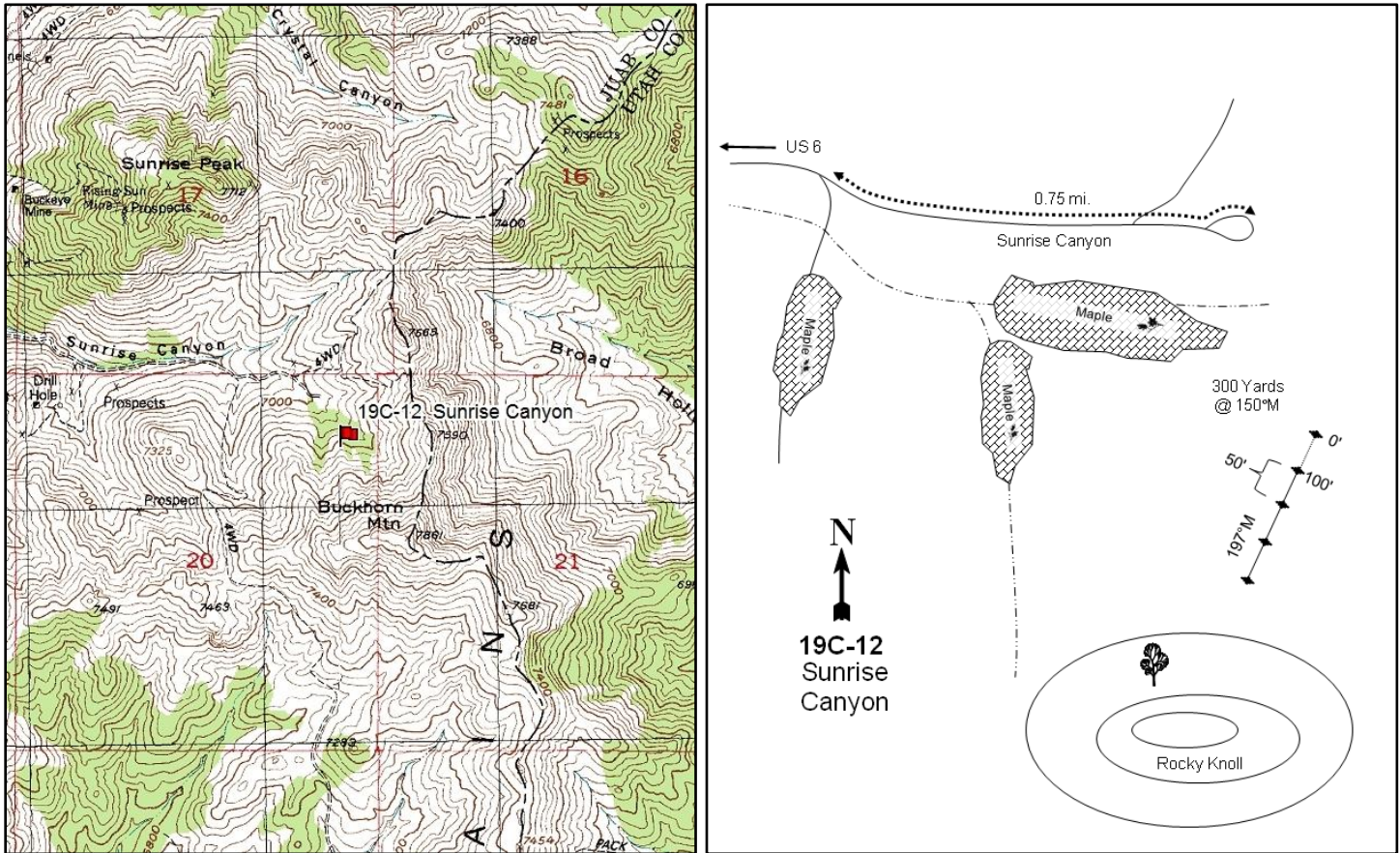


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 19C
★ RT, Suspended	
▲ WRI, Active	
☆ WRI, Suspended	



Credits: County of Utah, Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS

SUNRISE CANYON - STUDY NO. 19C-12

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Tintic Mountain NW; Township 11S, Range 2W, Section 20
NAD 83 UTM ZONE 12, 407276 East 4412453 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

437
197° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 3: 3ft, Belt 5: 1ft; Line 2: 50ft Long

Directions to Site

From the junction of Highway US-6 and U-36, proceed south on US-6 for 6.3 miles to where the Sunrise Seeding road leads off to the east at mile marker 132. Proceed east on this road for 0.7 miles to a fork, then keep left for an additional 0.9 miles to an intersection. Turn right (east) and travel up Sunrise Canyon for 0.85 miles to another fork. Stay left and go 0.75 miles to the end of the road in the bottom of Sunrise Canyon. From this point, the 0-foot mark of the baseline is located on a small ridge at 171 degrees magnetic on the opposite side of a maple-clogged draw. Walk on the designated azimuth through the draw to the sagebrush-grass ridge. The 0-foot stake, marked by a green fencepost with a red browse tag number 437, is located approximately midway up the slope and in the middle of the ridge.

NOTE: The road now dead-ends near the top of the canyon in a patch of maples -- parking here (on a slope, but closer to the site) is also possible as of 2017 and 2022.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	DIAMOND SPRING
Elevation	7,250ft (2,210m)
Aspect	Northwest
Slope	44%
Sample Dates	07/10/1997, 06/12/2002, 08/08/2007, 06/18/2012, 06/06/2017, 06/08/2022

Wildlife Habitat and Vegetation History**Table 19C-12.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter/spring
Greater Sage-Grouse		

Table 19C-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Sagebrush	NA
1989	Sagebrush	NA
1997	Sagebrush	NA
2002	Sagebrush	NA
2007	Sagebrush	NA
2012	Sagebrush	NA
2017	Sagebrush/Perennial Grass	NA
2022	Sagebrush/Perennial Grass	NA

Site Notes

In 1983, numerous does with fawns, as well as a sage-grouse brood were flushed from the draw below the study. In 2007, three deer were seen and a deer carcass was found near the study. A three-foot rattlesnake was found on the site in 2017. Part of the site crosses into a different ecological site, Mountain Shallow Loam (Low Sagebrush) R047XA442UT.

Soils**Table 19C-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.1	54.4	23.0	22.6	4.7	23.1	358.4	0.6	07/10/1997

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

This site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and little sagebrush (*A. arbuscula*) dominated plant community in all sample years (Photos, Table 19C-12.12, Table 19C-12.13). The grass and grass-like community is robust and mostly native. Perennial grasses -- primarily the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) -- have been a co-dominant vegetation component since 2017. The introduced annual grass species cheatgrass has also been observed in the understory, contributing little (but increasing) cover since 1997 (Table 19C-12.10). The forb community is robust and diverse, being composed of mostly native species. The perennial species silvery lupine (*Lupinus argentus*) has been the dominant forb in all sample years, with ballhead waterleaf (*Hydrophyllum capitatum*) and spiny phlox (*Phlox hoodii*) expressing less dominance but still contributing significant cover in 2022 (Table 19C-12.11). Other shrub species such as Utah serviceberry (*Amelanchier utahensis*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), and mountain snowberry (*Symphoricarpos oreophilus*) have also been present over the study period, but with mostly less cover and density than sagebrush (Table 19C-12.12, Table 19C-12.13).

Trend Summary Tables

Table 19C-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	24.7	2.3	-	-	-	-
2002	28.8	4.1	0.2	44.5	6.1	-
2007	15.8	3.3	0.0	24.5	4.6	0.1
2012	24.2	4.4	0.4	24.6	3.8	0.2
2017	21.3	6.3	0.2	26.3	6.7	-
2022	22.4	4.9	-	22.2	6.3	-

Table 19C-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	15	297	80	224	0.0	5.9	1.9	9.1
2002	8	256	82	246	0.0	7.2	0.4	19.4
2007	5	185	40	152	0.0	2.7	0.3	4.6
2012	117	246	81	252	1.8	9.5	0.5	13.9
2017	111	308	167	312	1.6	16.9	2.3	22.0
2022	75	348	147	274	2.2	17.9	1.5	22.2

Table 19C-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	13.4	0.2	39.1	7.7	20.0	39.5
2002	14.2	0.2	23.9	7.1	20.9	52.3
2007	15.1	0.0	34.9	7.2	21.2	29.2
2012	15.3	0.1	39.0	2.7	23.6	48.1
2017	9.0	-	41.5	5.4	17.2	66.6
2022	10.0	0.0	31.3	5.8	21.0	54.5

Table 19C-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	-	10	-	-	-	6
2002	-	4	-	-	-	13
2007	-	2	7	-	-	13
2012	-	2	3	-	1	8
2017	-	3	-	-	2	2
2022	3	6	2	-	-	1
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	6.7 (16.6)	-	-	-	-
2007	-	10.7 (26.5)	-	4.7 (11.5)	-	72.4 (178.8)
2012	-	11.4 (28.1)	2.0 (5.0)	-	-	31.5 (77.8)
2017	-	6.7 (16.6)	-	-	-	7.4 (18.2)
2022	5.1 (12.6)	21.5 (53.0)	5.3 (13.2)	-	-	8.7 (21.5)

Table 19C-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Achnatherum lettermanii (Letterman's needlegrass)										
Achnatherum nelsonii (Columbia needlegrass)										
Bromus tectorum ^{ai} (cheatgrass)										
Carex (sedge)										
Koeleria macrantha (prairie Junegrass)										
Melica bulbosa (oniongrass)										
Pascopyrum smithii (western wheatgrass)										
Poa fendleriana (muttongrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
year	Average Cover (%)									
1997	-	9	15	-	-	-	-	183	31	154
2002	-	-	8	4	-	3	-	150	16	126
2007	3	3	5	-	20	-	-	72	25	98
2012	-	10	117	-	-	-	-	44	105	143
2017	1	2	111	2	-	76	-	101	65	163
2022	1	0	75	-	-	-	2	172	103	233
year	Average Cover (%)									
1997	-	0.4	0.0	-	-	-	-	3.3	0.2	2.0
2002	-	-	0.0	0.1	-	0.1	-	4.3	0.1	2.6
2007	0.0	0.0	0.0	-	0.1	-	-	0.9	0.2	1.5
2012	-	0.1	1.8	-	-	-	-	1.7	2.4	5.4
2017	0.1	0.0	1.6	0.0	-	2.8	-	4.1	1.4	8.3
2022	0.0	0.0	2.2	-	-	-	0.1	5.2	2.2	10.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19C-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Alyssum desertorum ^{ai} (desert madwort)																		
Antennaria (pussytoes)																		
Arabis (rockcress)																		
Arenaria fendleri (Fendler's sandwort)																		
Astragalus cibirarius (browse milkvetch)																		
Calochortus nuttallii (sego lily)																		
Castilleja linariifolia (Wyoming Indian paintbrush)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Chenopodium ^a (goosefoot)																		
Chenopodium album ^a (lambsquarters)																		
Chenopodium leptophyllum ^a (narrowleaf goosefoot)																		
Cirsium (thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Collomia linearis ^a (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Cymopterus (springparsley)																		
Cynoglossum officinale ^{aim} (gypsyflower)																		
year	Average Cover (%)																	
1997	-	11	3	98	3	-	-	-	1	-	-	-	29	2	-	-	-	40
2002	-	3	-	75	4	-	-	-	-	-	-	24	2	4	-	-	-	37
2007	-	1	-	34	-	-	-	-	-	9	8	12	3	-	-	-	-	-
2012	1	3	1	35	2	2	4	-	-	3	9	1	16	12	3	-	-	4
2017	21	11	2	38	8	8	1	8	-	-	-	79	39	2	7	-	-	-
2022	26	3	1	36	2	16	0	12	-	-	-	6	46	18	-	3	-	-
year	Average Cover (%)																	
1997	-	0.0	0.0	1.9	0.0	-	-	-	0.0	-	-	-	0.1	0.0	-	-	-	1.8
2002	-	0.0	-	1.7	0.0	-	-	-	-	-	-	-	0.1	0.0	0.0	-	-	0.2
2007	-	0.0	-	0.3	-	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-	-	-
2012	0.0	0.0	0.0	0.4	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	0.0	0.0	-	-	0.0
2017	0.3	0.2	0.0	0.6	0.1	0.1	0.0	0.0	-	-	-	0.5	0.1	0.1	0.1	0.1	-	-
2022	0.1	0.0	0.0	0.5	0.0	0.2	0.0	0.0	-	-	-	0.2	0.1	0.0	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Delphinium nuttalianum (two-lobed larkspur)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum brevicule (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Galium ^a (bedstraw)	Hackelia patens (spotted stickseed)	Heuchera parvifolia (littleleaf alumroot)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia oblongifolia (oblongleaf bluebells)	Microsteris gracilis ^a (slender phlox)	Orobanche (broomrape)
year	Nested Frequency																
1997	-	-	-	-	-	-	-	-	-	7	-	1	132	3	-	-	-
2002	-	22	3	-	-	3	-	-	-	-	-	-	164	3	-	-	-
2007	-	2	-	-	1	-	-	-	-	2	-	-	110	1	-	-	-
2012	-	15	-	-	1	13	-	-	-	20	-	-	178	-	-	-	1
2017	-	-	3	3	2	40	5	-	39	1	-	3	223	8	-	10	-
2022	1	-	1	-	-	8	4	2	59	-	1	3	163	12	7	42	3
year	Average Cover (%)																
1997	-	-	-	-	-	-	-	-	-	0.0	-	0.0	6.3	0.0	-	-	-
2002	-	0.0	0.0	-	-	0.0	-	-	-	-	-	-	16.1	0.0	-	-	-
2007	-	0.0	-	-	0.0	-	-	-	-	0.0	-	-	4.0	0.0	-	-	-
2012	-	0.1	-	-	0.0	0.1	-	-	-	0.1	-	-	11.3	-	-	-	0.0
2017	-	-	0.0	0.0	0.0	0.6	0.1	-	1.8	0.0	-	0.0	15.8	0.0	-	0.0	-
2022	0.0	-	0.0	-	-	0.0	0.3	0.0	1.8	-	0.0	0.2	15.2	0.1	0.3	0.3	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Taraxacum officinale (common dandelion)	unknown perennial forb (unknown forb)	Viola (violet)	Zigadenus paniculatus (foothill death camas)
year	Nested Frequency								
1997	2	49	-	21	-	-	-	-	5
2002	-	59	4	4	5	3	10	-	-
2007	6	20	6	10	3	-	-	-	-
2012	1	78	12	17	2	5	-	-	-
2017	1	70	-	3	33	-	-	16	-
2022	-	80	-	5	55	-	-	48	3
year	Average Cover (%)								
1997	0.0	0.8	-	0.1	-	-	-	-	0.0
2002	-	1.2	0.0	0.0	0.0	0.0	0.2	-	-
2007	0.0	0.2	0.0	0.0	0.0	-	-	-	-
2012	0.0	2.0	0.1	0.0	0.0	0.0	-	-	-
2017	0.0	2.9	-	0.0	0.6	-	-	0.1	-
2022	-	2.7	-	0.0	0.9	-	-	0.5	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19C-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Acer grandidentatum ^t (bigtooth maple)	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia arbuscula ^p (little sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra nevadensis ^p (Nevada jointfir)	Ericameria nauseosa ssp. nauseosa var. spectiosa ^p (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1997	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	22	21.4	3.5	-	0.7	0	2	0.6	-	0.4	-
2007	0.1	-	11.1	12.8	1.9	-	0.4	0.2	0.4	-	2.3	0	-
2012	0.2	-	11	11.9	3	-	0.6	0.5	0.7	0.1	-	0.6	0
2017	-	0.9	13.1	10.7	5.3	-	0.6	0.6	0.3	0.8	-	0.4	0.3
2022	-	-	10.3	9.5	4.9	-	1	1.1	0.9	-	-	0.3	0.5
year	Quadrat Cover (%)												
1997	-	-	14.2	10.0	1.1	-	-	0.5	0.5	0.6	-	0.1	0.0
2002	0.2	-	12.9	14.9	2.6	-	0.0	0.5	0.7	0.6	-	0.5	0.1
2007	0.0	-	7.0	7.3	1.6	0.4	0.1	0.4	0.3	0.1	1.3	0.5	0.0
2012	0.4	-	11.2	11.7	2.8	-	0.1	0.5	1.0	0.1	-	0.6	0.4
2017	0.2	0.0	9.7	9.4	5.1	-	0.4	0.9	0.8	0.4	-	0.9	0.0
2022	-	-	6.8	13.4	4.6	-	0.4	0.9	0.4	-	-	0.9	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19C-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Acer grandidentatum^t -- (bigtooth maple)									
1997	20	-	100	0	0	0	0	0	- / -
2002	120	20	83	17	0	0	0	0	- / -
2007	140	-	14	86	0	86	0	14	51/43
2012	80	-	50	50	0	25	0	0	38/42
2017	20	-	100	0	0	0	0	0	- / -
2022	40	-	100	0	0	0	100	0	- / -
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	20	-	0	100	0	0	0	0	64/29
2002	-	-	-	-	-	-	-	-	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	17/32
2017	100	-	80	20	0	80	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Artemisia arbuscula^p -- (little sagebrush)									
1997	6700	200	5	82	13	20	1	11	32/61
2002	6440	40	3	81	17	4	9	8	26/52
2007	3580	280	2	67	31	45	13	8	27/55
2012	5140	120	17	76	7	28	54	18	23/55
2017	4560	40	4	84	13	36	21	39	29/49
2022	3720	40	5	74	21	5	2	24	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1720	220	7	63	30	8	5	20	62/95
2002	3020	120	15	60	25	5	13	17	65/98
2007	2140	860	14	65	22	46	9	18	65/100
2012	3820	120	20	72	7	26	7	4	51/77
2017	2820	60	9	85	6	16	0	10	56/75
2022	3360	2000	5	87	8	1	2	13	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	20	-	100	0	0	0	0	0	36/6
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	200/220
2012	-	-	-	-	-	-	-	-	53/58
2017	-	-	-	-	-	-	-	-	81/101
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	2900	-	16	83	1	10	3	0	27/27
2002	2040	20	2	95	3	7	0	1	28/37
2007	1620	20	9	91	0	48	12	4	30/39
2012	1440	20	4	93	3	1	0	1	29/36
2017	2140	-	3	97	0	3	0	0	36/47
2022	2620	-	12	82	6	19	1	6	- / -
Ephedra nevadensis^P -- (Nevada jointfir)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	0	100	100	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum^P -- (slender buckwheat)									
1997	1020	40	10	90	0	2	0	0	12/18
2002	460	-	13	87	0	4	13	0	12/23
2007	500	40	20	76	4	20	8	0	17/24
2012	480	-	4	96	0	8	0	0	15/25
2017	660	-	24	76	0	58	9	0	19/24
2022	1260	-	8	87	5	11	0	5	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	0	0	96/66
2002	60	-	0	100	0	0	0	0	53/51
2007	20	-	0	0	100	0	0	100	143/158
2012	60	-	0	67	33	0	33	0	50/55
2017	40	-	0	100	0	50	0	0	50/39
2022	40	-	0	50	50	0	0	50	- / -
Mahonia repens -- (creeping barberry)									
1997	660	-	9	91	0	0	0	0	16/20
2002	780	-	0	100	0	0	0	0	14/20
2007	1720	20	15	85	0	0	0	1	9/12
2012	1220	-	2	98	0	7	0	0	17/19
2017	2080	-	0	100	0	0	0	0	15/15
2022	1240	140	65	36	0	0	0	2	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia polyacantha -- (plains pricklypear)									
1997	60	-	67	33	0	0	0	0	24/133
2002	680	-	0	100	0	0	0	0	15/48
2007	100	-	20	60	20	0	0	20	19/29
2012	20	-	0	100	0	0	0	0	17/44
2017	120	-	0	100	0	0	0	0	17/54
2022	180	-	0	78	22	0	0	22	- / -
Paxistima myrsinites -- (Oregon boxleaf)									
1997	20	-	0	100	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	680	140	0	82	18	18	0	15	24/56
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	280	40	0	100	0	7	7	7	28/29
2002	200	40	20	70	10	0	0	10	45/67
2007	140	-	14	86	0	14	14	29	33/96
2012	360	-	33	67	0	11	0	0	22/34
2017	160	-	0	100	0	0	0	0	39/64
2022	220	-	0	100	0	0	9	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	60	-	0	100	0	0	0	0	22/22
2002	60	-	0	67	33	0	0	33	26/29
2007	60	20	0	0	100	0	0	0	36/26
2012	180	-	0	100	0	0	0	0	31/35
2017	60	-	0	100	0	0	0	0	44/59
2022	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

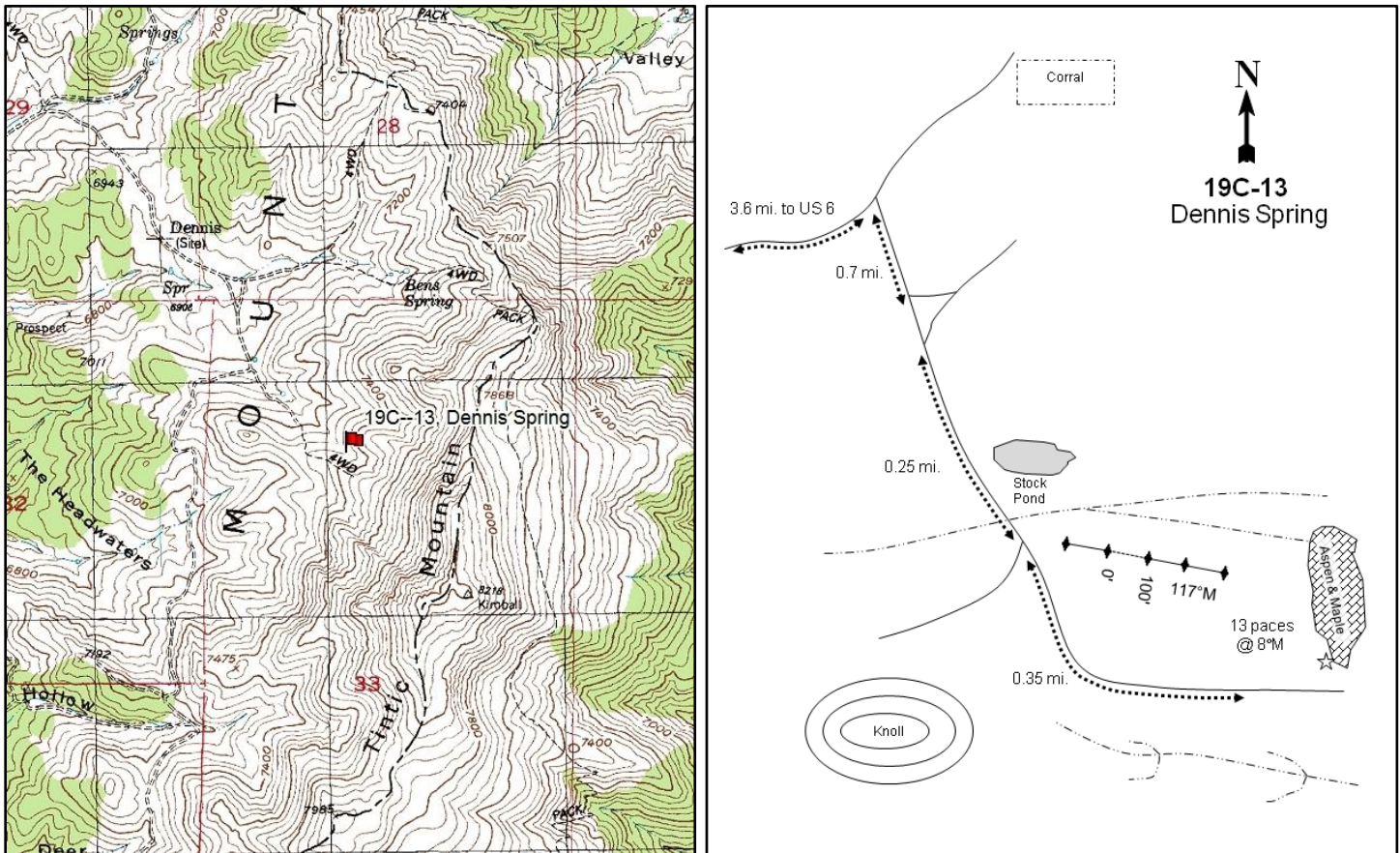
Table 19C-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2017	12	13	88	-	-	-	2.0

Table 19C-12.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	9.2	3.0	11.8	0.0	10.0	-2.0	62.0	Fair
2002	30.0	8.8	4.9	14.4	0.0	10.0	-2.0	66.1	Fair
2007	30.0	7.0	4.2	5.4	0.0	9.1	0.0	55.7	Poor-Fair
2012	30.0	12.7	9.1	19.1	-1.4	10.0	-2.0	77.5	Good
2017	30.0	12.3	4.2	30.0	-1.2	10.0	0.0	85.4	Good
2022	27.7	10.3	2.5	30.0	-1.6	10.0	0.0	78.8	Good

DENNIS SPRING - STUDY NO. 19C-13

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Tintic Mountain NW; Township 11S, Range 2W, Section 33
NAD 83 UTM ZONE 12, 408018 East 4408893 North

Transect Information

Browse Tag # (0' Stake)

3945

Transect Bearing

300° magnetic

Length

400ft

Belt Placement

Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)

Belt Marker Placement

No Rebar

Directions to Site

From mile marker 130 on Highway US-6, proceed east for 1.6 miles to a fork and go left. Proceed 2 miles on the "Dennis Road" up Copperpolis Creek to a fork. Turn right (to the southeast) and travel uphill for 0.7 miles to another fork. Turn right again and drive for 0.25 miles to where there is a fork turning off sharply to the right and a stock pond on the left. Continue straight ahead (on the left fork) for an additional 0.35 miles to where the road ends on top of a small ridge. At that point, there will be an aspen-maple stand to your immediate front-left at the head of a small drainage. Just behind you, there should be a knoll. From the front-rightmost maple tree of the clump to your front, walk 13 paces at 8 degrees magnetic to the 300-foot stake. The 0-foot stake, marked with a red browse tag #3945, is located in the approximate middle of a triangle formed by three boulders. All plot markers consist of steel fenceposts 15" to 20" in height.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	DIAMOND SPRING
Elevation	7,350ft (2,240m)
Aspect	Northwest
Slope	25%
Sample Dates	07/07/1997, 06/12/2002, 08/08/2007, 06/18/2012, 06/07/2017, 06/08/2022

Table 19C-13.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Mona West	-	July 2001	33852

Wildlife Habitat and Vegetation History**Table 19C-13.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Greater Sage-Grouse		

Table 19C-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1997	Mountain Big Sagebrush	No Encroachment
2002	Perennial Forb/Perennial Grass	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2017	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2022	Mountain Big Sagebrush/Perennial Grass-Forb	No Encroachment

Site Notes

Mormon crickets (*Anabrus simplex*) were abundant in 2002 and appeared to have utilized many of the herbaceous plants.

Soils**Table 19C-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	5.9	48.4	27.0	24.6	5.2	52.0	553.6	0.5	07/07/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From the time of establishment in 1983 through the most recent sample year, this study site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated ecological site. A fire in 2001 (Table 19C-13.1) reduced the sagebrush cover, but it has since recovered (Photos, Table 19C-13.12, Table 19C-13.13). Grass cover has historically been low, but the 2012, 2017, and 2022 studies showed that perennial grasses increased and became a co-dominant component with sagebrush in those sample years (Table 19C-13.7). The most common perennial grass species are bluebunch wheatgrass (*Pseudoroegneria spicata*) and Columbia needlegrass (*Achnatherum nelsonii*) as of 2022 (Table 19C-13.10). The forb component on this site is rich in diversity and abundant with a variety of perennial species contributing the most cover and being a co-dominant component in the most recent sample year (Table 19C-13.11). It is likely that this site will continue to exist in the current or a similar ecological state in future years without a disturbance.

Trend Summary Tables

Table 19C-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	35.1	4.2	1.1	-	-	-
2002	2.0	4.1	-	2.5	3.2	-
2007	24.0	5.1	-	37.7	8.3	-
2012	38.3	5.7	-	49.2	4.9	-
2017	40.6	4.1	0.0	68.1	3.6	-
2022	45.6	3.3	-	61.7	2.9	-

Table 19C-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	28	212	265	239	0.4	2.7	2.4	8.8
2002	142	117	299	233	0.7	3.9	4.4	8.6
2007	168	181	181	133	3.8	3.7	0.7	2.2
2012	31	278	133	237	0.1	13.9	0.9	3.8
2017	68	263	185	293	0.6	10.3	2.5	7.7
2022	62	292	308	313	0.5	9.9	8.7	13.0

Table 19C-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.0	0.0	53.8	1.3	3.4	47.6
2002	49.7	0.8	22.7	3.9	6.4	27.8
2007	28.3	-	32.2	2.8	5.0	43.6
2012	22.5	-	52.6	1.0	6.5	54.7
2017	17.4	-	53.5	5.0	5.3	58.7
2022	17.5	-	54.5	1.0	7.6	65.4

Table 19C-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	1	14	4	-	3	8
2002	-	4	-	-	1	6
2007	-	4	8	1	1	8
2012	1	1	-	-	-	2
2017	1	4	-	-	10	2
2022	1	2	-	-	5	-
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	7.4 (18.2)	-	-	-	13.4 (33.1)
2007	-	1.3 (3.3)	6.7 (16.6)	-	-	20.1 (49.7)
2012	-	2.0 (5.0)	-	-	-	8.7 (21.5)
2017	-	0.7 (1.7)	-	-	-	10.0 (24.8)
2022	2.2 (5.4)	5.3 (13.2)	3.4 (8.3)	0.6 (1.4)	-	-

Table 19C-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Achmatherum lettermanii (Letterman's needlegrass)	Achmatherum nelsonii (Columbia needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency																
1997	-	-	115	5	0	4	28	48	-	-	-	-	10	-	6	51	-
2002	-	2	67	1	-	2	142	3	9	-	-	-	8	-	1	32	-
2007	1	6	34	17	-	15	168	56	13	20	-	-	9	-	-	48	-
2012	1	8	120	37	-	20	31	42	8	6	-	-	6	-	7	78	-
2017	-	25	74	41	-	40	68	17	-	16	-	-	12	-	-	82	-
2022	27	17	74	39	-	17	75	62	-	-	1	5	26	7	7	70	28
year	Average Cover (%)																
1997	-	-	1.5	0.0	0.0	0.0	0.4	0.6	-	-	-	-	0.2	-	0.0	0.3	-
2002	-	0.0	2.4	0.2	-	0.1	0.7	0.2	0.2	-	-	-	0.3	-	0.0	0.6	-
2007	0.0	0.0	0.5	0.2	-	0.1	3.8	0.8	0.3	0.5	-	-	0.2	-	-	1.1	-
2012	0.0	0.5	5.1	0.9	-	0.9	0.1	2.4	0.3	0.2	-	-	0.1	-	0.2	3.2	-
2017	-	2.2	1.9	1.7	-	0.8	0.6	0.4	-	0.2	-	-	0.6	-	-	2.5	-
2022	0.3	0.1	1.2	1.1	-	0.3	0.5	1.8	-	-	0.0	0.1	1.2	0.1	0.2	2.3	1.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19C-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium album ^a (lambsquarters)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1997	2	-	-	-	-	4	-	3	1	-	91	-	2	209	5	2	31
2002	3	-	-	-	-	-	-	13	1	-	161	-	2	21	-	-	0
2007	4	-	-	-	1	-	-	6	-	-	7	6	-	44	1	-	1
2012	17	-	-	1	3	-	-	5	2	-	2	-	-	49	-	1	16
2017	12	2	-	-	4	-	-	12	3	-	-	-	3	99	10	7	5
2022	28	10	7	-	-	-	13	11	25	4	-	-	2	148	44	2	10
year	Average Cover (%)																
1997	0.0	-	-	-	-	0.0	-	0.0	0.0	-	0.4	-	0.0	1.1	0.0	0.0	0.3
2002	0.0	-	-	-	-	-	-	0.3	0.0	-	1.4	-	0.0	0.1	-	-	0.0
2007	0.0	-	-	-	0.0	-	-	0.0	-	-	0.0	0.0	-	0.1	0.0	-	0.0
2012	0.1	-	-	0.0	0.1	-	-	0.1	0.0	-	0.0	-	-	0.1	-	0.0	0.1
2017	0.2	0.0	-	-	0.1	-	-	0.2	0.0	-	-	-	0.0	0.6	0.1	0.2	0.1
2022	0.3	0.0	0.0	-	-	-	0.2	0.4	0.1	0.0	-	-	0.2	0.6	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus (springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Delphinium nuttalianum (two-lobed larkspur)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Heuchera parvifolia (littleleaf alumroot)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca scariola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia oblongifolia (oblongleaf bluebells)
year	Nested Frequency																
1997	2	39	-	-	3	-	-	-	-	1	-	-	4	19	148	2	-
2002	-	10	-	3	3	2	-	32	-	-	-	64	131	18	49	-	-
2007	-	-	-	-	-	-	-	7	-	-	-	42	-	2	8	9	3
2012	-	2	-	7	-	14	-	3	3	14	-	18	2	5	10	4	1
2017	-	-	-	-	8	-	33	-	-	1	-	60	8	19	18	6	88
2022	1	-	6	6	3	2	14	-	2	-	2	64	3	46	40	2	24
year	Average Cover (%)																
1997	0.0	0.8	-	-	0.0	-	-	-	-	0.0	-	-	0.0	0.3	7.3	0.0	-
2002	-	0.2	-	0.0	0.0	0.0	-	0.3	-	-	-	3.7	1.1	0.5	1.3	-	-
2007	-	-	-	-	-	-	-	0.0	-	-	-	1.2	-	0.1	0.1	0.0	0.0
2012	-	0.0	-	0.0	-	0.1	-	0.0	0.1	0.1	-	0.4	0.0	0.1	0.2	0.0	0.0
2017	-	-	-	-	0.0	-	0.1	-	-	0.0	-	1.5	0.4	0.9	0.7	0.0	0.7
2022	0.0	-	0.0	0.0	0.0	0.3	0.0	-	0.0	-	0.1	1.7	0.0	1.3	1.4	0.0	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Orobancha (broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarpos (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Trifolium (clover)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency																
1997	-	36	-	45	-	82	21	-	-	5	-	15	-	39	-	-	-
2002	-	14	-	-	3	142	92	-	30	-	1	2	-	23	-	-	-
2007	-	21	-	1	3	84	131	-	17	-	1	-	-	3	-	-	-
2012	-	31	2	-	3	161	48	-	9	-	-	-	-	21	17	-	30
2017	-	16	-	-	-	173	46	1	71	-	-	5	2	92	3	19	19
2022	3	18	6	-	4	189	14	8	239	-	-	8	1	85	51	62	54
year	Average Cover (%)																
1997	-	0.1	-	0.5	-	0.2	0.1	-	-	0.0	-	0.1	-	0.1	-	-	-
2002	-	0.2	-	-	0.0	2.5	0.8	-	0.3	-	0.0	0.0	-	0.2	-	-	-
2007	-	0.0	-	0.0	0.0	0.5	0.4	-	0.1	-	0.0	-	-	0.0	-	-	-
2012	-	0.1	0.1	-	0.0	2.0	0.2	-	0.2	-	-	-	-	0.1	0.2	-	0.2
2017	-	0.0	-	-	-	1.7	0.1	0.0	1.1	-	-	0.0	0.0	0.9	0.0	0.3	0.1
2022	0.0	0.1	0.1	-	0.0	2.1	0.0	0.1	7.2	-	-	0.2	0.0	1.3	0.5	2.1	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19C-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Acer grandidentatum ^t (bigtooth maple)	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. spectiosa ^p (rubber rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Mahonia repens (creeping barberry)	Paxistima myrsinites (Oregon boxleaf)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	1.4	2.5	-	-	0.5	-	-	0	1.1	0.2
2007	-	-	36	5.3	-	-	2.6	0.1	-	0.1	1.6	0.3
2012	-	-	46.8	2.1	-	-	2.5	-	-	0.2	2.2	0.3
2017	-	-	65.6	1.7	-	-	1.9	-	-	-	2.5	-
2022	-	-	58.2	2.2	-	-	0.7	-	-	-	3.5	-
year	Quadrat Cover (%)											
1997	-	-	32.0	2.7	0.7	1.1	1.3	-	0.0	0.1	2.2	0.2
2002	-	-	1.4	2.7	-	-	0.9	0.0	-	0.1	0.4	0.5
2007	-	-	22.4	3.4	-	-	1.4	0.1	-	0.3	1.2	0.2
2012	-	0.0	36.0	2.8	-	-	2.5	0.4	-	0.1	2.2	0.0
2017	0.0	-	38.5	2.1	-	-	1.8	0.1	-	0.0	2.1	-
2022	-	-	43.2	2.4	-	-	0.8	0.1	-	0.1	2.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19C-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Acer grandidentatum^t -- (bigtooth maple)									
1997	20	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	20	0	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	24/33
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	0	0	100	0	0	100	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	4920	40	1	88	11	1	0	8	84/93
2002	7120	1020	100	0	0	0	0	0	20/29
2007	9500	26420	51	48	0	4	0	1	64/84
2012	12020	-	9	91	1	1	0	0	66/80
2017	10860	100	1	96	3	14	0	1	67/89
2022	10220	40	0	86	14	12	0	20	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	5560	100	15	85	1	12	1	2	26/27
2002	4700	-	20	79	0	6	1	1	21/26
2007	2700	500	10	82	8	25	3	13	35/47
2012	3100	80	3	97	1	0	0	0	25/30
2017	2700	20	17	82	1	0	0	0	26/32
2022	3000	1440	19	79	3	1	0	3	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1997	200	-	10	50	40	70	0	30	99/89
2002	20	-	100	0	0	0	100	100	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	92/72
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
1997	4540	20	8	93	0	0	0	0	12/14
2002	6340	-	0	98	1	0	0	5	9/14
2007	8320	-	0	100	0	0	0	0	12/17
2012	6320	-	0	100	0	0	0	0	12/14
2017	9420	-	2	98	0	0	0	0	10/11
2022	4680	40	40	60	0	0	0	0	- / -
Paxistima myrsinites -- (Oregon boxleaf)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	60	-	33	67	0	33	0	33	12/24
2012	40	-	0	100	0	0	0	0	18/36
2017	240	-	0	100	0	0	0	0	9/12
2022	720	-	0	100	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	40	-	100	0	0	0	0	0	- / -
Rosa woodsii^P -- (Woods' rose)									
1997	180	20	78	22	0	0	0	0	- / -
2002	260	-	100	0	0	0	0	8	- / -
2007	240	-	25	75	0	8	0	0	28/33
2012	480	-	83	17	0	0	0	0	17/21
2017	180	-	44	56	0	0	0	0	26/21
2022	380	-	5	90	5	0	0	5	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	2540	20	13	87	1	5	1	1	31/55
2002	1160	20	69	31	0	2	2	2	30/60
2007	420	-	10	91	0	24	0	14	35/75
2012	700	-	6	94	0	0	0	0	25/49
2017	780	20	8	92	0	0	0	0	37/63
2022	800	-	28	73	0	0	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1997	220	-	18	82	0	0	0	0	36/44
2002	400	-	25	75	0	0	0	0	24/36
2007	240	-	33	67	0	8	0	0	32/66
2012	100	-	0	100	0	0	0	0	26/49
2017	20	-	0	100	0	0	0	0	43/54
2022	20	-	0	0	100	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

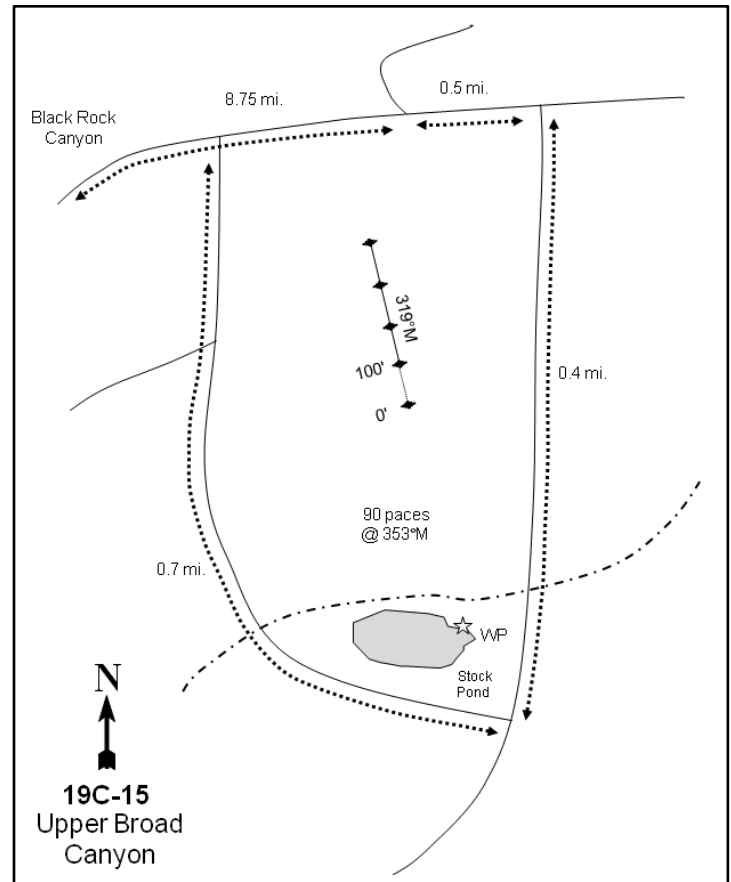
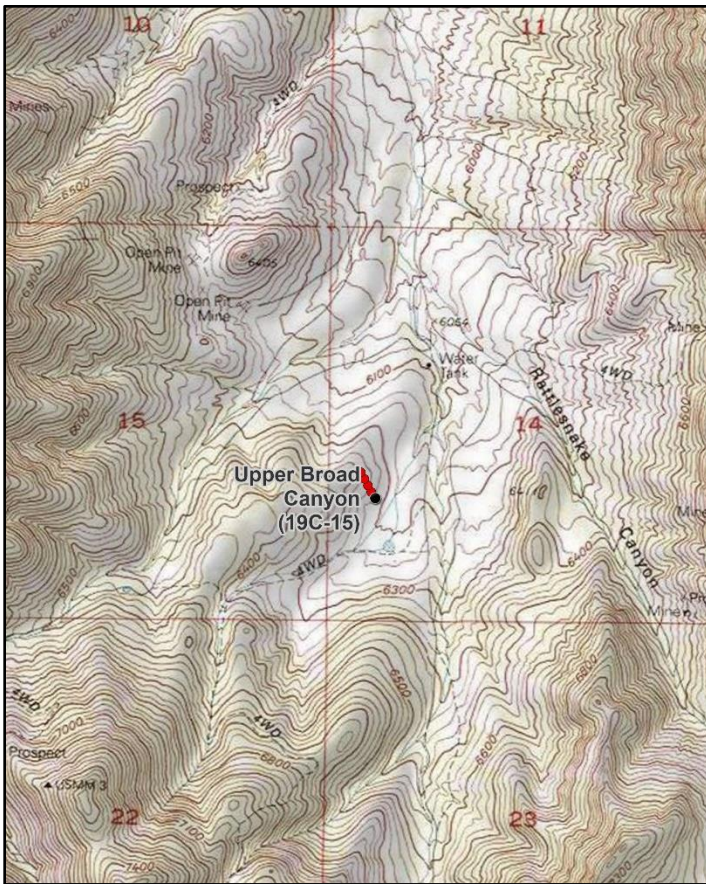
Table 19C-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2017	9	-	75	25	-	-	2.5

Table 19C-13.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	11.7	1.1	5.4	-0.3	10.0	-2.0	55.9	Poor-Fair
2002	2.3	0.0	0.0	7.9	-0.5	10.0	-2.0	17.7	Very Poor
2007	30.0	14.9	15.0	7.5	-2.9	4.3	0.0	68.8	Fair-Good
2012	30.0	14.9	4.5	27.7	-0.1	7.6	-2.0	82.5	Good
2017	30.0	14.2	0.8	20.5	-0.4	10.0	0.0	75.1	Good
2022	30.0	11.1	1.0	19.7	-0.4	10.0	0.0	71.4	Fair-Good

UPPER BROAD CANYON - STUDY NO. 19C-15

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Boulder Peak SE; Township 9S, Range 3W, Section 14
NAD 83 UTM ZONE 12, 401601 East 4431968 North

Transect Information

Browse Tag # (0' Stake)

3935

Transect Bearing

319° magnetic

Length

500ft

Belt Placement

Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)

Belt Marker Placement

Belts 1, 2: 1ft, Belt 3: 2ft, Belt 5: 5ft

Directions to Site

From Highway U-36 between Vernon and Tintic Junction, proceed east on the Black Rock Canyon Road for 9.2 miles to the road junction in Broad Canyon within Utah County. At this point, proceed right at the fork (east) and travel an additional 0.5 miles to another fork. Turn right and travel 0.4 miles to another fork. Turn left and travel approximately 0.1 miles to where there is a stock pond surrounded by a fence on the west side of the road. From the northwest corner of the stock pond, walk 90 paces at 353 degrees magnetic toward a large juniper at the base of the hill. At that point, there will be a green steel fencepost, 15 inches high with a red browse tag #3935 attached: this fencepost marks the 0-foot end of the frequency baseline.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BROAD CANYON
Elevation	6,220ft (1,896m)
Aspect	Southeast
Slope	15-20%
Sample Dates	07/07/1997, 08/02/2002, 08/02/2007, 06/07/2012, 06/07/2017, 06/08/2022

Wildlife Habitat and Vegetation History**Table 19C-15.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall

Table 19C-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	Phase I
1989	Mountain Big Sagebrush/Perennial Grass	Phase I
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2012	Mountain Big Sagebrush/Perennial Grass	Phase I
2017	Mountain Big Sagebrush/Perennial Grass	Phase I
2022	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

There are obvious signs of sheep trailing to a stock pond located 600 feet to the south. Two antler sheds were found within the transect in 1983, and in 2002 four bucks and a few does were seen just north of the study. A very large band of sheep came through the site in 2017.

Soils**Table 19C-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	42.4	29.1	28.5	3.0	7.1	166.4	0.6	07/07/1997

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has been a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grass ecological site. Sagebrush has steadily decreased in cover since 2012, and density exhibited a notable decrease in 2022. These decreases may be indicative of a possible community transition in species composition in the future (Table 19C-15.12, Table 19C-15.13). Perennial grasses have been a co-dominant vegetation component throughout the study years, with the dominant species being bluebunch wheatgrass (*Pseudoroegneria spicata*). The introduced species bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2012 with cover increasing significantly in 2017 and 2022 (Table 19C-15.10). Perennial forb species are sparse and rather non-diverse. However, annual forbs do contribute significant cover, most of which is provided by the introduced species desert madwort (*Alyssum desertorum*) (Table 19C-15.11). There is some singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus utahensis*) encroachment occurring on the site, and it is likely that this will continue to occur without a tree-removing disturbance (Table 19C-15.4, Table 19C-15.14). Overall, this site has not changed greatly during the study period, although increased annual grass cover and the introduction of bulbous bluegrass may pose a threat to the future ecological stability of the plant community.

Trend Summary Tables

Table 19C-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	10.5	1.2	0.9	-	-	-
2002	9.1	0.7	0.0	8.8	0.8	0.8
2007	7.5	0.8	0.0	10.5	0.9	0.9
2012	9.0	1.3	0.8	11.5	1.0	1.3
2017	7.9	4.1	1.9	8.7	5.3	1.9
2022	6.8	0.4	2.7	6.4	0.1	3.6

Table 19C-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	237	358	409	40	1.2	19.9	2.2	0.2
2002	17	381	21	33	0.1	18.1	0.1	0.4
2007	103	376	298	57	0.5	26.7	1.3	0.4
2012	179	376	366	58	0.8	18.2	2.2	0.7
2017	264	326	433	44	5.6	17.0	5.5	0.6
2022	213	348	428	24	1.9	24.5	18.6	0.1

Table 19C-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.5	3.0	28.3	12.0	19.2	34.1
2002	16.7	4.1	27.9	13.5	19.5	27.5
2007	16.4	4.9	20.9	13.7	17.3	35.1
2012	12.1	1.5	26.1	9.8	23.9	34.2
2017	21.2	2.1	33.7	9.9	24.7	35.9
2022	23.2	2.8	27.8	13.3	24.8	44.2

Table 19C-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer/Pronghorn	Mule Deer/Domestic Sheep	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	-	-	17	-	7	12
2002	3	-	15	-	3	6
2007	-	-	7	-	9	-
2012	-	-	2	-	1	8
2017	-	-	6	-	1	31
2022	3	-	5	2	1	14
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	-	22.1 (54.6)	-	-	19.4 (48.0)
2007	-	-	30.2 (74.5)	-	-	4.0 (9.9)
2012	-	8.7 (21.5)*	3.4 (8.3)	-	-	12.1 (29.8)
2017	-	-	1.3 (3.3)	-	-	62.3 (153.9)
2022	7.2 (17.9)	-	14.1 (34.8)	-	-	24.8 (61.2)

Pellets per acre (ha)

Table 19C-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	1	44	237	3	-	-	4	298	224
2002	-	16	17	3	-	-	-	327	226
2007	2	14	103	3	-	-	-	330	218
2012	3	10	179	-	-	44	-	313	218
2017	3	3	264	-	3	85	2	146	222
2022	1	12	213	0	-	93	-	243	177
year	Average Cover (%)								
1997	0.0	0.8	1.2	0.0	-	-	0.0	5.1	13.9
2002	-	1.1	0.1	0.0	-	-	-	4.1	12.9
2007	0.3	0.7	0.5	0.0	-	-	-	10.0	15.6
2012	0.1	0.3	0.8	-	-	1.1	-	6.5	10.3
2017	0.1	0.1	5.6	-	0.0	3.1	0.0	2.7	11.0
2022	0.0	0.2	1.9	0.0	-	4.8	-	8.8	10.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19C-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcross)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cymopterus longipes (longstalk springsparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	
year	Nested Frequency																	
1997	2	401	19	5	-	154	-	1	17	-	-	-	-	15	-	-	-	
2002	1	11	30	-	-	13	-	-	-	-	-	-	-	-	-	-	1	
2007	3	263	18	-	12	126	-	-	27	-	-	10	11	-	-	-	5	
2012	2	362	32	-	-	67	4	4	9	3	-	-	20	3	-	-	27	
2017	-	430	34	-	2	115	-	4	8	-	-	1	34	-	10	4	33	
2022	-	339	11	-	1	208	-	-	11	-	2	-	47	-	47	-	301	
year	Average Cover (%)																	
1997	0.0	1.3	0.1	0.0	-	0.7	-	0.0	0.0	-	-	-	-	0.0	-	-	-	
2002	0.0	0.0	0.3	-	-	0.0	-	-	-	-	-	-	-	-	-	-	0.0	
2007	0.0	0.8	0.1	-	0.0	0.3	-	-	0.1	-	-	0.1	0.1	-	-	-	0.0	
2012	0.0	1.8	0.6	-	-	0.1	0.0	0.0	0.0	0.0	-	-	0.0	0.0	-	-	0.1	
2017	-	4.1	0.5	-	0.0	0.9	-	0.0	0.0	-	-	0.0	0.1	-	0.3	0.0	0.1	
2022	-	4.2	0.0	-	0.0	3.1	-	-	0.0	-	0.0	-	0.3	-	0.8	-	10.2	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)					
<i>Lomatium</i> (desertparsley)					
<i>Microsteris gracilis</i> ^a (slender phlox)					
<i>Phlox longifolia</i> (longleaf phlox)					
<i>Zigadenus paniculatus</i> (foothill deathcamas)					
year	Nested Frequency				
1997	-	12	61	-	6
2002	-	-	-	1	1
2007	-	30	9	-	2
2012	-	9	6	1	3
2017	3	-	-	-	4
2022	-	7	2	1	2
year	Average Cover (%)				
1997	-	0.0	0.1	-	0.0
2002	-	-	-	0.0	0.0
2007	-	0.2	0.0	-	0.0
2012	-	0.0	0.0	0.0	0.0
2017	0.0	-	-	-	0.1
2022	-	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19C-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)							
<i>Eriogonum microthecum</i> ^p (slender buckwheat)							
<i>Grayia spinosa</i> (spiny hopsage)							
<i>Gutierrezia sarothrae</i> (broom snakeweed)							
<i>Juniperus osteosperma</i> ^t (Utah juniper)							
<i>Pinus monophylla</i> ^t (singleleaf pinyon)							
<i>Purshia tridentata</i> ^p (antelope bitterbrush)							
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	6.2	-	-	0.8	-	0.8	2.6
2007	7.9	0.1	-	0.9	-	0.9	2.5
2012	8.7	-	-	1	-	1.3	2.8
2017	6.9	-	-	5.3	-	1.9	1.8
2022	4.4	-	-	0.1	0.7	2.9	2
year	Quadrat Cover (%)						
1997	8.6	-	-	1.2	0.0	0.8	1.9
2002	7.2	-	-	0.7	-	0.0	1.9
2007	5.5	0.0	-	0.8	-	0.0	2.0
2012	6.2	-	0.0	1.3	-	0.8	2.7
2017	5.5	-	-	4.1	0.0	1.9	2.4
2022	4.3	-	-	0.4	0.1	2.7	2.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19C-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1997	40	-	0	100	0	50	0	0	31/32
2002	40	-	0	100	0	100	0	0	29/40
2007	40	-	0	100	0	50	0	0	52/58
2012	40	-	0	100	0	0	50	0	65/68
2017	20	-	0	0	100	100	0	100	10/20
2022	20	-	0	0	100	0	0	100	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	2060	20	8	63	29	42	9	37	56/89
2002	2100	-	3	51	47	17	0	18	54/87
2007	1560	-	3	50	47	35	24	45	56/99
2012	1540	400	8	65	27	42	8	35	48/89
2017	1680	40	11	52	37	32	24	36	46/85
2022	1120	20	7	55	38	27	20	41	- / -
Cercocarpus ledifolius^P -- (curl-leaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	19/20
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
1997	20	-	0	100	0	0	0	0	12/20
2002	20	-	0	100	0	0	0	0	9/13
2007	20	-	0	0	100	0	0	100	18/23
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Grayia spinosa -- (spiny hopsage)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	40	-	0	0	100	0	0	100	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	60	-	67	33	0	0	33	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	6760	20	20	80	1	0	0	0	19/17
2002	2500	-	2	74	24	1	0	13	14/20
2007	1360	40	4	96	0	0	0	0	19/25
2012	3420	3980	46	54	1	0	0	1	16/21
2017	7460	960	6	93	1	0	0	1	18/25
2022	780	-	39	62	0	0	3	5	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	40	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pinus monophylla^t -- (singleleaf pinyon)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	80	0	0	0	0	0	0	-/-
2007	-	40	0	0	0	0	0	0	-/-
2012	40	20	100	0	0	0	0	0	-/-
2017	60	20	100	0	0	0	0	0	-/-
2022	100	20	60	20	20	0	0	20	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1997	380	-	5	84	11	16	63	0	57/93
2002	360	-	0	78	22	28	39	11	50/117
2007	220	-	0	100	0	36	46	0	61/135
2012	240	-	0	83	17	42	25	25	70/129
2017	240	-	0	42	58	58	25	58	55/124
2022	340	-	0	65	35	82	18	53	-/-
Ribes^p -- (currant)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	36/83
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	36/165

t - Tree Species; p - Preferred Browse; i - Introduced Species

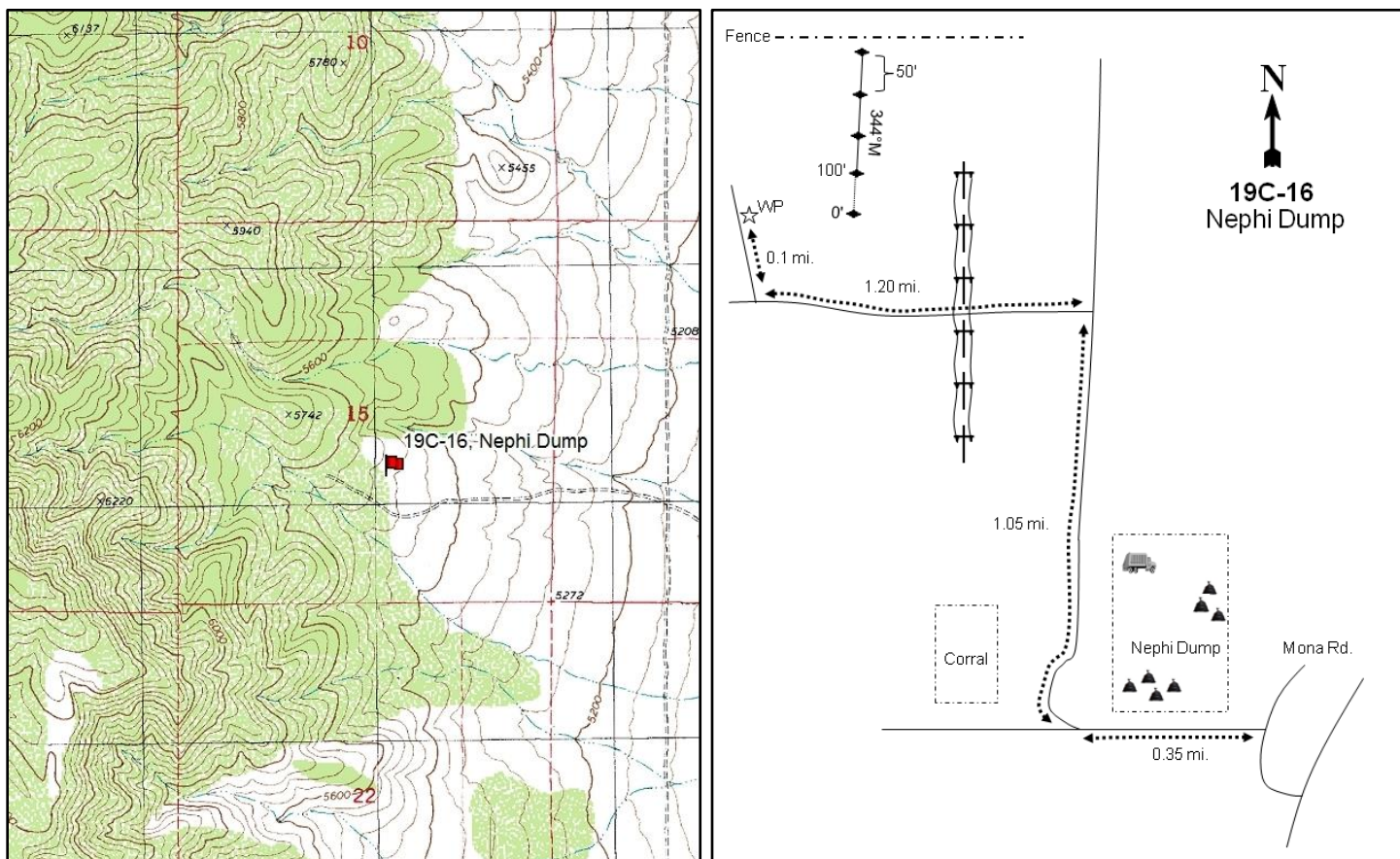
Table 19C-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	18	-	-	-	-	-	4.5
2007	18	-	30	60	10	-	8.2
2012	17	-	27	36	27	9	8.4
2017	20	-	9	82	9	-	10.8
2022	17	10	20	50	20	-	8.3
Pinus monophylla (singleleaf pinyon)							
2002	70	-	-	-	-	-	4.5
2007	50	13	56	25	-	6	7.1
2012	46	-	14	50	21	14	9.2
2017	76	-	42	32	16	11	9.3
2022	96	-	53	21	5	21	8.7

Table 19C-15.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	13.6	7.3	3.7	30.0	-0.9	0.4	0.0	53.9	Poor-Fair
2002	11.9	2.5	1.1	30.0	0.0	0.7	0.0	46.3	Poor
2007	13.8	4.0	1.0	30.0	-0.4	0.8	0.0	49.2	Poor
2012	15.1	7.6	3.0	30.0	-0.6	1.5	0.0	56.4	Poor-Fair
2017	11.3	2.6	4.2	28.0	-4.2	1.2	0.0	43.2	Poor
2022	8.5	4.0	2.4	30.0	-1.4	0.3	0.0	43.7	Poor

NEPHI DUMP - STUDY No. 19C-16

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Slate Jack Canyon SE; Township 12S, Range 1W, Section 15
NAD 83 UTM ZONE 12, 420978 East 4402322 North

Transect Information

Browse Tag # (0' Stake)	79
Transect Bearing	344° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (29ft)
Belt Marker Placement	Standard

Directions to Site

From the Nephi City Dump, travel north on a gravel road for 1.05 miles, then turn left (west) just after passing over a cattle guard. Travel west for 1.25 miles, turn right (north) onto a faint road, and proceed for 0.1 miles. At this point, there is a small stockpile and a short red steel stake: park here. From here, walk east for a short distance to the 0-foot mark of the frequency baseline, marked by a steel fencepost.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NEPHI BENCH
Elevation	5,500ft (1,676m)
Aspect	East
Slope	5-10%
Sample Dates	07/10/1997, 05/21/2002, 06/01/2007, 05/17/2012, 05/17/2017, 05/12/2022

Wildlife Habitat and Vegetation History**Table 19C-16.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter/spring

Table 19C-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	Phase I
1989	Mountain Big Sagebrush/Perennial Grass	Phase I
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2012	Mountain Big Sagebrush/Perennial Grass	Phase I
2017	Mountain Big Sagebrush/Perennial Grass	Phase I
2022	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

This site is located within a 40 acre area that was not burned in 1996, though much of the surrounding vegetation burned in both 1986 and 1996.

Soils**Table 19C-16.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.9	42.0	27.4	30.6	2.9	7.7	284.8	0.7	07/09/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has been a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community in Phase I of encroachment by Utah juniper (*Juniperus osteosperma*) (Photos, Table 19C-16.4, Table 19C-16.12, Table 19C-16.13). Perennial grasses have remained co-dominant with sagebrush throughout the duration of the study, with crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) as the dominant species (Table 19C-16.10). The forb community has varied, but much of the forb cover is provided by the introduced annual species curvseed butterwort (*Ceratocephala testiculata*) and desert madwort (*Alyssum desertorum*) as of 2022 (Table 19C-16.11). Mountain big sagebrush is the primary browse component of the site, with cover having remained stable throughout the duration of the study. Juniper cover and density have been similar. However, average tree diameter has increased, indicating that the tree community is becoming more mature (Table 19C-16.12, Table 19C-16.13, Table 19C-16.14).

Trend Summary Tables**Table 19C-16.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.6	6.9	3.4	-	-	-
2002	8.9	5.2	0.7	-	-	-
2007	6.3	4.2	2.2	7.6	5.8	6.6
2012	8.9	2.6	5.9	9.7	3.8	9.6
2017	6.9	2.9	1.6	8.5	4.9	11.3
2022	5.8	4.8	1.8	8.4	4.6	10.0

Table 19C-16.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	236	287	396	55	4.6	14.7	4.4	0.3
2002	192	308	289	81	2.8	16.0	3.4	1.6
2007	375	318	369	94	10.5	17.6	5.5	1.5
2012	240	346	295	111	2.5	20.9	1.4	1.4
2017	91	325	370	129	1.3	17.0	6.2	2.2
2022	323	280	419	89	8.6	18.6	16.0	1.9

Table 19C-16.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.7	3.9	39.2	18.1	9.5	38.5
2002	16.6	14.7	29.8	12.1	10.6	40.8
2007	11.0	4.3	31.0	12.3	8.0	47.3
2012	10.0	2.8	42.5	12.2	8.0	42.0
2017	20.2	3.1	36.5	21.9	11.3	33.5
2022	15.3	1.3	31.3	17.4	13.5	48.4

Table 19C-16.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	8	17	-	22
2002	1	12	-	5
2007	9	8	1	51
2012	8	3	-	8
2017	2	2	-	51
2022	7	1	-	23
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	5.1 (12.6)	30.8 (76.1)	-	-
2007	24.0 (59.2)	18.7 (46.3)	-	-
2012	16.7 (41.2)	0.7 (1.7)	-	-
2017	3.6 (9.0)	1.3 (3.3)	-	-
2022	10.2 (25.1)	-	-	-

Table 19C-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
1997	-	163	24	212	8	-	-	187	35	-	-
2002	4	155	17	181	4	-	-	213	43	-	2
2007	0	130	34	368	12	6	-	236	89	-	-
2012	2	150	4	240	8	-	-	265	63	-	-
2017	2	185	-	91	2	4	-	201	57	-	4
2022	-	146	39	311	7	36	3	200	44	2	2
year	Average Cover (%)										
1997	-	9.0	0.1	4.5	0.1	-	-	4.2	1.4	-	-
2002	0.0	8.8	0.1	2.8	0.2	-	-	5.1	1.9	-	0.0
2007	0.0	5.1	0.2	10.3	0.2	0.0	-	8.7	3.5	-	-
2012	0.2	7.9	0.0	2.4	0.1	-	-	8.6	4.1	-	-
2017	0.2	8.3	-	1.3	0.1	0.2	-	4.7	3.3	-	0.1
2022	-	6.4	0.2	8.3	0.2	1.1	0.1	8.6	2.1	0.1	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19C-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibarius (browse milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (tittlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chorispora tenella ^{ai} (crossflower)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata ^a (western tansymustard)	Erodium cicutarium ^{ai} (redstem stork's bill)
year	Nested Frequency																
1997	-	-	308	-	-	11	18	10	1	223	5	-	-	-	-	-	-
2002	1	-	167	-	-	32	1	-	1	227	7	-	7	-	6	-	-
2007	-	-	238	-	11	7	4	8	-	331	-	-	4	-	2	-	-
2012	3	1	251	-	7	17	1	-	10	115	-	4	2	-	3	-	-
2017	-	-	161	2	26	4	26	9	29	307	8	-	10	1	4	3	9
2022	-	-	285	-	15	8	10	4	5	365	1	-	4	-	8	11	13
year	Average Cover (%)																
1997	-	-	3.0	-	-	0.1	0.1	0.0	0.0	1.2	0.0	-	-	-	-	-	-
2002	0.0	-	0.4	-	-	1.2	0.0	-	0.0	2.7	0.3	-	0.0	-	0.0	-	-
2007	-	-	0.9	-	0.7	0.0	0.0	0.0	-	4.4	-	-	0.0	-	0.0	-	-
2012	0.0	0.0	0.8	-	0.2	0.2	0.0	-	0.1	0.5	-	0.1	0.0	-	0.0	-	-
2017	-	-	2.2	0.0	0.9	0.0	0.1	0.0	0.5	2.8	0.4	-	0.1	0.0	0.2	0.0	0.1
2022	-	-	3.5	-	0.6	0.2	0.0	0.0	0.2	11.7	0.0	-	0.0	-	0.1	0.2	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency															
<i>Gilia inconspicua</i> ^a (shy gilia)	-	-	10	-	3	5	1	17	-	1	-	2	4	2	4	
<i>Holosteum umbellatum</i> ^{ai} (jagged chickweed)	-	-	-	-	2	1	1	44	1	-	-	-	-	-	-	
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)	-	45	-	-	6	-	2	63	2	-	-	-	-	13	-	
<i>Lappula occidentalis</i> ^a (flatspine stickseed)	-	44	-	-	12	-	1	65	-	-	-	-	-	19	-	
<i>Microsteris gracilis</i> ^a (slender phlox)	6	20	8	-	7	-	-	56	15	-	-	-	-	10	-	
<i>Packera multiflobata</i> (lobeleaf groundsel)	13	22	-	3	-	-	-	61	6	-	4	-	-	6	0	
<i>Phlox austromontana</i> (mountain phlox)	Average Cover (%)															
<i>Phlox longifolia</i> (longleaf phlox)	-	-	0.0	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	0.0	
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)	-	-	-	-	0.0	0.0	0.0	0.3	0.0	-	-	-	-	-	-	
<i>Sphaeralcea coccinea</i> (scarlet globemallow)	-	0.1	-	-	0.0	-	0.0	0.3	0.0	-	-	-	-	0.3	-	
<i>Sphaeralcea munroana</i> (Munro's globemallow)	-	0.1	-	-	0.0	-	0.0	0.4	-	-	-	-	-	0.4	-	
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)	0.0	0.1	0.0	-	0.2	-	-	0.4	0.2	-	-	-	-	0.1	-	
unknown annual forb ^a (unknown forb)	0.1	0.1	-	0.0	-	-	-	0.7	0.3	-	0.0	-	-	0.2	0.0	
<i>Vicia americana</i> (American vetch)																
<i>Zigadenus paniculatus</i> (foothill deathcamas)																

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19C-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	-	-	-	-	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)	-	-	-	-	-	-	-
<i>Ericameria nauseosa</i> (rubber rabbitbrush)	7.6	5.5	0.3	-	6.6	-	-
<i>Gutierrezia sarothrae</i> (broom snakeweed)	9.7	3.8	-	-	9.6	-	-
<i>Juniperus osteosperma</i> ^a (Utah juniper)	8.5	4.9	-	-	11.3	-	-
<i>Purshia stansburiana</i> ^p (Stansbury cliffrose)	8.4	4.6	-	-	10	-	-
year	Quadrat Cover (%)						
1997	10.9	5.4	0.8	0.7	3.4	0.8	-
2002	8.9	4.1	1.0	0.1	0.7	-	-
2007	6.3	3.5	0.6	0.0	2.2	-	-
2012	8.9	2.6	-	0.0	5.9	-	-
2017	6.9	2.9	-	0.0	1.6	-	-
2022	5.8	4.7	-	0.1	1.8	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19C-16.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	1920	60	5	75	20	38	0	28	61/83
2002	2220	-	1	55	44	32	9	15	63/83
2007	1740	20	0	53	47	24	14	28	75/92
2012	1580	-	0	70	30	8	0	9	73/98
2017	1480	40	8	76	16	0	0	14	74/103
2022	1400	40	4	59	37	9	0	37	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	0	100	0	0	100	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	1780	-	2	89	9	0	0	2	43/49
2002	2380	-	3	75	23	0	0	7	40/61
2007	1820	20	0	44	56	2	0	14	40/62
2012	1600	260	1	75	24	3	0	1	31/50
2017	1420	-	3	93	4	0	0	4	38/62
2022	1160	40	0	85	16	2	0	16	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	40	-	0	0	100	0	0	0	- / -
2002	20	-	0	0	100	0	0	0	107/187
2007	20	-	0	0	100	0	0	100	58/168
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	1920	120	21	78	1	0	0	1	27/28
2002	680	-	3	59	38	0	0	41	17/23
2007	140	20	0	100	0	0	0	0	19/23
2012	60	-	0	100	0	0	0	0	20/25
2017	20	-	0	100	0	0	0	0	28/41
2022	180	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1997	20	-	0	100	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2022	20	-	0	100	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	25/46
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	40	-	0	50	50	0	100	0	103/119
2002	-	-	-	-	-	-	-	-	94/80
2007	-	-	-	-	-	-	-	-	119/133
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	28/41

t - Tree Species; p - Preferred Browse; i - Introduced Species

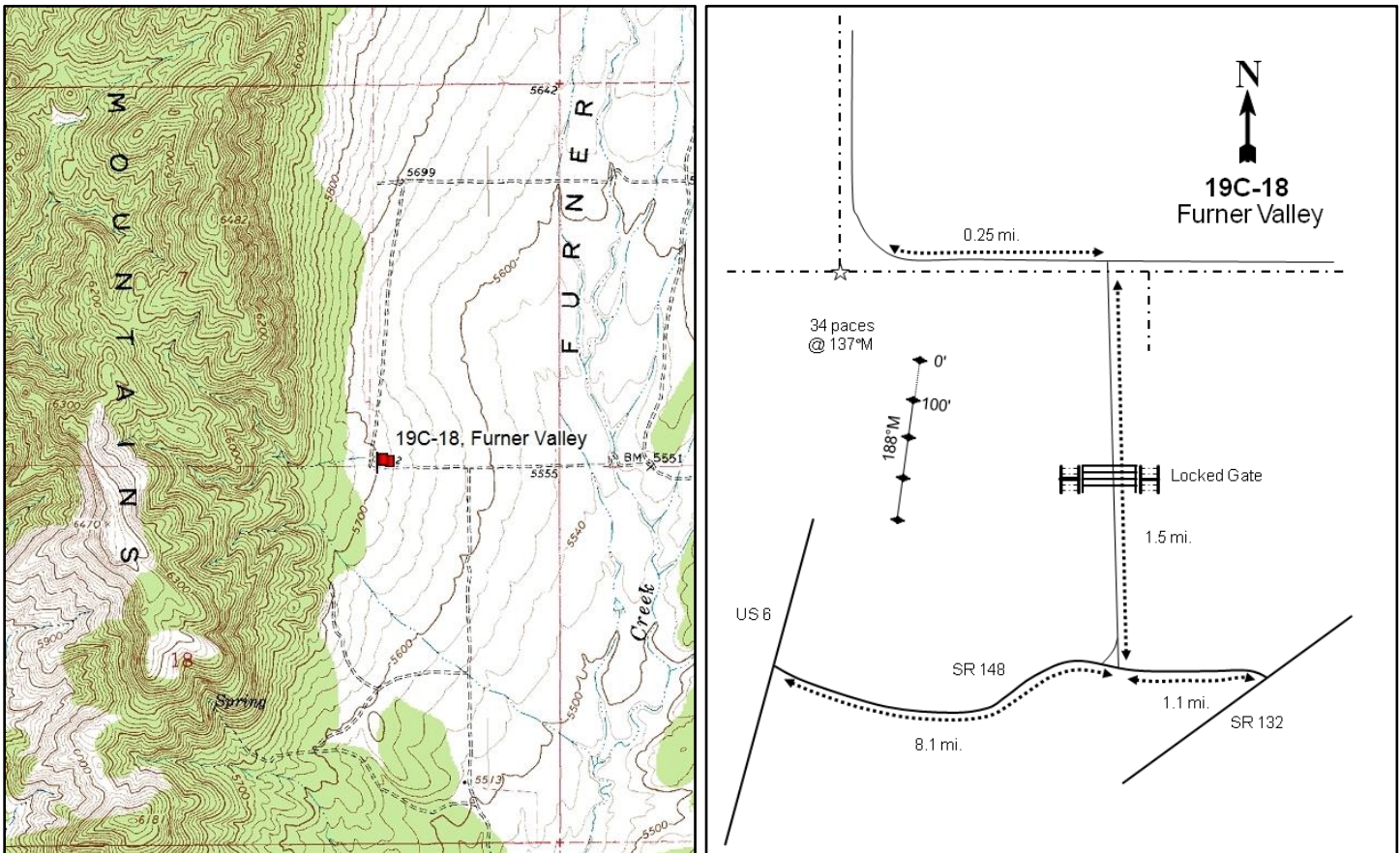
Table 19C-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	62	-	-	-	-	-	11.7
2007	45	-	8	33	25	33	19.1
2012	45	-	8	25	33	33	23.4
2017	39	-	-	33	42	25	22.2
2022	44	-	8	8	33	50	19.7

Table 19C-16.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	14.8	8.5	2.4	29.4	-3.4	0.6	0.0	52.2	Fair
2002	11.2	1.8	0.5	30.0	-2.1	3.2	0.0	44.5	Poor
2007	9.5	0.9	0.0	30.0	-7.8	2.9	0.0	35.5	Very Poor-Poor
2012	12.1	5.9	0.0	30.0	-1.8	2.8	0.0	48.9	Poor-Fair
2017	10.6	10.1	4.1	30.0	-1.0	4.5	0.0	58.3	Fair
2022	10.5	3.9	2.2	30.0	-6.5	3.9	0.0	44.0	Poor

FURNER VALLEY - STUDY NO. 19C-18



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Furner Ridge SW; Township 13S, Range 2W, Section 18
NAD 83 UTM ZONE 12, 406570 East 4393604 North

Transect Information

Browse Tag # (0' Stake)	3936
Transect Bearing	188° magnetic
Length	400ft
Belt Placement	Belt 1 (11ft & 95ft), Belt 2 (34ft), Belt 3 (59ft), Belt 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From a point on Highway U-148 located 8.1 miles east of the junction of Highway U-148 and US-6, proceed north on the dirt road to Furner Valley for 1.5 miles. At this point, there is a "T" intersection with cropland immediately to the north. Turn left (west) and travel for 0.25 miles, then drive to where the road turns north again at a right angle: stop here. From the corner of the fence, walk 34 paces at 137 degrees magnetic to the 0-foot marker of the frequency baseline, a green steel fencepost 15" high with a red browse tag #3936 attached.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	East
Slope	8%
Sample Dates	07/08/1997, 06/03/2002, 08/28/2007, 07/09/2012, 06/01/2017, 06/01/2022

Table 19C-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical or Aerator - Mower or Aerator Unknown	-	-	Between 2002 and 2007	-

Wildlife Habitat and Vegetation History

Table 19C-18.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter/spring
Rocky Mountain Elk	substantial	year-long
Greater Sage-Grouse		undefined & undefined

Table 19C-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
1989	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2007	Perennial Grass/Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2017	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2022	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I

Site Notes

The study was mowed or aerated between the 2002 and 2007 readings, thinning the the browse cover substantially. The area is in close proximity to a large dryland farm, which may attract deer in the spring. Cattle were seen adjacent to the study in 2017.

Soils

Table 19C-18.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.0	54.3	23.1	22.6	2.4	10.5	160.0	0.6	07/08/1997

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, the plant community on this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) (Photos, Table 19C-18.12, Table 19C-18.13). Perennial grasses have provided significant cover, with needle and thread (*Hesperostipa comata*) being the most dominant species. There have also been significant amounts of cover contributed by annual grasses, namely cheatgrass (*Bromus tectorum*). More specifically, cheatgrass cover was nearly 16% in 2022 (Table 19C-18.10); increased amounts of annual grasses can amplify fuel loads and may have the potential to alter fire regimes. Perennial forbs have remained sparse throughout the duration of the study. Annual forb cover has been high since 2017, however, and has been nearly entirely provided by the introduced species desert madwort (*Alyssum desertorum*) (Table 19C-18.7, Table 19C-18.11). Utah juniper (*Juniperus osteosperma*) has been present throughout the study period, and the site is currently considered to be within Phase I of woodland succession (Photos, Table 19C-18.4, Table 19C-18.12, Table 19C-18.14). Encroachment from Utah juniper will likely continue without a tree-removing disturbance; this site was not part of the Furner and Dog Valley Juniper Removal treatment.

Trend Summary Tables

Table 19C-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	15.8	1.3	2.7	-	-	-
2002	18.2	1.0	4.6	-	-	-
2007	5.1	1.0	4.9	9.0	0.9	7.6
2012	10.4	0.1	4.6	15.4	0.2	9.3
2017	9.3	0.1	7.4	16.1	0.2	16.5
2022	11.1	0.6	9.0	20.0	0.9	12.4

Table 19C-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	257	258	372	157	5.3	9.0	2.4	1.8
2002	281	266	410	71	2.4	13.8	5.9	0.8
2007	365	311	440	46	10.3	11.6	7.7	0.3
2012	317	343	304	45	6.4	17.0	2.6	0.4
2017	294	313	411	108	8.6	7.2	11.1	0.7
2022	408	234	412	79	15.7	11.5	13.7	1.0

Table 19C-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	22.6	1.3	40.1	8.7	1.5	34.3
2002	20.5	11.3	36.1	7.6	2.0	46.4
2007	15.1	1.1	44.6	9.6	1.0	37.3
2012	20.2	0.4	47.9	7.0	1.7	39.2
2017	20.9	0.9	42.9	11.4	1.1	46.5
2022	24.0	0.8	37.4	14.6	3.2	51.5

Table 19C-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	2	11	1	-	12	2
2002	2	12	-	2	21	2
2007	5	1	1	10	85	-
2012	5	1	-	2	8	-
2017	11	8	-	-	66	-
2022	3	13	3	-	12	-
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	5.8 (14.3)	36.2 (89.4)	-	4.7 (11.5)	-	4.0 (9.9)
2007	10.2 (25.1)	1.3 (3.3)	-	20.3 (50.2)	-	-
2012	39.2 (96.8)	4.0 (9.9)	-	22.1 (54.5)	-	-
2017	-	8.7 (21.5)	0.7 (1.7)	-	-	-
2022	15.3 (37.7)	7.4 (18.2)	-	-	-	-

Table 19C-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	unknown perennial grass (unknown grass)
year	Nested Frequency										
1997	22	2	-	257	87	190	-	41	4	5	3
2002	39	1	4	281	26	196	9	46	21	2	-
2007	26	-	-	365	80	212	7	67	11	3	-
2012	15	3	-	317	7	259	8	128	22	-	-
2017	9	-	-	294	46	201	36	87	12	-	-
2022	13	0	-	408	42	167	5	61	4	-	-
year	Average Cover (%)										
1997	0.8	0.2	-	5.3	1.3	6.0	-	0.5	0.1	0.1	0.1
2002	1.8	0.0	0.0	2.4	0.5	9.3	0.0	1.1	1.0	0.0	-
2007	0.7	-	-	10.3	2.2	6.4	0.1	1.6	0.5	0.0	-
2012	0.6	0.2	-	6.4	0.1	11.6	0.0	3.3	1.2	-	-
2017	0.6	-	-	8.6	0.6	4.3	0.4	0.8	0.4	-	-
2022	0.5	0.0	-	15.7	1.1	8.4	0.0	1.2	0.3	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 19C-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans ^{ai} (nodding plumeless thistle)	Castilleja angustifolia var. dubia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Crepis acuminata (tapertip hawkbeard)	Delphinium nuttallianum (twolobe larkspur)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)
year	Nested Frequency																
1997	372	2	7	30	-	-	3	2	9	-	12	2	-	-	-	-	33
2002	410	-	4	23	-	-	3	-	1	-	-	-	-	-	-	-	3
2007	440	-	-	14	-	0	-	-	-	3	-	-	-	12	-	-	11
2012	304	-	-	14	-	-	2	-	-	2	-	1	-	-	-	-	-
2017	408	-	-	11	-	4	17	3	2	7	-	-	-	20	8	2	8
2022	410	-	-	3	4	5	13	-	1	10	-	-	3	20	5	-	-
year	Average Cover (%)																
1997	2.3	0.0	0.1	0.4	-	-	0.0	0.0	0.2	-	0.0	0.0	-	-	-	-	0.2
2002	5.8	-	0.0	0.3	-	-	0.0	-	0.0	-	-	-	-	-	-	-	0.0
2007	7.4	-	-	0.1	-	0.0	-	-	-	0.0	-	-	-	0.2	-	-	0.1
2012	2.6	-	-	0.2	-	-	0.0	-	-	0.0	-	0.0	-	-	-	-	-
2017	10.6	-	-	0.0	-	0.0	0.0	0.0	0.0	0.0	-	-	-	0.4	0.1	0.0	0.0
2022	13.1	-	-	0.1	0.0	0.0	0.1	-	0.0	0.0	-	-	0.0	0.6	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Lithospermum incisum (narrowleaf stone seed)												
Lygodesmia grandiflora (largeflower skeletonplant)												
Microsteris gracilis ^a (slender phlox)												
Oenothera (evening primrose)												
Packera multiflora (lobeleaf groundsel)												
Phlox austromontana (mountain phlox)												
Phlox longifolia (longleaf phlox)												
Sphaeralcea coccinea (scarlet globemallow)												
Streptanthus cordatus (heartleaf twistflower)												
Tragopogon dubius ^{at} (yellow salsify)												
Zigadenus paniculatus (foothill death camas)												
year	Nested Frequency											
1997	1	-	-	7	47	7	37	-	15	7	3	
2002	2	8	-	4	1	6	26	3	1	6	2	
2007	-	2	3	-	2	3	7	6	1	4	1	
2012	-	3	-	-	1	2	25	1	-	-	-	
2017	4	8	-	-	6	5	45	8	3	4	14	
2022	-	8	-	3	-	1	39	11	-	5	11	
year	Average Cover (%)											
1997	0.0	-	-	0.0	0.4	0.2	0.1	-	0.1	0.1	0.0	
2002	0.0	0.0	-	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0	
2007	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2012	-	0.0	-	-	0.0	0.0	0.1	0.0	-	-	-	
2017	0.0	0.1	-	-	0.0	0.0	0.3	0.1	0.0	0.0	0.0	
2022	-	0.1	-	0.0	-	0.1	0.3	0.2	-	0.0	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 19C-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)							
Gutierrezia sarothrae (broom snakeweed)							
Juniperus osteosperma ^t (Utah juniper)							
Linanthus pungens (granite prickly phlox)							
Opuntia polyacantha (plains pricklypear)							
Purshia stansburiana ^p (Stansbury cliffrose)							
Purshia tridentata ^p (antelope bitterbrush)							
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2007	2.6	0.9	7.6	-	-	-	6.4
2012	5.1	-	9.3	0.2	-	-	10.3
2017	5.9	0.1	16.5	0.1	-	-	10.2
2022	11.9	0.9	12.4	-	-	-	8.1
year	Quadrat Cover (%)						
1997	11.0	1.3	2.7	-	0.0	-	4.8
2002	9.3	1.0	4.6	0.0	0.0	-	8.8
2007	1.4	1.0	4.9	0.0	-	-	3.7
2012	3.1	-	4.6	0.1	-	-	7.3
2017	2.3	0.1	7.4	0.0	-	-	7.0
2022	5.2	0.6	9.0	-	-	0.4	5.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 19C-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1997	2100	60	16	57	27	10	0	24	81/116
2002	1980	120	24	51	25	14	4	10	79/109
2007	900	100	11	40	49	9	11	53	48/68
2012	900	-	4	80	16	36	2	47	56/92
2017	900	60	9	71	20	49	4	7	55/84
2022	1020	20	8	82	10	4	0	14	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	0	100	0	0	0	0	41/67
2002	40	-	0	100	0	0	0	0	18/31
2007	40	-	50	50	0	0	0	0	23/54
2012	20	-	0	100	0	0	0	0	18/51
2017	20	-	0	100	0	0	100	0	21/39
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	5000	40	24	76	0	0	0	0	24/25
2002	3820	-	3	84	14	0	0	9	18/26
2007	2160	400	13	82	6	0	0	6	21/32
2012	-	-	-	-	-	-	-	-	-/-
2017	160	-	38	63	0	0	0	0	18/23
2022	800	60	15	85	0	0	0	0	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1997	80	-	25	75	0	0	0	0	-/-
2002	100	20	0	100	0	0	0	0	-/-
2007	100	-	0	100	0	0	0	0	-/-
2012	80	-	25	75	0	0	0	25	-/-
2017	80	-	0	100	0	0	0	0	-/-
2022	80	-	0	100	0	0	0	0	-/-
Linanthus pungens -- (granite prickly phlox)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	24/41
2007	60	-	33	67	0	0	0	0	9/31
2012	20	-	0	100	0	0	0	100	29/67
2017	80	-	0	100	0	0	0	0	14/24
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	20	-	0	100	0	0	0	0	7/8
2002	20	-	0	100	0	0	0	0	12/19
2007	20	-	0	100	0	0	0	0	10/25
2012	40	-	0	100	0	0	0	0	13/32
2017	20	-	0	100	0	0	0	100	3/7
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^P -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	86/53
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata^P -- (antelope bitterbrush)									
1997	580	-	3	86	10	59	17	3	84/145
2002	520	-	0	92	8	58	15	4	117/206
2007	460	-	0	96	4	13	17	30	83/159
2012	460	-	4	91	4	35	52	17	84/168
2017	480	20	0	79	21	71	25	4	82/164
2022	440	-	5	86	9	14	50	14	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

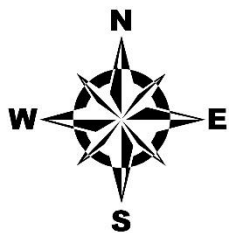
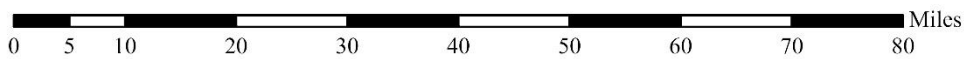
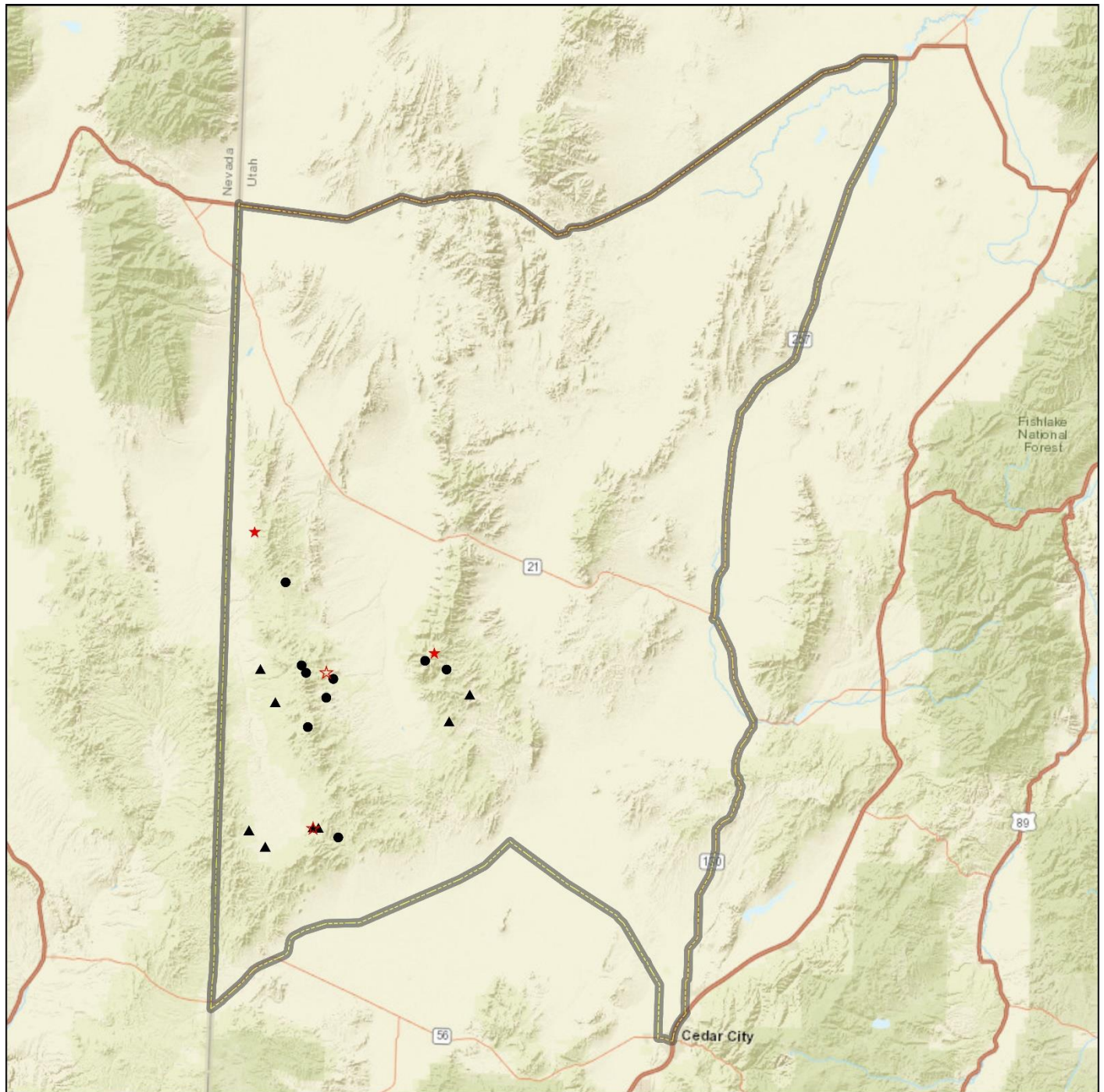
Table 19C-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	37	-	-	-	-	-	8.4
2007	31	-	38	23	23	15	10.7
2012	33	-	13	50	25	13	9.8
2017	33	-	7	33	53	7	15.3
2022	33	-	13	38	13	38	13.1

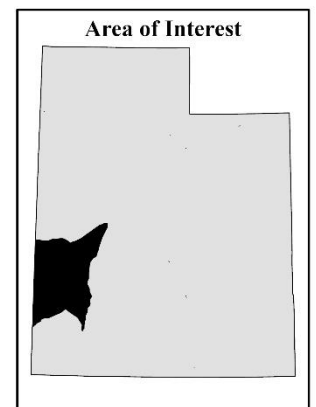
Table 19C-18.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	21.0	8.5	6.2	18.1	-3.9	3.6	-2.0	51.4	Poor-Fair
2002	24.9	10.0	6.2	27.5	-1.8	1.6	0.0	68.5	Good
2007	12.9	9.8	1.6	23.1	-7.7	0.5	0.0	40.3	Poor
2012	21.8	12.6	2.2	30.0	-4.8	0.7	0.0	62.5	Fair
2017	22.7	8.8	1.6	14.3	-6.4	1.3	-2.0	40.4	Poor
2021	23.4	4.4	9.0	15.8	-0.2	4.7	0.0	57.0	Good

WILDLIFE MANAGEMENT UNIT 20 – SOUTHWEST DESERT

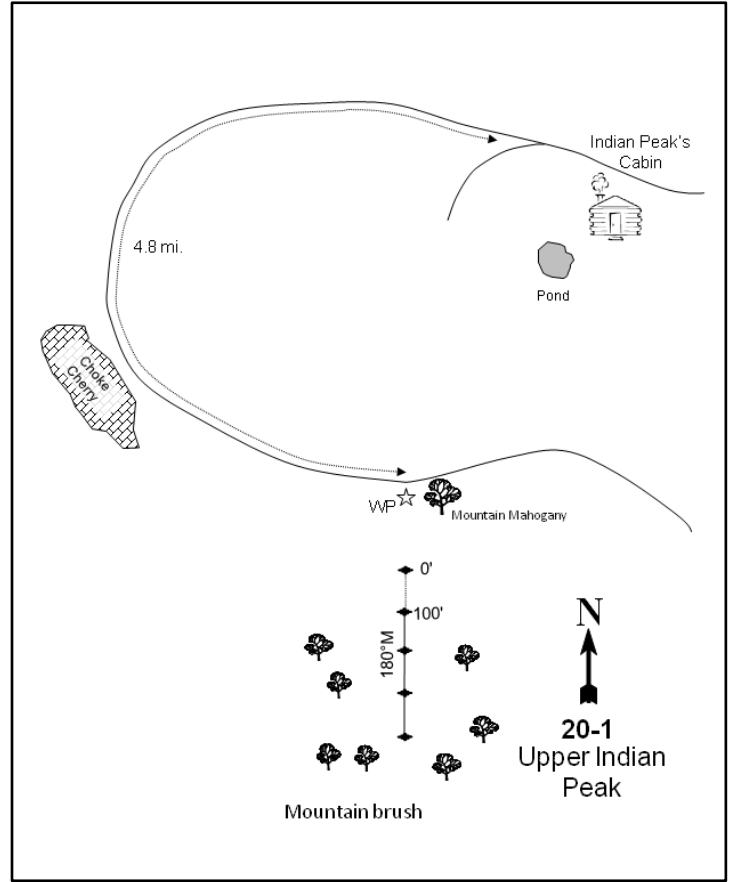
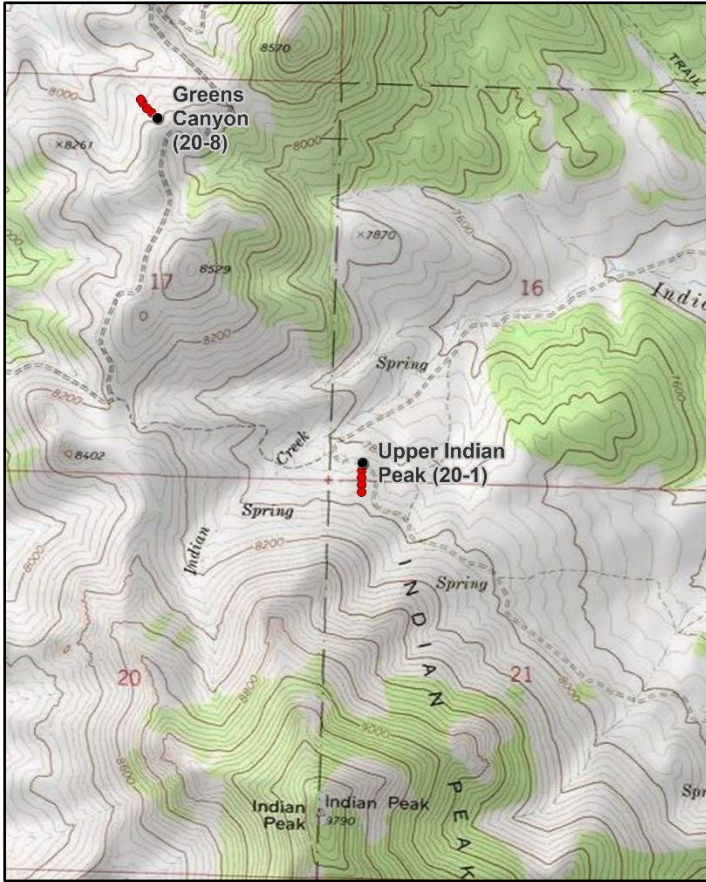


Study Locations Project, Status		Unit Boundary
●	RT, Active	Unit - 20
★	RT, Suspended	
▲	WRI, Active	
★	WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

UPPER INDIAN PEAK - STUDY NO. 20-1



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Buckhorn Spring SW; Township 29S, Range 18W, Section 16
NAD 83 UTM ZONE 12, 248615 East 4240757 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
180° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: No Rebar

Directions to Site

From the Indian Peaks state cabin, travel west for 0.4 miles to a fork, then turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curl-leaf mountain mahogany on the west side of the road and the witness post; it is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany, and the study is marked by 2-to-3-foot-tall steel rebar.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	7,875ft (2,400m)
Aspect	North
Slope	20-30%
Sample Dates	06/18/1998, 07/01/2003, 06/18/2008, 06/25/2012, 06/13/2017, 06/14/2022

Wildlife Habitat and Vegetation History**Table 20-01.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	substantial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 20-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I
2008	Mixed Mountain Brush	Phase I
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush	Phase I

Site Notes

There are several springs and a small perennial stream within 0.25 miles of this study.

Soils**Table 20-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.0	62.0	21.1	16.9	2.2	9.3	112.0	0.4	06/18/1998

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1985 through the 2022 sample year, the site has existed as a mixed mountain brush plant community. The dominant browse species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and alderleaf mountain mahogany (*Cercocarpus montanus*), and lesser species include antelope bitterbrush (*Purshia tridentata*), curl-leaf mountain mahogany (*C. ledifolius*) and mountain snowberry (*Symphoricarpos oreophilus*). Total preferred shrub cover has steadily increased each sample year since 2003 (Table 20-01.6, Table 20-01.12). The grass component of the understory is dominated by the perennial species muttongrass (*Poa fendleriana*), but overall cover is relatively low, with total perennial grass cover steadily decreasing each sample year since 2008 (Table 20-01.7, Table 20-01.10). Forbs are diverse and relatively abundant with no introduced species sampled; mountain phlox (*Phlox austromontana*) is the most prevalent forb (Table 20-01.11). Tree cover on and around the site has increased since study establishment (Photos, Table 20-01.12), and in time tree cover may begin to affect herbaceous understory and shrub production.

Trend Summary Tables

Table 20-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	33.1	1.3	-	-	-	-
2003	33.2	1.2	-	38.9	1.0	-
2008	36.7	1.7	-	44.8	1.5	-
2012	32.2	1.4	0.0	46.0	2.0	-
2017	40.5	1.8	0.5	47.3	1.5	0.8
2022	35.5	2.1	1.0	52.4	1.5	1.0

Table 20-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	-	326	40	301	-	12.8	0.2	14.3
2003	-	265	14	246	-	4.7	0.1	6.4
2008	-	290	11	275	-	8.1	0.1	7.7
2012	-	266	39	204	-	6.6	0.3	7.7
2017	-	267	26	264	-	5.5	0.1	6.1
2022	-	226	29	230	-	4.3	0.3	6.9

Table 20-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	8.1	0.1	33.9	33.4	4.5	49.4
2003	21.9	-	25.7	22.3	2.7	42.0
2008	13.3	0.0	24.4	26.9	3.4	45.7
2012	28.7	-	25.9	17.8	2.9	42.0
2017	25.1	0.0	33.5	21.3	3.1	48.4
2022	20.3	0.2	32.6	26.8	4.3	43.6

Table 20-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	3	14	19	-	19
2003	-	3	24	-	-
2008	-	6	27	-	25
2012	-	11	25	-	1
2017	-	8	21	6	8
2022	-	14	5	5	2
Year	Days Use Per Acre (ha)				
1998	3.6 (9.0)	8.1 (19.9)	26.2 (64.6)	-	-
2003	-	2.0 (5.0)	60.3 (149.0)	-	-
2008	-	16.1 (39.7)	38.2 (94.4)	0.6 (1.4)	-
2012	-	16.1 (39.7)	49.6 (122.5)	-	-
2017	-	12.1 (29.8)	25.5 (62.9)	4.7 (11.5)	-
2022	-	2.0 (5.0)	4.7 (11.6)	-	-

Table 20-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leucopoa kingii (spike fescue)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1998	-	-	-	-	1	4	6	2	-	303	18	25
2003	-	-	-	6	-	-	-	-	-	152	69	55
2008	-	-	-	-	-	-	1	-	1	236	47	55
2012	1	-	-	0	-	-	1	-	-	163	27	109
2017	9	2	6	-	-	-	11	-	2	223	33	18
2022	6	-	3	-	9	-	-	-	2	206	10	11
year	Average Cover (%)											
1998	-	-	-	-	0.1	0.1	0.1	0.0	-	11.7	0.6	0.3
2003	-	-	-	0.0	-	-	-	-	-	2.6	1.3	0.9
2008	-	-	-	-	-	-	0.0	-	0.0	6.3	0.8	1.1
2012	0.1	-	-	0.0	-	-	0.0	-	-	2.6	0.3	3.5
2017	0.1	0.0	0.0	-	-	-	0.1	-	0.0	4.2	0.7	0.4
2022	0.0	-	0.0	-	0.0	-	-	-	0.0	3.9	0.1	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Androsace septentrionalis ^a (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis drummondii (Drummond's rockcress)	Astragalus mollissimus (woolly locoweed)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)
year	Nested Frequency																
1998	3	14	20	5	-	2	21	7	37	1	5	70	14	-	39	-	28
2003	-	6	3	-	1	2	-	-	-	4	1	28	-	-	17	-	12
2008	-	13	3	-	16	-	-	15	2	-	-	9	-	-	66	6	27
2012	8	6	3	-	8	4	-	6	-	2	-	-	1	-	17	-	2
2017	-	5	3	-	1	15	-	3	-	-	-	7	4	4	66	25	1
2022	-	20	18	-	5	9	8	-	-	-	6	2	3	-	49	-	24
year	Average Cover (%)																
1998	0.0	0.0	0.1	0.0	-	0.0	0.1	0.3	0.6	0.0	0.0	1.4	0.1	-	0.3	-	0.3
2003	-	0.0	0.0	-	0.0	0.0	-	-	-	0.1	0.0	0.1	-	-	0.0	-	0.1
2008	-	0.1	0.0	-	0.1	-	-	0.1	0.0	-	-	0.1	-	-	0.4	0.0	0.1
2012	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	-	0.0	-	0.0
2017	-	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-	0.2	0.0	0.0	0.5	0.1	0.0
2022	-	0.1	0.1	-	0.0	0.1	0.0	-	-	-	0.0	0.0	0.0	-	0.7	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Delphinium nuttallianum (two-lobed larkspur)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium multiflorum (shrubby bedstraw)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Penstemon eatonii (firecracker penstemon)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Senecio integerrimus ^a (lambstongue ragwort)
year	Nested Frequency																
1998	2	121	3	25	48	14	6	3	-	41	21	3	4	20	104	34	17
2003	-	115	-	18	30	-	5	-	-	7	13	-	6	2	90	33	14
2008	-	116	2	25	43	-	5	-	-	-	16	-	6	16	96	63	11
2012	3	27	18	20	30	-	8	-	-	-	27	-	3	12	97	39	38
2017	-	17	1	20	30	-	9	-	10	17	22	5	-	27	92	79	17
2022	-	19	1	23	33	3	-	-	-	1	18	14	1	15	96	72	12
year	Average Cover (%)																
1998	0.0	2.0	0.0	0.2	0.9	0.1	0.2	0.0	-	0.5	0.9	0.0	0.2	1.2	4.6	0.2	0.1
2003	-	0.9	-	0.2	0.2	-	0.0	-	-	0.0	0.7	-	0.0	0.4	3.4	0.1	0.1
2008	-	0.8	0.0	0.1	0.6	-	0.0	-	-	-	1.1	-	0.1	1.0	2.9	0.2	0.1
2012	0.0	0.2	0.1	0.4	0.3	-	0.1	-	-	-	0.5	-	0.0	1.5	4.1	0.2	0.3
2017	-	0.1	0.0	0.1	0.3	-	0.2	-	0.0	0.1	0.6	0.0	-	0.5	2.9	0.4	0.1
2022	-	0.3	0.0	0.2	0.7	0.0	-	-	-	0.0	0.6	0.2	0.0	0.5	3.1	0.3	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Streptanthus cordatus (heartleaf twistflower)
year	Nested
1998	7
2003	7
2008	4
2012	1
2017	5
2022	-
year	Average Cover (%)
1998	0.0
2003	0.1
2008	0.0
2012	0.0
2017	0.0
2022	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia arbuscula ^p (little sagebrush)	Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha var. erinacea (grizzlybear pricklypear)	Pinus monophylla ^t (singleleaf pinyon)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1998	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	11.2	11.9	1.3	7.8	0.5	0.4	0.4	-	0	-	1.3	5	0.1
2008	12.5	12.4	2	7.6	1.1	0.2	1.5	-	0.1	-	1.5	7.3	0.1
2012	12.2	12.9	2.7	10	1.7	0.1	1.5	-	-	-	1.4	5.3	0.2
2017	15.4	13.4	3.4	6.5	1.2	-	1	-	0.1	0.8	1.7	5.9	0.2
2022	16.7	12.7	4	9.8	1.2	0.2	1.7	0.1	-	1	1.8	5.7	-
year	Quadrat Cover (%)												
1998	8.3	15.8	0.4	5.2	0.9	-	0.8	-	0.2	-	0.7	1.9	0.2
2003	5.8	13.2	1.6	7.6	1.1	0.0	1.1	-	0.1	-	0.7	3.3	0.0
2008	9.6	11.4	1.9	5.7	1.5	0.0	1.2	-	0.2	-	1.1	5.8	0.0
2012	7.6	9.8	1.8	6.2	1.1	0.2	1.6	-	0.0	0.0	1.7	3.6	0.2
2017	11.3	12.6	0.9	7.7	1.5	0.0	1.4	-	0.0	0.5	1.8	4.9	0.2
2022	10.4	9.5	2.7	5.2	1.9	0.0	1.9	0.0	0.1	1.0	1.4	4.3	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1998	900	60	36	62	2	27	9	0	109/122
2003	920	20	9	89	2	15	78	0	104/129
2008	960	100	17	71	13	33	17	0	105/126
2012	840	100	17	76	7	24	57	5	82/109
2017	940	20	15	85	0	4	72	0	110/135
2022	1320	-	8	92	0	12	6	5	- / -
Artemisia arbuscula^p -- (little sagebrush)									
1998	6840	840	15	72	13	34	13	3	26/48
2003	7100	-	3	80	18	25	0	3	24/45
2008	6900	40	7	69	24	23	10	6	21/50
2012	4720	60	3	84	13	32	10	28	20/54
2017	5720	60	3	84	13	59	0	12	20/53
2022	5260	20	5	80	15	23	0	25	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1998	100	-	40	60	0	40	20	0	175/150
2003	100	-	20	80	0	20	60	0	159/187
2008	80	-	0	100	0	25	0	0	120/101
2012	200	-	80	20	0	0	0	20	85/112
2017	120	-	0	100	0	67	0	0	150/150
2022	160	20	13	88	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1998	740	20	19	73	8	46	24	3	120/141
2003	1040	-	14	87	0	12	81	0	99/135
2008	800	80	18	83	0	33	28	0	95/114
2012	780	20	5	92	3	33	49	10	93/131
2017	780	160	28	72	0	33	62	0	101/134
2022	1160	-	3	97	0	12	16	2	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	720	20	11	72	17	11	0	0	27/39
2003	960	-	0	94	6	19	4	0	25/32
2008	1100	-	6	82	13	2	0	4	20/30
2012	900	20	7	91	2	0	0	7	22/33
2017	880	-	2	96	2	2	11	2	23/37
2022	960	-	6	94	0	0	0	6	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
1998	1000	120	6	90	4	0	2	0	16/23
2003	2240	-	1	97	2	5	2	0	18/21
2008	2600	100	13	82	5	2	0	2	17/25
2012	1780	-	3	94	2	7	3	6	16/26
2017	2040	20	1	99	0	24	0	4	15/20
2022	1580	-	4	95	1	8	1	3	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	340	-	0	94	6	6	24	0	20/26
2008	20	-	0	100	0	0	100	0	35/36
2012	140	-	0	71	29	0	0	29	21/26
2017	200	-	30	70	0	0	20	0	27/35
2022	80	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	-	-	-	-	-	-	-	-	- / -
2003	20	-	0	100	0	0	0	0	15/23
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	0	100	0	0	0	0	- / -
Opuntia polyacantha var. erinacea -- (grizzlybear pricklypear)									
1998	440	-	36	46	18	0	0	18	11/26
2003	420	-	14	81	5	0	0	10	12/27
2008	200	80	0	90	10	0	0	30	12/26
2012	60	-	0	100	0	0	0	67	10/20
2017	100	-	0	100	0	0	0	0	10/20
2022	180	-	11	89	0	0	0	11	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
1998	60	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	20	-	0	0	100	0	0	100	- / -
2012	60	-	100	0	0	0	0	0	- / -
2017	60	-	33	67	0	0	0	0	- / -
2022	100	20	20	80	0	0	0	0	- / -

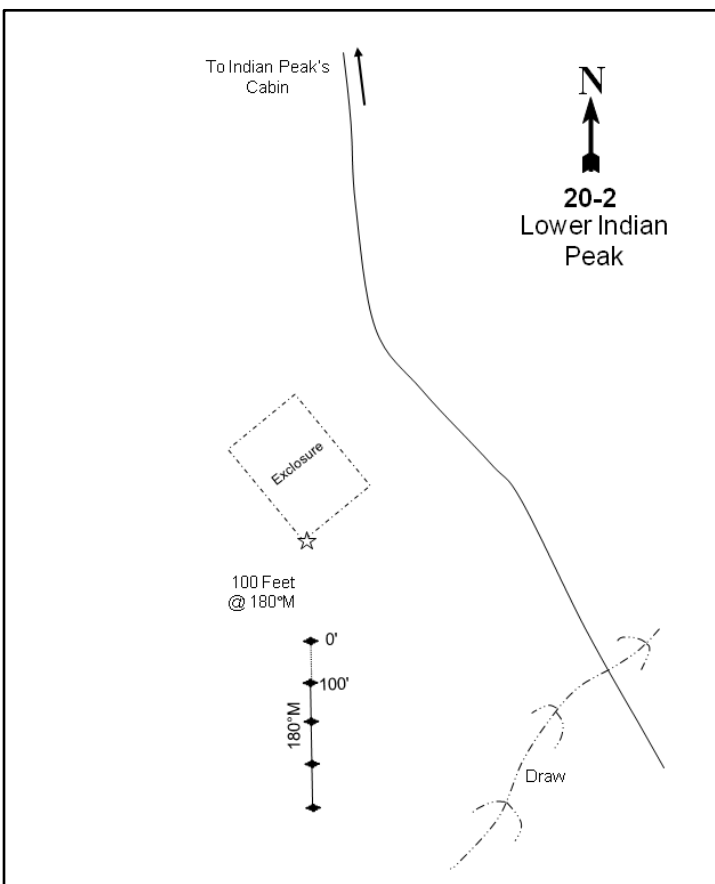
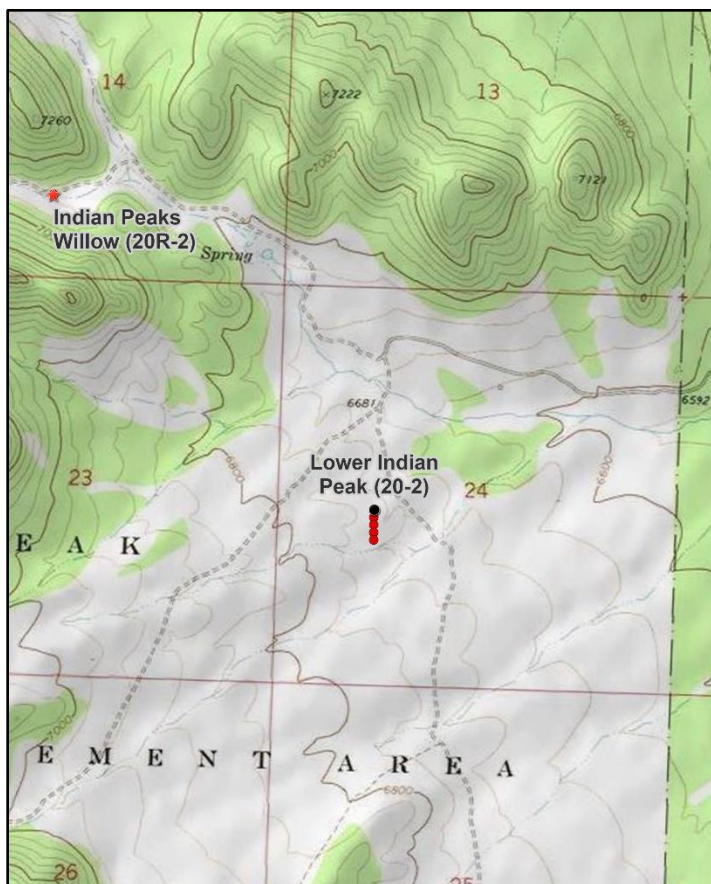
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
1998	60	-	0	100	0	0	33	0	28/135
2003	80	-	0	100	0	25	75	0	35/180
2008	140	-	0	100	0	0	86	43	32/84
2012	100	-	0	100	0	0	100	0	26/125
2017	60	-	0	100	0	67	33	0	43/145
2022	220	-	0	100	0	91	0	0	- / -
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	20	0	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1998	1420	60	28	72	0	3	0	1	27/53
2003	1900	-	12	85	3	8	0	2	27/56
2008	1900	440	36	63	1	2	2	0	32/65
2012	1460	60	15	85	0	23	0	3	25/56
2017	1980	-	5	95	0	5	0	0	28/55
2022	3060	20	11	89	0	3	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1998	100	-	0	80	20	0	0	0	28/32
2003	320	-	13	75	13	19	0	0	26/34
2008	340	-	12	41	47	6	0	41	15/20
2012	100	-	20	80	0	20	40	20	24/38
2017	300	-	20	80	0	7	0	0	22/28
2022	80	-	25	50	25	25	0	25	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	43	15	54	8	23	-	6.1
2022	41	27	53	7	-	13	5.6

LOWER INDIAN PEAK - STUDY NO. 20-2



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Buckhorn Spring SW; Township 29S, Range 18W, Section 24
NAD 83 UTM ZONE 12, 253679 East 4239627 North

Transect Information

Browse Tag # (0' Stake)	7076
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (34ft), Line 4 (59ft)
Belt Marker Placement	Belt 1: 6ft, Belt 3: 8ft, Belt 5: 1ft

Directions to Site

From the Indian Peaks state cabin, travel 0.4 miles west to a fork, then turn left and cross the stream. Continue for 0.1 miles and turn left at the fork, then go 0.3 miles to an enclosure, which is about 180 feet off of the right (west) side of the road. The 0-foot stake is 100 feet south and in line with the fence of the southwest corner of the enclosure. The 0-foot stake is a rebar with browse tag #7076 attached.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,710ft (2,045m)
Aspect	East
Slope	8-10%
Sample Dates	06/10/1998, 07/02/2003, 06/16/2008, 06/28/2012, 06/12/2017, 06/15/2022

Table 20-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Indian Peaks WMA Mule Deer Habitat Improvement Project	4818	November 2018-October 2019	991
Chaining - Chain Unknown	-	-	1959	100
Seeding - Rangeland Drill	-	-	1959	100
Hand Crew - Lop and Scatter	Indian Peaks WMA Lop and Scatter	1784	May-June 2011	930

Wildlife Habitat and Vegetation History**Table 20-02.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Rocky Mountain Elk	substantial	year-long

Table 20-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Sagebrush/Perennial Grass	Phase I
1991	Sagebrush/Perennial Grass	Phase I
1998	Sagebrush/Perennial Grass	Phase I
2003	Sagebrush/Perennial Grass	Phase I
2008	Sagebrush/Perennial Grass	Phase I
2012	Sagebrush/Perennial Grass	Phase I
2017	Sagebrush/Perennial Grass	Phase I
2022	Sagebrush/Perennial Grass	Phase I

Site Notes

There is an ephemeral stream approximately 0.25 miles from the study site.

Soils**Table 20-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6	06/10/1998

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY332UT
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 1985, it was a sagebrush and perennial grass plant community. Black sagebrush (*Artemisia nova*) is the dominant browse species on the site with mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and broom snakeweed (*Gutierrezia sarothrae*) as lesser components (Table 20-02.12). Black sagebrush cover was higher in the two sample years following the lop and scatter treatment that occurred in 2011; however, sagebrush cover did decrease slightly from 7% in 2017 to 6.5% in 2022 (Table 20-02.1, Table 20-02.12). Perennial grasses are diverse and abundant, with crested wheatgrass (*Agropyron cristatum*) being the dominant species (Table 20-02.10). The forb community for this site is not diverse and is fairly sparse (Table 20-02.11). Post-treatment tree cover and density of Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have decreased from pre-treatment levels. Singleleaf pinyon is showing signs of infilling with a couple of young trees appearing in 2022 (Table 20-02.12, Table 20-02.14). The site is considered to be in Phase I of woodland succession as of the 2022 sample year (Table 20-02.4), although there may be potential for further infilling in future years.

Trend Summary Tables

Table 20-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	6.6	0.4	3.9	-	-	-
2003	8.3	0.2	4.8	5.4	0.4	6.3
2008	6.9	0.5	6.9	6.8	0.5	10.4
2012	7.0	0.4	2.3	6.1	0.3	2.6
2017	7.6	1.3	2.3	7.9	1.2	3.3
2022	6.7	0.1	3.8	7.5	0.3	3.0

Table 20-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	202	328	55	20	2.9	16.9	0.2	0.4
2003	37	220	52	10	0.3	5.6	0.2	0.2
2008	190	243	11	10	1.3	11.6	0.0	0.2
2012	223	256	10	16	2.6	15.9	0.0	0.1
2017	247	289	39	23	5.3	16.3	0.1	0.3
2022	282	254	28	23	6.4	12.3	0.1	0.3

Table 20-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	21.4	1.2	36.9	10.7	13.1	34.1
2003	27.5	0.6	34.2	14.8	13.3	19.4
2008	15.8	0.2	38.2	14.6	13.7	27.8
2012	26.1	0.1	38.9	4.6	12.1	27.2
2017	25.3	0.1	37.7	7.5	13.5	34.7
2022	24.5	0.1	48.8	16.8	15.6	28.5

Table 20-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	3	8	-	23
2003	-	4	36	-	57
2008	-	8	16	-	87
2012	-	9	14	-	33
2017	-	14	12	-	53
2022	-	19	12	2	5
Year	Days Use Per Acre (ha)				
1998	5.8 (14.3)	6.7 (16.6)	16.1 (39.7)	0.6 (1.4)	-
2003	-	10.7 (26.5)	44.2 (109.2)	-	-
2008	-	10.7 (26.5)	26.8 (66.2)	-	-
2012	1.5 (3.6)	10.0 (24.8)	9.4 (23.2)	-	-
2017	-	22.1 (54.6)	6.7 (16.6)	1.7 (4.3)	-
2022	0.7 (1.8)	5.3 (13.2)	13.4 (33.1)	0.6 (1.4)	-

Table 20-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency															
1998	-	262	8	1	50	202	12	1	3	-	27	8	23	9	-	32
2003	1	174	15	-	6	37	-	1	7	-	44	-	4	5	-	18
2008	1	216	9	-	14	190	11	-	-	-	15	16	8	11	1	18
2012	-	174	0	7	13	223	1	-	-	-	16	3	74	3	1	74
2017	-	223	28	4	33	247	4	-	10	5	43	-	12	12	-	42
2022	12	167	3	2	23	282	7	-	-	47	61	20	22	-	-	-
year	Average Cover (%)															
1998	-	12.7	0.1	0.0	1.3	2.9	0.7	0.0	0.0	-	0.3	0.2	0.3	0.1	-	1.3
2003	0.0	3.9	0.1	-	0.0	0.3	-	0.0	0.2	-	1.0	-	0.0	0.0	-	0.3
2008	0.0	9.4	0.3	-	0.2	1.3	0.1	-	-	-	0.2	0.1	0.1	0.8	0.0	0.4
2012	-	9.5	0.0	0.2	0.2	2.6	0.0	-	-	-	1.1	0.1	1.4	0.0	0.0	3.4
2017	-	9.6	1.1	0.1	0.9	5.3	0.0	-	0.1	0.1	1.9	-	0.1	0.3	-	2.1
2022	0.3	8.0	0.1	0.0	0.2	6.4	0.2	-	-	1.6	0.8	0.5	0.7	-	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Calochortus nuttallii (sego lily)	Chaetopappa ericoides (rose heath)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Navarretia intertexta ^a (needleleaf navarretia)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon linarioides ssp. sileri (Siler's penstemon)	Phlox austromontana (mountain phlox)
year	Nested Frequency																
1998	-	-	-	2	-	-	2	-	39	3	19	1	-	-	1	-	10
2003	-	2	-	-	-	-	-	-	-	-	50	-	2	-	-	-	4
2008	3	-	-	-	-	-	-	-	1	-	3	7	-	-	-	-	5
2012	4	-	-	-	-	-	4	-	-	-	-	10	-	-	-	-	6
2017	-	-	2	-	6	-	-	-	6	3	21	6	2	1	1	1	11
2022	-	-	1	4	18	2	-	5	4	-	-	2	-	-	-	-	7
year	Average Cover (%)																
1998	-	-	-	0.0	-	-	0.0	-	0.1	0.0	0.1	0.0	-	-	0.0	-	0.4
2003	-	0.1	-	-	-	-	-	-	-	-	0.2	-	0.0	-	-	-	0.0
2008	0.0	-	-	-	-	-	-	-	0.0	-	0.0	0.0	-	-	-	-	0.2
2012	0.0	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.1
2017	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
2022	-	-	0.0	0.0	0.1	0.0	-	0.0	0.0	-	-	0.0	-	-	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES		
	Sphaeralcea coccinea (scarlet globemallow)	
	Streptanthus cordatus (heartleaf twistflower)	
year	Nested	
1998	2	-
2003	1	3
2008	2	-
2012	2	-
2017	6	-
2022	12	-
year	Average Cover (%)	
1998	0.0	-
2003	0.0	0.0
2008	0.0	-
2012	0.0	-
2017	0.0	-
2022	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES															
Artemisia nova ^a (black sagebrush)	Artemisia tridentata ssp. vaseyana ^a (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Cylindropuntia whipplei (Whipple cholla)	Echinocereus (hedgehog cactus)	Ephedra viridis ^p (mormon tea)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ¹ (Utah juniper)	Pediocactus simpsonii (mountain ball cactus)	Pinus monophylla ¹ (singleleaf pinyon)	Purshia tridentata ^a (antelope bitterbrush)	Sclerocactus (fishhook cactus)		
year	Line Intercept Cover (%)														
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	3.5	1	0.2	-	-	0.4	-	0.2	5.9	-	0.4	0.5	-	-	
2008	4.2	1.5	-	-	-	0.4	0.4	0.5	6.9	-	3.5	0.3	0	-	
2012	4.6	1.1	-	-	-	0.2	0.1	0.3	2.6	-	-	0.1	-	-	
2017	7.1	0.2	-	-	-	0.4	-	0.8	0.4	3.3	-	0.2	-	-	
2022	6.5	0.1	-	-	-	0.5	-	0.3	3	-	-	0.4	-	-	
year	Quadrat Cover (%)														
1998	1.9	3.9	0.4	0.0	-	0.1	0.1	-	0.0	3.9	-	0.0	0.5	0.0	
2003	4.8	1.9	0.0	-	-	0.7	0.0	0.0	0.1	4.2	0.0	0.6	1.0	-	
2008	5.0	1.1	0.0	-	-	0.4	0.0	-	0.4	4.5	0.0	2.4	0.4	0.0	
2012	5.3	0.8	-	-	-	0.5	0.0	0.0	0.4	2.3	-	-	0.4	-	
2017	6.9	0.3	-	-	0.1	0.0	-	0.0	1.2	2.3	-	-	0.4	-	
2022	4.4	1.2	0.0	-	-	0.0	-	-	0.1	3.4	0.0	0.4	1.1	-	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia frigida^P -- (prairie sagewort)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	12/28
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Artemisia nova^P -- (black sagebrush)									
1998	1320	220	21	74	5	20	2	0	22/54
2003	1420	-	7	51	42	32	1	7	26/50
2008	1420	20	11	72	17	28	17	9	32/65
2012	1080	20	4	74	22	33	13	9	23/62
2017	2340	20	8	86	6	21	8	9	30/65
2022	1480	-	7	74	19	24	7	19	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	500	40	4	72	24	16	4	4	51/86
2003	240	-	25	58	17	50	0	8	57/96
2008	440	80	23	55	23	14	23	14	40/59
2012	540	120	11	70	19	11	37	30	38/70
2017	80	-	25	75	0	50	0	0	67/100
2022	200	-	0	50	50	0	0	60	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	40	-	0	100	0	0	0	0	34/64
2003	60	-	0	67	33	0	0	33	30/54
2008	120	-	17	50	33	33	17	33	17/24
2012	20	-	0	0	100	0	0	100	- / -
2017	-	-	-	-	-	-	-	-	-/-
2022	40	-	0	100	0	0	0	50	- / -
Cylindropuntia whipplei -- (Whipple cholla)									
1998	20	-	0	100	0	0	0	0	11/29
2003	-	-	-	-	-	-	-	-	10/29
2008	-	-	-	-	-	-	-	-	8/12
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	15/53
2022	-	-	-	-	-	-	-	-	-/-
Echinocereus -- (hedgehog cactus)									
1998	20	-	0	100	0	0	0	0	10/31
2003	60	-	0	100	0	0	0	0	9/19
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	8/20
2017	60	-	0	100	0	0	0	0	10/25
2022	-	-	-	-	-	-	-	-	-/-
Ephedra viridis^P -- (mormon tea)									
1998	40	-	50	50	0	50	0	50	69/99
2003	20	-	0	0	100	100	0	100	65/96
2008	40	-	0	50	50	100	0	50	58/78
2012	20	-	0	0	100	0	0	0	54/94
2017	20	-	0	100	0	0	100	0	60/90
2022	40	-	0	100	0	0	50	50	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Eriogonum -- (buckwheat)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	5/11
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
1998	100	-	0	60	40	40	0	40	50/58
2003	20	-	0	0	100	0	0	0	49/72
2008	120	-	0	83	17	0	50	17	35/51
2012	60	-	0	67	33	0	33	33	30/45
2017	20	-	0	0	100	0	100	100	56/77
2022	20	-	0	100	0	0	0	0	-/-
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	100	0	0	0	0	0	-/-
2008	-	-	-	-	-	-	-	-	12/33
2012	20	20	0	100	0	0	0	0	13/25
2017	20	-	0	100	0	0	0	0	32/60
2022	40	-	0	100	0	0	0	0	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	180	40	0	56	44	0	0	44	14/19
2003	420	-	0	71	29	0	0	0	19/25
2008	980	40	4	84	12	2	2	8	16/19
2012	1260	60	24	68	8	0	0	19	16/24
2017	1640	-	1	88	11	0	0	15	14/19
2022	320	-	0	88	13	0	0	25	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1998	80	-	0	100	0	0	0	0	-/-
2003	80	-	25	75	0	0	0	0	-/-
2008	40	-	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	40	20	0	100	0	0	0	0	-/-
2022	100	-	20	80	0	0	0	0	-/-
Krascheninnikovia lanata^p -- (winterfat)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	8/28
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1998	20	-	0	100	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	12/18
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	0	100	0	0	0	0	9/15
2022	20	-	0	100	0	0	0	0	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pediocactus simpsonii -- (mountain ball cactus)									
1998	-	-	-	-	-	-	-	-	-/-
2003	60	-	0	100	0	0	0	0	4/6
2008	20	-	0	100	0	0	0	0	4/7
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	40	-	0	100	0	0	0	0	-/-
Pinus monophylla¹ -- (singleleaf pinyon)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	20	0	0	0	0	0	0	-/-
2022	40	-	100	0	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1998	40	-	0	50	50	0	100	50	55/155
2003	60	-	0	0	100	0	100	0	52/182
2008	60	-	0	33	67	100	0	0	47/125
2012	20	-	0	100	0	100	0	0	45/124
2017	40	-	0	100	0	0	100	0	51/141
2022	40	-	0	100	0	0	50	0	-/-
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	63/178
2008	-	-	-	-	-	-	-	-	64/199
2012	-	-	-	-	-	-	-	-	90/97
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Sclerocactus -- (fishhook cactus)									
1998	20	-	0	100	0	0	0	0	5/7
2003	-	-	-	-	-	-	-	-	-/-
2008	60	-	0	100	0	0	0	0	13/26

t - Tree Species; p - Preferred Browse; i - Introduced Species

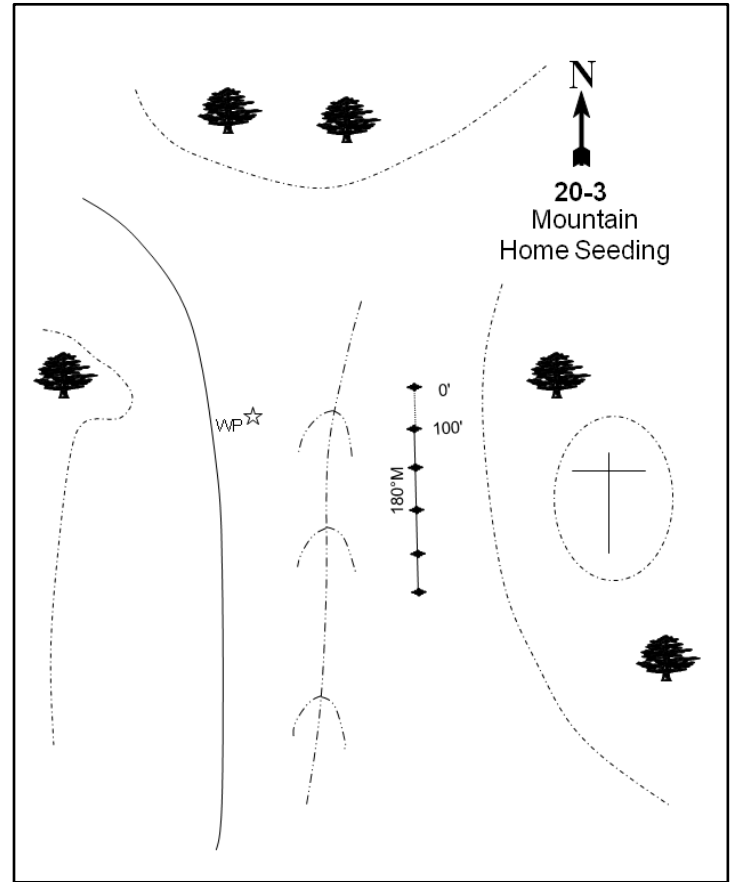
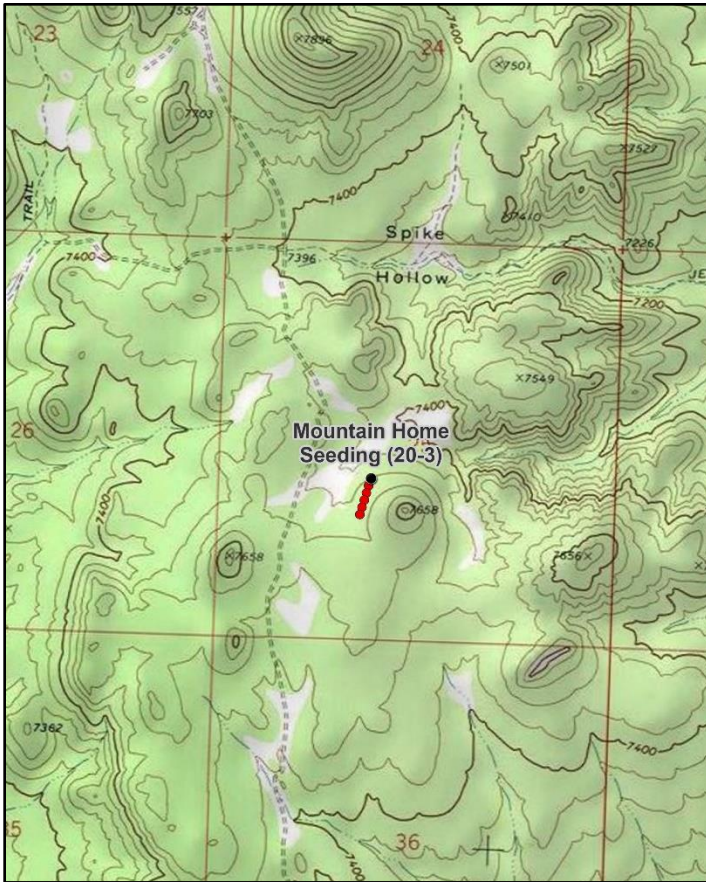
Table 20-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	24	-	-	-	-	-	10.9
2003	22	-	-	30	40	30	22.6
2008	26	-	8	23	46	23	21.6
2012	17	55	-	-	45	-	12.0
2017	14	10	20	10	20	40	14.6
2022	11	-	17	-	17	67	18.8
Pinus monophylla (singleleaf pinyon)							
1998	78	-	-	-	-	-	10.7
2003	80	5	11	16	47	21	14.4
2008	45	-	18	18	47	18	16.6
2012	21	30	10	20	40	-	11.1
2017	22	10	40	10	10	30	10.4
2022	11	-	33	-	-	67	14.3

Table 20-02.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	8.4	9.0	4.9	30.0	-2.1	0.9	0.0	51.0	Poor-Fair
2003	6.9	0.8	4.6	9.2	-0.3	0.4	0.0	21.7	Very Poor
2008	8.6	8.3	6.0	22.8	-1.0	0.4	0.0	45.1	Poor
2012	7.7	7.8	2.4	29.7	-1.9	0.2	0.0	45.9	Poor
2017	9.9	13.4	3.8	28.9	-4.0	0.5	0.0	52.6	Fair
2022	9.5	9.9	2.9	23.0	-4.8	0.6	0.0	41.1	Poor

MOUNTAIN HOME SEEDING - STUDY NO. 20-3

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Lopers Spring SE; Township 27S, Range 19W, Section 25
NAD 83 UTM ZONE 12, 244818 East 4257569 North

Transect Information

Browse Tag # (0' Stake)	143
Transect Bearing	180° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Indian Peaks cabin, drive to the main Pine Valley Road. Turn left (north) and drive about 2.0 miles to a fork, which is labeled with a sign saying "Hamblin Valley Road 15 miles". Drive west on this road (avoiding side roads) for about 12.0 miles to a four-way intersection, where a sign to the north reads "Lopers Spring 6.0 miles." Turn right (north) and drive for 6.2 miles to a witness post on the right side of the road (you will pass another four-way intersection at about 3.7 miles). The 0-foot stake is 170 paces from the witness post at 113 degrees magnetic and is marked with browse tag #143.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	7,500ft (2,286m)
Aspect	Northwest
Slope	5%
Sample Dates	06/09/1998, 07/01/2003, 07/06/2005, 06/17/2008, 06/27/2012, 06/14/2017, 06/13/2022

Table 20-03.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed	Mountain Home Habitat Improvement 1988	-	1989	1066
Chaining - Two-Way Chain Unknown	Mountain Home Habitat Improvement 1988	-	1989	1066
Seeding - Aerial Before	Mountain Home Habitat Improvement 1988	-	1989	1066
Harrow - One-Way Dixie	Mountain Home Habitat Improvement	226	Fall 2005	746
Seeding - Broadcast Before	Mountain Home Habitat Improvement	226	Fall 2005	746

Table 20-03.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Moutain Home Chaining			Aerial	Sep 1989	1066
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass		0.05	0.00
G	Agropyron cristatum	Crested Wheatgrass	Nordan	2.79	0.00
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.31	0.00
G	Agropyron cristatum	Crested Wheatgrass	Ephraim	1.22	0.00
G	Bromus inermis	Smooth Brome	Lincoln	2.02	0.00
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		1.13	0.00
G	Thinopyrum ponticum	Tall Wheatgrass		0.47	0.00
F	Medicago sativa	Alfalfa	Ladak	1.55	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.47	0.00

Mix Name			Application Type	Application Date	Acres
Moutain Home Chaining			Broadcast	Sep 1989	1066
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Leymus cinereus	Great Basin Wildrye		0.05	0.00

Mix Name			Application Type	Application Date	Acres
Mountain Home			Broadcast	Sep 2005	1200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass		1.00	0.96
G	Agropyron cristatum	Crested Wheatgrass	Douglas	0.50	0.40
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.50	0.47
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.93
G	Festuca brevipila	Hard Fescue	Durar	0.50	0.47
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.40
G	Poa secunda	Sandberg Bluegrass	SID OR	0.50	0.40
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.52	0.49
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.50	0.42
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.12	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.88	0.83
F	Linum perenne	Blue Flax	Appar	0.05	0.05
F	Medicago sativa	Alfalfa	Ladak+	0.33	0.32
F	Medicago sativa	Alfalfa	Nomad	0.33	0.31
F	Medicago sativa	Alfalfa	Spredor 4	0.33	0.31
F	Melilotus officinalis	Yellow Sweetclover		0.33	0.24
F	Onobrychis viciifolia	Sainfoin	Eski	1.50	1.41
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.94

Wildlife Habitat and Vegetation History**Table 20-03.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Rocky Mountain Elk	substantial	year-long

Table 20-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1998	Perennial Grass	No Encroachment
2003	Perennial Grass	No Encroachment
2005	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2008	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2012	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2017	Mountain Big Sagebrush	Phase I
2022	Mountain Big Sagebrush	Phase I

Site Notes

The area is occupied by deer, elk and wild horses throughout most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. In 2017, it was noted that most of the rubber rabbitbrush (*Ericameria nauseosa*) was defoliated.

Soils**Table 20-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.2	70.0	15.1	14.9	2.0	21.5	163.2	0.6	06/09/1998

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 1998, this site was a perennial grass plant community. It transitioned to a rubber rabbitbrush (*Ericameria nauseosa*) encroached site and was mechanically treated in 2005 (Table 20-03.1). Following this treatment, however, rabbitbrush maintained a presence. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) began establishing on the site in 2003, and in 2017 and 2022 it was the dominant shrub in the community (Table 20-03.12, Table 20-03.13). Perennial grass cover and frequency have fluctuated, but the general trend has been a decreasing one, with crested wheatgrass (*Agropyron cristatum*) expressing dominance. The invasive annual grass cheatgrass (*Bromus tectorum*) has increased in both cover and nested frequency since 2008, and was at its highest in 2022 (Table 20-03.10). Forbs are modestly diverse, but cover is low; the dominant forb is perennial cryptantha (*Cryptantha* sp.) (Table 20-03.11). Few trees have been observed since 2017 (Table 20-03.12), but the surrounding tree community (Photos) and tree presence prior to site establishment indicates potential for future encroachment on this site.

Trend Summary Tables

Table 20-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	0.4	-	-	-	-	-
2003	1.0	0.0	-	0.3	0.5	-
2005	1.9	0.2	-	2.1	0.2	-
2008	2.7	1.0	-	3.4	1.4	-
2012	6.1	1.7	-	8.5	2.6	-
2017	12.2	2.9	-	12.5	3.9	-
2022	16.4	3.2	-	19.6	3.9	-

Table 20-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	84	382	61	43	0.7	29.4	0.2	0.4
2003	29	330	2	14	0.1	9.3	0.0	0.2
2005	10	364	16	12	0.0	20.3	0.1	0.3
2008	6	363	5	37	0.0	13.1	0.0	0.4
2012	15	354	12	44	0.0	12.3	0.0	0.3
2017	152	260	145	61	1.8	4.7	0.8	1.1
2022	252	142	196	40	4.4	2.5	1.5	0.3

Table 20-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	15.5	0.0	42.2	23.4	13.6	35.3
2003	41.4	-	18.8	24.4	11.8	10.6
2005	21.0	-	15.5	38.8	13.4	22.8
2008	13.8	0.1	25.1	35.8	16.7	17.1
2012	36.6	-	18.0	8.6	16.2	23.1
2017	44.8	-	24.3	5.9	14.8	24.1
2022	24.1	0.0	28.1	38.4	14.1	25.3

Table 20-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	14	27	26	4
2003	1	7	16	27	-
2005	-	9	29	21	23
2008	-	9	31	20	53
2012	1	3	38	5	6
2017	1	13	20	6	8
2022	-	5	-	6	-
Year	Days Use Per Acre (ha)				
1998	-	6.7 (16.6)	26.8 (66.2)	44.1 (109.0)	-
2003	0.7 (1.8)	2.7 (6.6)	39.6 (97.7)	38.3 (94.7)	-
2005	-	0.7 (1.7)	28.1 (69.5)	33.1 (81.8)	-
2008	-	4.7 (11.6)	51.6 (127.5)	43.6 (107.6)	-
2012	-	1.3 (3.3)	42.9 (105.9)	14.5 (35.9)	-
2017	-	16.8 (41.4)	10.7 (26.5)	13.9 (34.4)	-
2022	-	59.6 (147.3)	3.4 (8.3)	34.3 (84.6)	-

Table 20-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus inermis ⁱ (smooth brome)	Bromus rubens ^{ai} (red brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency							
1998	-	352	5	115	-	84	3	34
2003	-	318	-	82	-	29	-	18
2005	-	334	-	130	-	10	-	43
2008	-	337	4	92	-	6	7	57
2012	8	312	3	105	-	15	8	16
2017	-	235	-	62	86	76	-	6
2022	-	96	-	58	-	252	-	6
year	Average Cover (%)							
1998	-	25.1	0.1	3.2	-	0.7	0.0	0.9
2003	-	8.6	-	0.7	-	0.1	-	0.1
2005	-	17.4	-	2.6	-	0.0	-	0.2
2008	-	10.9	0.0	1.8	-	0.0	0.0	0.4
2012	0.1	9.5	0.0	2.1	-	0.0	0.0	0.5
2017	-	3.9	-	0.8	1.0	0.8	-	0.0
2022	-	1.7	-	0.8	-	4.4	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Dalea (prairie clover)	Descurainia pinnata ^a (western tansymustard)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Grindelia squarrosa (curlycup gumweed)	Halogeton glomeratus ^{ai} (saltlover)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
1998	1	-	11	-	34	-	2	-	25	-	-	5	-	3	7	24	-
2003	-	-	-	-	2	-	-	-	-	-	2	-	-	-	1	-	-
2005	-	1	3	-	-	-	-	7	-	-	-	1	-	0	-	5	-
2008	3	-	1	-	6	3	-	3	-	1	-	-	1	4	-	1	2
2012	6	-	6	5	1	-	-	-	-	-	-	1	-	9	-	5	-
2017	3	-	30	34	6	-	-	106	15	-	-	3	-	6	-	27	-
2022	11	-	38	7	4	-	1	3	13	-	-	-	-	0	-	177	-
year	Average Cover (%)																
1998	0.0	-	0.0	-	0.1	-	0.0	-	0.1	-	-	0.0	-	0.0	0.2	0.1	-
2003	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	-
2005	-	0.0	0.0	-	-	-	-	0.0	-	-	-	0.0	-	0.0	-	0.1	-
2008	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0
2012	0.1	-	0.0	0.0	0.0	-	-	-	-	-	-	0.0	-	0.1	-	0.0	-
2017	0.0	-	0.1	0.6	0.0	-	-	0.5	0.1	-	-	0.0	-	0.3	-	0.1	-
2022	0.1	-	0.1	0.0	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	1.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Sanguisorba minor ⁱ (small burnet)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency			
1998	1	1	-	2
2003	7	5	-	0
2005	7	3	-	1
2008	12	3	3	3
2012	22	2	-	1
2017	17	0	-	6
2022	21	-	-	3
year	Average Cover (%)			
1998	0.0	0.0	-	0.0
2003	0.0	0.1	-	0.0
2005	0.0	0.1	-	0.1
2008	0.0	0.1	0.0	0.1
2012	0.1	0.0	-	0.0
2017	0.1	0.0	-	0.0
2022	0.1	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	-	0.3	-	0.5	-	-	-
2005	-	0.5	-	0.2	1.6	-	-
2008	-	1	-	1.4	2.4	-	-
2012	-	4	-	2.6	4.5	-	-
2017	-	10.7	-	3.9	1.8	0	-
2022	-	18.2	0.1	3.8	1.4	-	-
year	Quadrat Cover (%)						
1998	-	-	-	-	0.4	-	-
2003	-	0.0	-	0.0	1.0	-	0.0
2005	-	0.4	-	0.2	1.5	-	-
2008	-	0.3	-	1.0	2.4	-	-
2012	-	1.9	0.0	1.7	4.2	-	-
2017	-	8.7	0.0	2.8	3.5	0.0	-
2022	0.0	14.4	0.1	3.1	1.9	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	24/53
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	-	-	-	-	-	-	-	-	76/101
2003	20	-	0	100	0	0	100	0	74/112
2005	920	580	96	4	0	0	2	0	67/103
2008	1340	80	70	30	0	3	3	6	27/34
2012	4900	440	74	24	2	2	8	78	38/53
2017	7020	200	33	67	1	28	1	1	43/55
2022	4920	-	20	71	9	20	5	37	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	30/54
2005	20	-	0	100	0	0	0	0	24/45
2008	40	-	0	100	0	0	0	0	21/26
2012	60	20	67	33	0	0	0	33	24/40
2017	60	-	0	100	0	0	0	33	26/39
2022	160	-	0	100	0	0	0	0	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	40	0	0	0	0	0	0	107/161
2005	1020	1040	94	6	0	0	0	0	80/112
2008	1760	20	9	82	9	22	0	33	37/42
2012	2680	1360	32	59	9	2	0	37	49/54
2017	1720	-	31	64	5	7	0	71	56/63
2022	760	-	5	71	24	3	0	24	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	88/129
2003	40	-	0	100	0	50	0	0	81/123
2005	2220	1180	95	5	0	0	0	0	67/113
2008	3500	20	15	75	9	21	2	19	30/44
2012	2360	460	22	64	14	7	0	34	45/55
2017	1860	-	5	93	2	1	0	82	48/57
2022	640	-	0	22	78	25	3	78	-/-
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	0	100	0	0	0	0	27/26
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	24/50
2012	-	-	-	-	-	-	-	-	-/-
2017	100	-	20	20	60	20	0	80	16/30
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	100	0	0	0	0	0	16/12
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	31/69
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	22/89
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	11/27
2022	-	-	-	-	-	-	-	-	-/-
Ribes^p -- (currant)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	71/57
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	83/92

t - Tree Species; p - Preferred Browse; i - Introduced Species

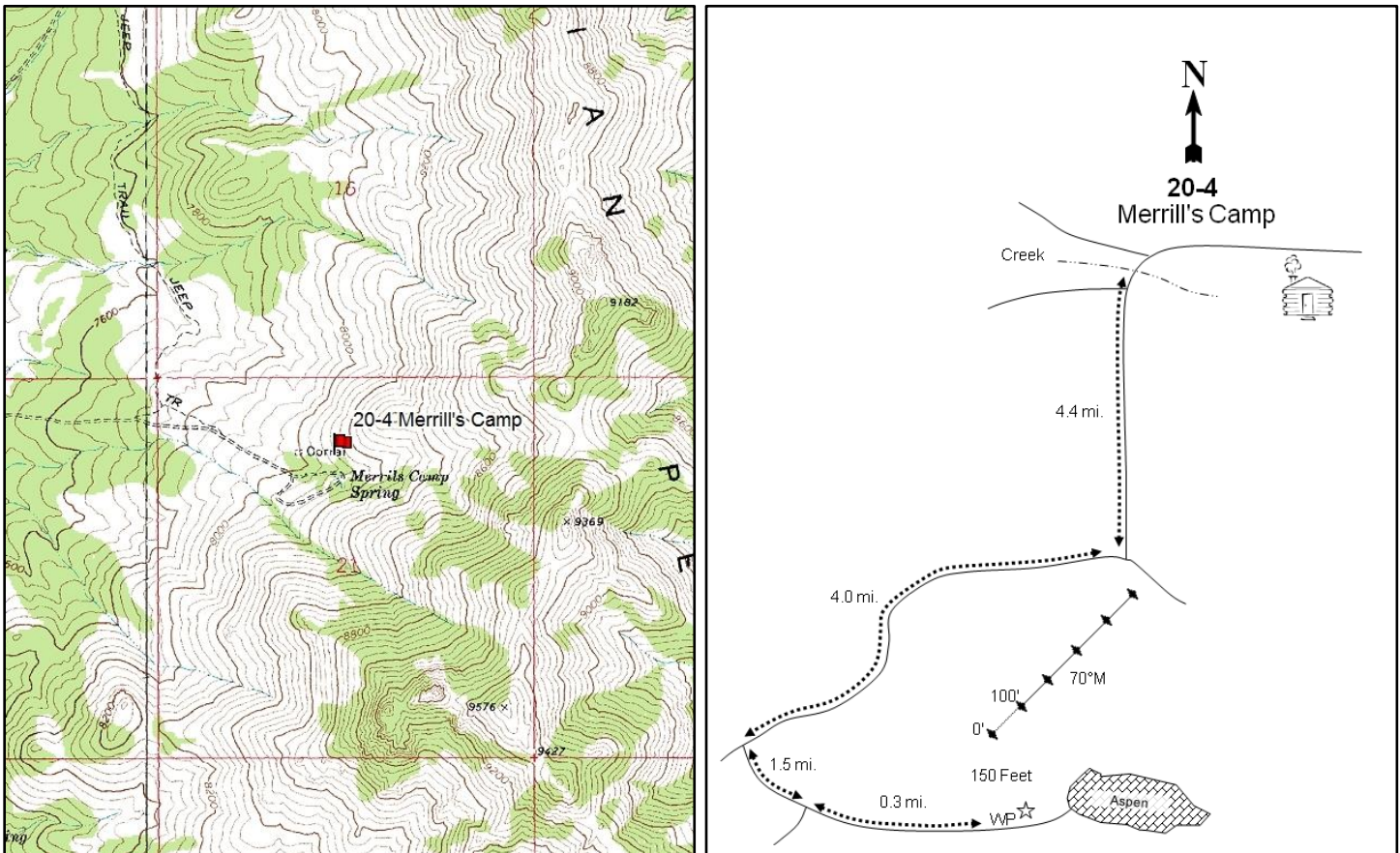
Table 20-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	1	-	100	-	-	-	6.0
2022	1	-	-	100	-	-	4.0
Pinus monophylla (singleleaf pinyon)							
2017	1	-	100	-	-	-	2.0
2022	2	100	-	-	-	-	1.5

Table 20-03.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	0.5	0.0	0.0	30.0	-0.5	0.8	0.0	30.8	Very Poor
2003	0.4	0.0	0.0	18.6	-0.1	0.4	0.0	19.3	Very Poor
2005	2.6	0.0	0.0	30.0	0.0	0.6	0.0	33.2	Very Poor
2008	4.3	0.0	0.0	26.3	0.0	0.7	0.0	31.2	Very Poor
2012	10.6	12.5	15.0	24.5	0.0	0.5	0.0	63.1	Fair
2017	15.6	14.7	14.3	9.3	-1.3	2.3	0.0	54.9	Poor-Fair
2022	24.5	10.7	9.2	5.0	-3.3	0.6	0.0	46.8	Poor

MERRILL'S CAMP - STUDY NO. 20-4

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Pinto Spring NW; Township 30S, Range 18W, Section 21
NAD 83 UTM ZONE 12, 248942 East 4230696 North

Transect Information

Browse Tag # (0' Stake)

112

Transect Bearing

70° magnetic

Length

500ft

Belt Placement

Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)

Belt Marker Placement

Standard

Directions to Site

From the Indian Peaks Cabin, drive for 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive for 4.4 miles to a "T" junction, then turn right. Drive 4.0 miles and turn left. Proceed for another 1.5 miles and turn left, and then drive for 0.3 miles to the witness post on the left (north) side of the road. The 0-foot stake is 50 paces up the hill at approximately 0 degrees magnetic. The 0-foot stake is marked with browse tag #112.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	ATCHISON CREEK
Elevation	8,150ft (2,484m)
Aspect	Southwest
Slope	25-30%
Sample Dates	06/27/2012, 06/12/2017, 06/13/2022

Wildlife Habitat and Vegetation History**Table 20-04.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	substantial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 20-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush	Phase I

Site Notes

Merrill's Camp Spring is the nearest source of water available to wildlife, and is located approximately 500 feet from the site in an old grove of aspen (*Populus tremuloides*) trees and shrubs that may provide escape and thermal cover for wildlife. Common Poorwills (*Phalaenoptilus nuttallii*) were found brooding under Utah serviceberry plants in 2012.

Soils**Table 20-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.5	67.4	17.5	15.1	2.2	6.7	232.0	0.5	06/27/2012

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2012, this site was a mountain brush community dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*A. nova*), and Utah serviceberry (*Amelanchier utahensis*) and has remained so through the 2022 sample year. A notable, steady decrease in both cover and density for mountain big sagebrush has occurred each sample year, which may indicate potential for a community transition in the future (Table 20-04.12, Table 20-04.13). The introduced annual species cheatgrass (*Bromus tectorum*) is the dominant grass species on the site and may be detrimental to biodiversity. The forb component is moderately diverse, but cover is low; the perennial species silvery lupine (*Lupinus argentus*) and annual species slender phlox (*Microsteris gracilis*) are the dominant species (Table 20-04.11). Singleleaf pinyon (*Pinus monophylla*) is present on the site, placing it in Phase I of woodland succession (Photos, Table 20-04.4, Table 20-04.13, Table 20-04.14); it is possible that this study site may experience further encroachment in the future.

Trend Summary Tables**Table 20-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2012	34.5	1.6	0.7	41.3	1.8	-
2017	33.3	1.8	0.8	39.9	2.0	-
2022	32.9	1.1	2.6	37.5	1.8	1.7

Table 20-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2012	390	132	99	131	8.3	1.6	0.8	2.4
2017	399	146	227	164	10.5	1.7	1.6	5.1
2022	222	106	140	156	2.5	1.0	0.6	2.8

Table 20-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	20.0	-	32.5	3.3	11.3	47.6
2017	15.4	0.0	46.2	12.0	14.5	49.4
2022	22.2	0.0	38.1	23.6	18.0	36.5

Table 20-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2012	1	4	3	5	1
2017	5	8	-	11	1
2022	-	8	3	5	-
Year	Days Use Per Acre (ha)				
2012	-	12.8 (31.5)	14.1 (34.8)	5.8 (14.3)	-
2017	-	13.4 (33.1)	2.7 (6.6)	9.9 (24.4)	-
2022	-	53.6 (132.4)	14.1 (34.8)	7.5 (18.6)	-

Table 20-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
2012	-	390	59	4	11	63
2017	1	399	65	12	9	66
2022	3	222	66	7	16	18
year	Average Cover (%)					
2012	-	8.3	0.4	0.1	0.2	0.9
2017	0.0	10.5	0.6	0.4	0.1	0.6
2022	0.0	2.5	0.7	0.1	0.1	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus argophyllus (silverleaf milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericooides (rose heath)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron eatonii (Eaton's fleabane)	Gilia inconspicua ^a (shy gilia)	Lupinus argenteus (silvery lupine)	
year	Nested Frequency																	
2012	15	3	4	1	1	1	-	6	3	67	1	1	1	3	3	3	59	
2017	17	2	6	4	3	3	1	5	-	83	5	9	-	8	3	-	72	
2022	10	-	16	24	-	8	-	10	-	73	-	15	-	-	1	-	31	
year	Average Cover (%)																	
2012	0.0	0.0	0.0	0.0	0.0	0.0	-	0.4	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6	
2017	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	-	0.5	0.0	0.1	-	0.1	0.0	-	4.0	
2022	0.0	-	0.3	0.7	-	0.0	-	0.0	-	0.3	-	0.3	-	-	0.0	-	0.7	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency							
Microsteris gracilis ^a (slender phlox)	48	4	-	1	5	67	-	
Oenothera (evening primrose)	196	1	-	3	8	73	1	
Oenothera caespitosa (tufted evening primrose)	103	-	2	-	3	75	-	
Penstemon eatoni (firecracker penstemon)	Average Cover (%)							
Penstemon watsonii (Watson's penstemon)	2012	0.1	0.0	-	0.0	0.1	0.3	-
Phlox longifolia (longleaf phlox)	2017	1.0	0.0	-	0.0	0.2	0.3	0.0
Tragopogon dubius ^{at} (yellow salsify)	2022	0.4	-	0.0	-	0.1	0.5	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
Amelanchier utahensis ^p (Utah serviceberry)	8.2	2.6	22.8	0.2	-	1.4	-	0.1	0.1	0	7.7	
Artemisia nova ^p (black sagebrush)	7.9	13.9	13.8	0.3	0.1	1.7	-	-	0	-	4.2	
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	6.8	13.1	11	-	-	1.8	0	-	0	1.7	6.6	
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Quadrat Cover (%)											
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	2012	7.9	1.2	19.6	0.3	-	1.1	-	0.0	0.2	0.7	5.9
Ericameria parryi var. parryi (Parry's rabbitbrush)	2017	7.2	8.8	13.6	0.1	0.2	1.6	-	0.1	0.1	0.8	3.5
Eriogonum microthecum ^p (slender buckwheat)	2022	6.5	12.2	9.8	0.2	-	0.8	0.0	-	0.1	2.6	4.4
Gutierrezia sarothrae (broom snakeweed)												
Mahonia repens (creeping barberry)												
Pinus monophylla ⁱ (singleleaf pinyon)												
Symphoricarpos oreophilus ^p (mountain snowberry)												

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
2012	660	-	0	97	3	36	64	15	105/119
2017	900	80	22	76	2	29	53	4	106/104
2022	680	-	0	97	3	32	6	9	- / -
Artemisia nova^P -- (black sagebrush)									
2012	180	20	0	100	0	0	100	22	22/85
2017	3340	20	1	92	7	22	0	11	26/68
2022	3100	-	2	85	14	27	5	21	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
2012	4940	140	4	83	13	37	30	45	36/70
2017	2280	40	5	75	19	26	2	12	54/80
2022	1840	20	9	71	21	12	13	21	- / -
Cercocarpus ledifolius^P -- (curl-leaf mountain mahogany)									
2012	-	-	-	-	-	-	-	-	173/192
2017	-	-	-	-	-	-	-	-	192/179
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2012	100	-	0	100	0	0	0	0	24/33
2017	220	-	0	100	0	0	0	0	23/24
2022	260	-	8	92	0	8	0	0	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	25/27
2022	20	-	0	0	100	0	100	100	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
2012	20	-	0	100	0	0	0	0	73/84
2017	280	-	0	100	0	21	0	0	33/51
2022	-	-	-	-	-	-	-	-	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2012	1260	-	3	97	0	2	0	5	19/29
2017	860	-	0	98	2	28	19	2	25/36
2022	620	-	3	97	0	0	0	7	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2012	100	-	0	100	0	0	0	0	17/28
2017	240	-	8	92	0	0	0	0	16/19
2022	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
2012	1180	-	9	92	0	0	0	10	8/11
2017	860	-	0	100	0	0	0	0	9/8
2022	980	60	67	33	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2012	20	-	0	100	0	0	0	100	9/24
2017	40	-	0	100	0	0	0	0	12/21
2022	40	-	0	100	0	0	0	0	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
2012	40	40	100	0	0	0	0	0	- / -
2017	120	-	67	33	0	0	0	0	- / -
2022	120	-	67	33	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	54/106
2022	-	-	-	-	-	-	-	-	- / -

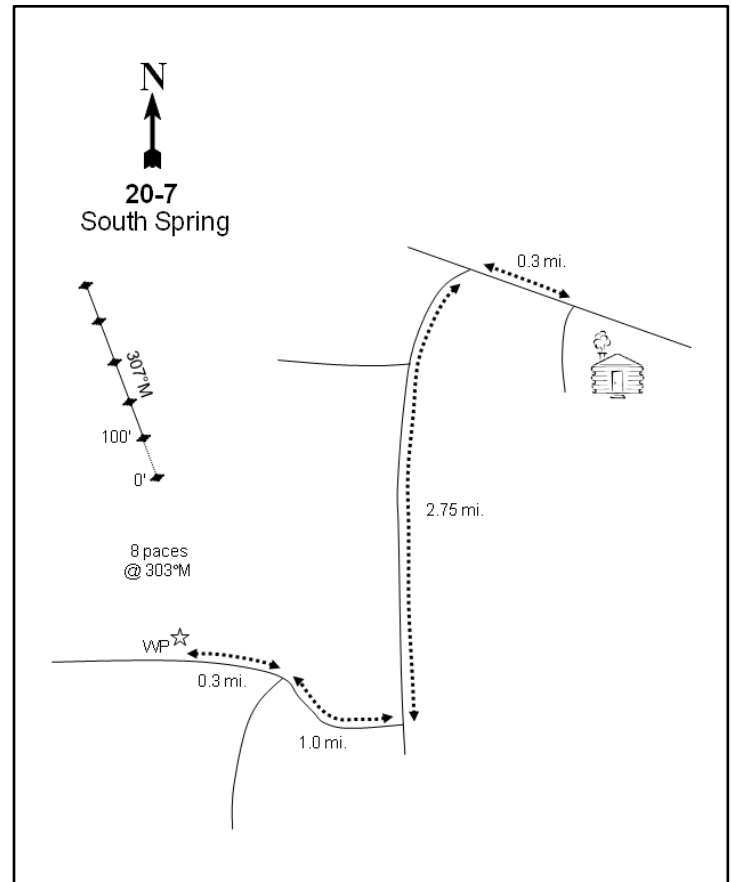
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rosa woodsii^p -- (Woods' rose)									
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	55/14
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2012	4200	340	17	83	0	18	7	9	22/39
2017	3200	40	4	96	0	22	33	0	22/36
2022	3280	40	9	91	0	6	3	3	- / -
Tetradymia canescens -- (spineless horsebrush)									
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	100	0	0	16/42

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	34	-	25	42	33	-	10.2
2022	45	-	14	29	21	36	12.9

SOUTH SPRING - STUDY NO. 20-7

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Pinto Spring NW; Township 29S, Range 18W, Section 35
NAD 83 UTM ZONE 12, 252367 East 4236143 North

Transect Information

Browse Tag # (0' Stake)	541
Transect Bearing	307° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Indian Peaks Cabin, go 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive 2.75 miles to another right (closed road): follow this for 1.0 miles to a fork near a spring with a trough. Stay to the right and drive for 0.3 miles into a sagebrush/grass flat and to the witness post on the right (north) side of the road. The 0-foot stake is 8 paces at 303 degrees magnetic from the witness post.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	7,300ft (2,225m)
Aspect	Northeast
Slope	10%
Sample Dates	07/28/1999, 07/02/2003, 06/18/2008, 06/26/2012, 08/10/2017, 06/15/2022

Table 20-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1960s	-
Seeding - Seed Unknown	-	-	1960s	-
Fire - Prescribed Fire	Indian Peak Prescribed Fire	-	1999	-

Wildlife Habitat and Vegetation History**Table 20-07.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Rocky Mountain Elk	substantial	year-long

Table 20-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1999	Mountain Big Sagebrush	Phase I
2003	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2008	Rubber Rabbitbrush/Perennial Grass	No Encroachment
2012	Rubber Rabbitbrush/Mountain Big Sagebrush/Annual Grass	No Encroachment
2017	Mountain Big Sagebrush/Rubber Rabbitbrush/Annual Grass	No Encroachment
2022	Mountain Big Sagebrush/Rubber Rabbitbrush/Annual Grass	No Encroachment

Site Notes

A deer skeleton was found on the site in 2017.

Soils**Table 20-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.4	72.0	15.4	12.6	2.5	12.3	256.0	0.5	07/28/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

When this study site was established in 1999, it was a sagebrush plant community in Phase I of woodland succession, being encroached by young Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*). Following the fire later that year (Table 20-07.1), it transitioned to a perennial grass and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *hololeuca*) community without tree encroachment. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has since infilled with cover steadily increasing each sample year, while density has held steady since 2012 (Table 20-07.12, Table 20-07.13). The increase and dominance of sagebrush indicates a community transition and recovery from the 1999 fire. Most grass cover has been contributed by annual species, specifically cheatgrass (*Bromus tectorum*). However, in 2022 perennial grasses became the most abundant herbaceous component with the introduced perennial grass species crested wheatgrass (*Abropyron cristatum*), smooth brome (*B. inermis*), and intermediate wheatgrass (*Thinopyrum intermedium*) contributing a combined cover of 10.7% (20-07.10). The forb community is sparse and lacking in diversity, with the dominant species being silvery lupine (*Lupinus argentus*) (Table 20-07.11). Although tree encroachment has not been a concern in the post-treatment sample years, there are trees present in areas surrounding the site (Photos), indicating that there may be potential for future infilling.

Trend Summary Tables

Table 20-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1999	13.7	1.0	0.0	-	-	-
2003	0.2	2.8	-	0.3	4.1	-
2008	11.1	5.9	-	11.6	7.2	-
2012	15.6	6.6	-	11.9	5.3	-
2017	17.3	4.5	-	20.0	4.2	-
2022	19.8	6.6	-	21.7	6.2	-

Table 20-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1999	117	374	-	85	1.2	16.7	-	2.6
2003	59	157	0	139	1.8	6.5	0.3	12.3
2008	359	281	42	159	6.8	9.0	0.3	5.2
2012	422	273	18	64	20.7	9.2	0.0	1.7
2017	407	341	37	69	14.3	14.5	0.1	3.8
2022	336	335	44	70	4.2	18.9	0.1	1.3

Table 20-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	8.8	0.2	58.3	8.4	0.1	36.3
2003	15.1	-	17.2	52.9	0.1	22.5
2008	16.4	-	35.8	16.6	0.3	41.6
2012	18.1	-	40.7	0.7	0.0	57.6
2017	21.2	0.0	47.1	16.1	0.2	45.6
2022	16.6	-	46.5	23.3	0.2	43.4

Table 20-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1999	2	8	28	-	8
2003	-	9	83	-	46
2008	1	8	59	12	85
2012	-	7	4	1	7
2017	-	6	5	16	33
2022	1	20	18	5	6
Year	Days Use Per Acre (ha)				
1999	-	-	-	-	-
2003	2.2 (5.4)	12.8 (31.5)	89.1 (220.2)	-	-
2008	-	20.1 (49.7)	28.1 (69.5)	15.1 (37.3)	-
2012	1.5 (3.6)	1.3 (3.3)	19.4 (48.0)	4.0 (10.0)	-
2017	-	2.7 (6.6)	6.0 (14.9)	15.7 (38.7)	-
2022	2.9 (7.2)	16.8 (41.4)	30.2 (74.5)	7.0 (17.2)	-

Table 20-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency														
1999	15	-	297	2	118	117	6	-	2	-	-	-	-	-	52
2003	5	-	9	2	10	59	-	61	9	0	-	-	-	-	70
2008	23	3	40	4	42	359	7	69	36	2	-	0	-	-	124
2012	8	-	48	-	73	422	4	37	16	-	-	-	-	-	138
2017	33	2	86	6	80	407	6	25	28	-	-	-	-	1	161
2022	17	-	102	-	111	336	5	-	44	-	113	-	3	-	52
year	Average Cover (%)														
1999	0.6	-	11.2	0.0	2.8	1.2	0.0	-	0.0	-	-	-	-	-	2.2
2003	0.2	-	0.2	0.0	0.1	1.8	-	1.6	0.2	0.0	-	-	-	-	4.2
2008	0.3	0.1	0.6	0.0	0.9	6.8	0.1	1.0	0.4	0.1	-	0.0	-	-	5.5
2012	0.1	-	0.8	-	1.1	20.7	0.1	0.5	0.2	-	-	-	-	-	6.5
2017	0.6	0.0	2.6	0.0	3.8	14.3	0.1	0.2	0.5	-	-	-	-	0.0	6.7
2022	0.4	-	4.0	-	5.0	4.2	0.1	-	1.4	-	6.2	-	0.1	-	1.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Chamaesyce (sandmat)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Navarretia intertexta ^a (needleleaf navarretia)	Orobanche fasciculata (clustered broomrape)	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Portulaca oleracea ^{ai} (little hogweed)	Sisymbrium altissimum ^{ai} (tall tumbledmustard)
year	Nested Frequency																
1999	2	-	-	-	-	0	-	-	-	-	83	-	-	-	-	-	-
2003	1	-	-	-	-	-	-	-	-	0	118	0	-	23	0	0	-
2008	6	-	5	2	21	-	-	18	-	-	131	-	-	32	2	-	2
2012	3	-	4	2	-	-	-	-	5	-	51	-	-	2	6	-	10
2017	-	4	-	-	0	-	-	10	-	-	51	-	-	8	7	29	2
2022	2	-	30	-	-	-	8	7	-	1	30	-	5	27	5	-	-
year	Average Cover (%)																
1999	0.0	-	-	-	-	0.0	-	-	-	-	2.5	-	-	-	-	-	-
2003	0.0	-	-	-	-	-	-	-	-	0.0	12.2	0.3	-	0.1	0.0	0.0	-
2008	0.0	-	0.0	0.0	0.2	-	-	0.0	-	-	4.9	-	-	0.2	0.0	-	0.0
2012	0.0	-	0.0	0.0	-	-	-	-	0.0	-	1.6	-	-	0.0	0.1	-	0.0
2017	-	0.0	-	-	0.0	-	-	0.0	-	-	3.7	-	-	0.1	0.0	0.1	0.0
2022	0.0	-	0.1	-	-	-	0.0	0.0	-	0.0	1.0	-	0.0	0.2	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)
year	Nested
1999	-
2003	2
2008	-
2012	1
2017	1
2022	-
year	Average Cover (%)
1999	-
2003	0.0
2008	-
2012	0.0
2017	0.0
2022	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1999	-	-	-	-	-	-
2003	-	3.4	0.3	-	-	0.7
2008	0.6	6.8	11	-	-	0.4
2012	2.5	5	9.4	-	-	0.3
2017	11.2	3.9	8.8	-	-	0.3
2022	17.9	6.1	3.8	-	-	0.1
year	Quadrat Cover (%)					
1999	13.6	0.5	-	0.0	0.0	0.5
2003	0.1	2.5	0.0	-	-	0.3
2008	0.8	5.2	10.2	-	-	0.7
2012	4.8	5.3	10.8	-	-	1.3
2017	9.4	4.0	8.0	-	-	0.5
2022	16.0	6.1	3.9	-	-	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1999	4100	-	1	70	29	38	2	15	72/85
2003	40	-	50	50	0	50	0	0	28/31
2008	620	-	10	90	0	3	0	0	33/44
2012	3200	220	76	24	0	0	0	37	41/60
2017	3000	40	13	85	2	7	0	1	55/86
2022	3260	-	6	93	1	15	6	8	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1999	580	-	17	76	7	0	3	3	39/38
2003	1200	20	3	97	0	5	0	0	35/52
2008	8000	820	56	38	7	0	0	1	35/54
2012	4020	-	13	87	1	0	0	2	29/52
2017	2760	700	54	44	1	12	2	1	37/62
2022	3780	20	6	94	0	1	0	9	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1999	-	-	-	-	-	-	-	-	- / -
2003	120	-	50	50	0	0	0	0	44/61
2008	5780	-	6	92	2	2	1	16	39/55
2012	2660	20	2	94	4	2	0	34	53/76
2017	2540	-	14	70	16	16	5	9	60/72
2022	1040	-	0	79	21	10	0	21	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1999	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	25/27
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1999	20	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Pinus monophylla¹ -- (singleleaf pinyon)									
1999	40	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1999	140	-	14	57	29	14	71	29	38/69
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	18/32
2012	-	-	-	-	-	-	-	-	15/33
2017	-	-	-	-	-	-	-	-	10/29
2022	-	-	-	-	-	-	-	-	- / -

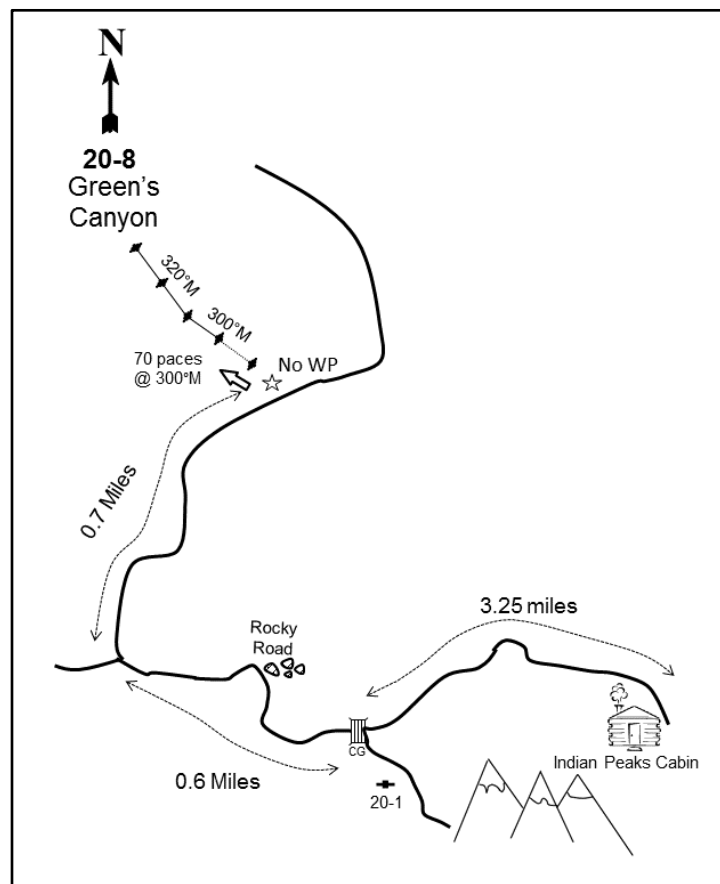
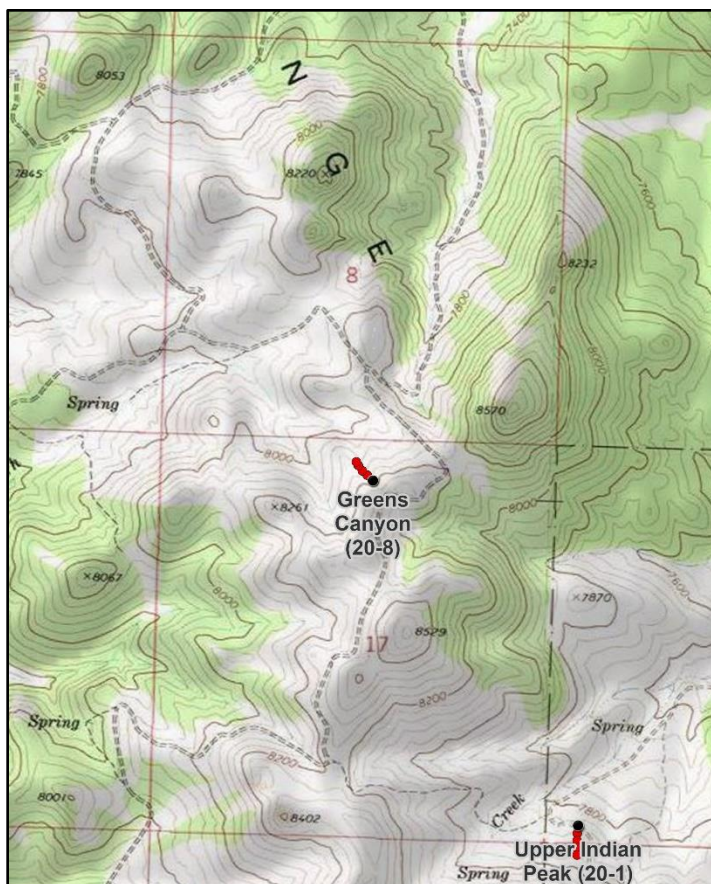
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1999	280	-	0	100	0	0	0	0	38/44
2003	340	100	0	100	0	0	6	0	25/41
2008	360	-	0	39	61	33	50	11	21/52
2012	340	-	18	82	0	6	0	6	25/47
2017	500	-	80	20	0	0	0	0	18/25
2022	800	-	13	88	0	18	65	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-07.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1999	17.1	6.2	0.5	30.0	-0.9	5.2	0.0	58.1	Fair
2003	0.4	0.0	0.0	13.0	-1.4	10.0	0.0	22.0	Very Poor
2008	14.5	14.3	2.9	18.1	-5.1	10.0	0.0	54.7	Poor-Fair
2012	14.9	14.1	8.9	18.3	-15.5	3.5	0.0	44.2	Poor
2017	25.0	12.6	6.7	29.0	-10.7	7.6	0.0	70.1	Fair-Good
2022	27.1	13.6	2.5	30.0	-3.2	2.5	0.0	72.6	Good

GREENS CANYON - STUDY NO. 20-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Miners Cabin Wash SE; Township 29S, Range 18W, Section 17
NAD 83 UTM ZONE 12, 247783 East 4242154 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
300° magnetic (Lines 3-4: 320° magnetic)
350ft
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Standard

Directions to Site

From the Indian Peaks DWR Cabin, continue up the road 3.25 miles to a gate and fork in the road. Continue straight and drive up the mountain for about 0.6 miles to a road, then turn right and continue for another 0.7 miles. There is no witness post; the site will be on the left (northwest) side of the road and down the hill. A UTV may be useful on some of the roads in the area.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN PEAK
Elevation	8,250ft (2,515m)
Aspect	Northwest
Slope	25-40%
Sample Dates	06/14/2017, 06/14/2022

Wildlife Habitat and Vegetation History**Table 20-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	substantial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 20-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush	Phase I

Site Notes

Numerous game and feral horse trails cross the site. Feral horses were seen at the edge of the canyon in 2017.

Soils**Table 20-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	48.2	30.1	21.8	3.8	8.1	328.0	0.7	06/14/2017

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Since the time of study establishment in 2017, this site has been dominated by mixed mountain brush species -- namely mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and mountain snowberry (*Symphoricarpos oreophilus*) (Table 20-08.12). Perennial grasses and graminoids are moderately diverse with sedges (*Carex* sp.) as the most abundant species, although they provide low amounts of cover in general (Table 20-08.10). Perennial and annual forbs are diverse and robust in quantity, with most cover contributed by the perennial species Watson's penstemon (*Penstemon watsonii*) as well as the annual species lambstongue ragwort (*Senecio integerrimus*) (Table 20-08.11). There is singleleaf pinyon (*Pinus monophylla*) present on the site in low amounts, indicating the potential for further tree encroachment which could lead to reduced understory and shrub production in future sample years (Table 20-08.14).

Trend Summary Tables

Table 20-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	34.3	5.9	-	46.6	3.3	-
2022	43.6	4.6	-	52.4	2.3	-

Table 20-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	1	315	250	345	0.0	6.9	5.2	16.4
2022	-	220	227	353	-	5.7	6.4	25.7

Table 20-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	17.4	0.0	40.6	9.7	2.4	60.9
2022	21.6	0.0	29.9	13.8	4.8	63.1

Table 20-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2017	-	30	25	11	2
2022	-	22	10	8	-
Year	Days Use Per Acre (ha)				
2017	0.7 (1.8)	61.7 (152.3)	47.6 (117.5)	30.2 (74.6)	-
2022	-	32.8 (81.1)	2.0 (5.0)	10.4 (25.8)	-

Table 20-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum ^a (cheatgrass)	Carex (sedge)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
2017	131	104	1	167	10	1	8	5
2022	60	54	-	95	42	10	36	8
year	Average Cover (%)							
2017	1.8	1.2	0.0	3.6	0.1	0.0	0.2	0.0
2022	0.7	0.7	-	2.2	1.1	0.1	0.9	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Calochortus nuttallii (sego lily)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha ^a (annual cryptantha)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Hackelia patens (spotted stickseed)	Heuchera parvifolia (littleleaf alumroot)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Melilotus officinalis ⁱ (sweetclover)	Mertensia (bluebells)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
2017	3	3	23	50	2	6	2	69	75	3	28	-	1	73	4	4	-
2022	9	12	28	3	-	-	1	34	54	3	47	3	1	130	-	-	3
year	Average Cover (%)																
2017	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.6	0.4	0.0	0.4	-	0.0	2.7	0.0	0.0	-
2022	0.1	0.4	0.1	0.0	-	-	0.0	0.8	0.7	0.0	1.2	0.0	0.0	6.2	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis var. fastigiata (slender cinquefoil)	Senecio integerrimus ^a (lambstongue ragwort)	Taraxacum officinale (common dandelion)
year	Nested Frequency						
2017	181	100	40	33	143	207	38
2022	164	107	34	88	120	192	23
year	Average Cover (%)						
2017	6.6	1.3	0.5	0.1	2.0	4.9	1.6
2022	8.6	2.9	0.2	0.3	4.0	6.1	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Prunus virginiana ^p (chokecherry)	Rosa woodsii ^p (Wood's rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)											
2017	5.7	22.1	0.2	0.5	-	0.4	-	2.8	0	-	1.6	16.6
2022	2.6	28.1	-	0.5	-	0.2	-	1.8	-	0.2	0.8	20.5
year	Quadrat Cover (%)											
2017	4.2	17.5	0.0	0.1	0.1	0.4	0.0	5.5	0.0	-	0.9	11.3
2022	3.3	22.9	-	0.4	-	0.3	-	4.2	-	0.4	0.8	16.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2017	1640	40	42	56	2	9	54	5	71/83
2022	1480	200	32	66	1	10	27	3	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	6140	60	9	89	2	22	0	2	41/67
2022	7060	2980	18	81	1	11	0	9	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2017	120	-	33	67	0	33	67	0	112/107
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	0	100	0	0	0	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	40	-	0	100	0	0	0	0	23/27
2022	280	60	21	79	0	0	0	0	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2017	900	-	9	91	0	24	33	0	11/14
2022	460	-	4	96	0	61	22	0	- / -
Ericameria parryi -- (Parry's rabbitbrush)									
2017	400	-	0	95	5	5	5	0	17/23
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	60	-	0	100	0	0	0	0	11/16
2022	60	-	0	100	0	0	33	0	- / -
Mahonia repens -- (creeping barberry)									
2017	19520	-	0	100	0	4	0	0	8/10
2022	13020	780	32	68	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2017	20	-	0	100	0	0	0	0	9/12
2022	-	-	-	-	-	-	-	-	- / -

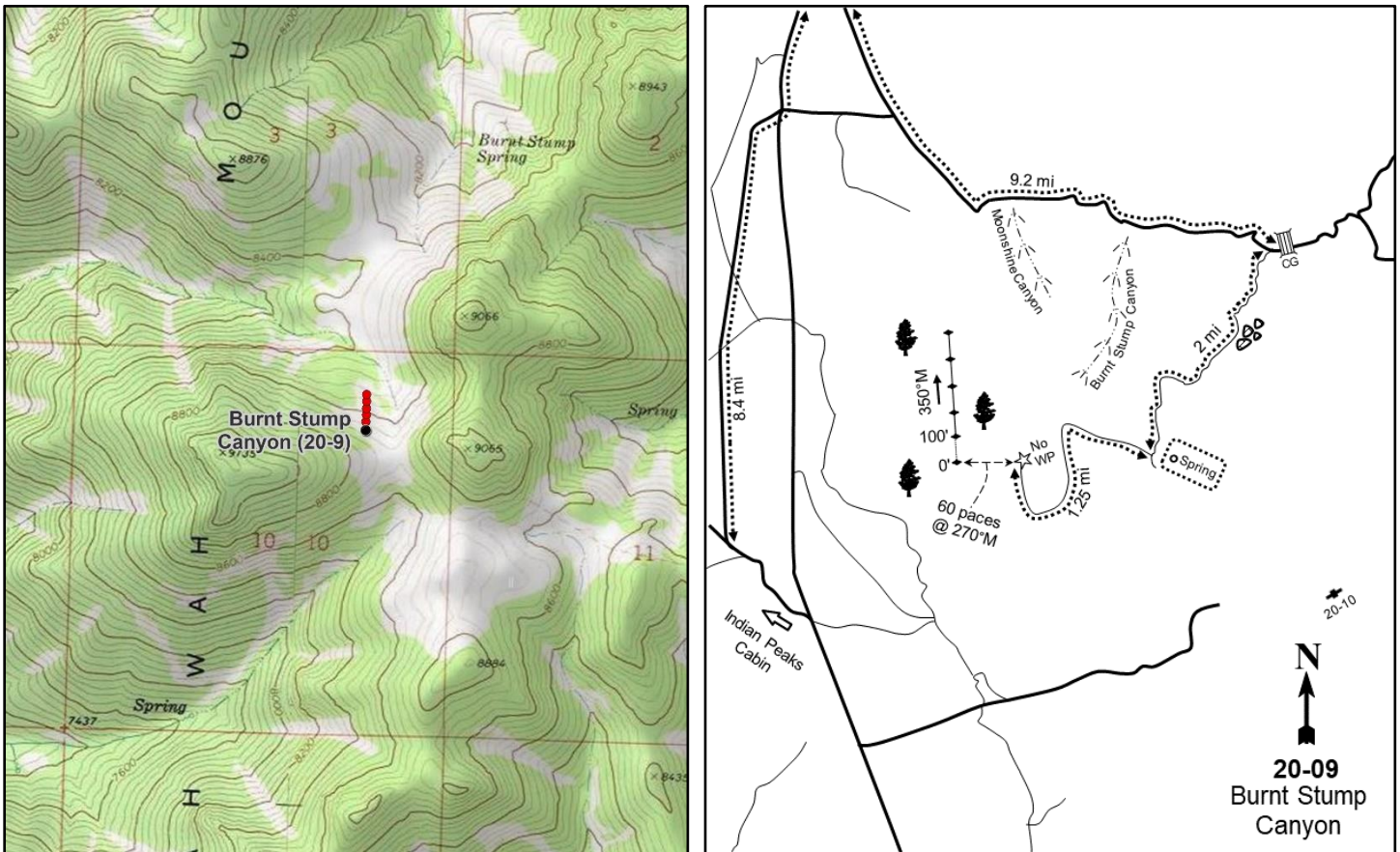
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Prunus virginiana^p -- (chokecherry)									
2017	-	-	-	-	-	-	-	-	-/-
2022	160	-	100	0	0	0	0	0	- / -
Ribes^p -- (currant)									
2017	-	-	-	-	-	-	-	-	173/268
2022	-	-	-	-	-	-	-	-	-/-
Rosa woodsii^p -- (Woods' rose)									
2017	1880	-	26	75	0	21	25	0	29/19
2022	1640	20	52	48	0	0	2	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2017	5380	-	7	93	0	29	3	0	35/66
2022	6500	-	10	90	0	17	9	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2017	-	-	-	-	-	-	-	-	33/36

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	3	-	100	-	-	-	3.5
2022	3	-	33	67	-	-	6.7

BURNT STUMP CANYON - STUDY NO. 20-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Lamerdorf Peak SW; Township 29S, Range 16W, Section 10
NAD 83 UTM ZONE 12, 270690 East 4242996 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
350° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Rebar or Stakes

Directions to Site

From Pine Valley Road, turn onto Pine Grove Road and follow the road for 9.2 miles to a cattle guard. Before this cattle guard, turn right and drive 2 miles to a "T", right at the end of the enclosure for a spring. Take this road (1.25 miles) as far as possible: the road may be washed out. Park and hike the road to the site.

NOTE: A UTV is advised when accessing this site as the road(s) may be washed out and rocky.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	WATER HOLLOW
Elevation	8,250ft (2,515m)
Aspect	North
Slope	20-30%
Sample Dates	08/08/2017, 06/14/2022

Wildlife Habitat and Vegetation History**Table 20-09.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	year-long

Table 20-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Little Sagebrush	NA
2022	Little Sagebrush	NA

Site Notes

Baseline stakes are marked by rock cairns.

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XB442UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a little sagebrush (*Artemisia arbuscula*) plant community since study establishment in 2017; other browse species are present, but contribute much less cover (Table 20-09.12, Table 20-09.13). Grasses are lacking in diversity but provide good cover, with the native perennial species muttongrass (*Poa fendleriana*) as the dominant species (Table 20-09.10). Perennial forbs are plentiful, but also low in diversity; most forb cover is contributed by littleleaf pussytoes (*Antennaria microphylla*), silvery lupine (*Lupinus argenteus*), and Watson's penstemon (*Penstemon watsonii*) (Table 20-09.11). A mixture of trees are present, including white fir (*Abies concolor*), Rocky Mountain juniper (*Juniperus scopulorum*), and quaking aspen (*Populus tremuloides*) (Table 20-09.14). Barring a major disturbance, this site will likely remain in this state in future sample years.

Trend Summary Tables

Table 20-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	28.5	4.6	0.2	35.8	3.8	-
2022	26.6	3.4	0.1	31.5	3.3	-

Table 20-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	-	378	42	284	-	13.7	0.1	15.0
2022	-	342	106	356	-	12.3	0.4	22.4

Table 20-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	12.8	0.1	38.5	12.6	11.8	50.8
2022	21.6	0.2	33.1	4.4	13.3	53.6

Table 20-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2017	-	8	18	6	3
2022	2	13	14	1	-
Year	Days Use Per Acre (ha)				
2017	-	4.0 (9.9)	4.7 (11.6)	5.8 (14.3)	-
2022	2.9 (7.2)	8.7 (21.5)	26.8 (66.2)	10.4 (25.8)	-

Table 20-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lemmonii var. lemmonii (Lemmon's needlegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Carex (sedge)	Carex geyeri (Geyer's sedge)	Carex rossii (Ross' sedge)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa pratensis (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency										
2017	-	105	-	-	8	-	-	15	333	16	-
2022	24	92	11	2	-	14	7	6	278	10	31
year	Average Cover (%)										
2017	-	2.2	-	-	0.3	-	-	0.0	10.8	0.4	-
2022	0.9	1.2	0.1	0.0	-	0.6	0.1	0.1	8.7	0.2	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Antennaria microphylla (littleleaf pussytoes)	Arabis holboellii ^a (Holboell's rockcress)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Erigeron eatonii (Eaton's fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Lomatium (desertparsley)
year	Nested Frequency																
2017	-	-	88	3	2	-	13	4	-	-	68	-	125	-	-	-	-
2022	3	71	100	2	1	5	82	-	6	39	146	11	132	3	14	5	70
year	Average Cover (%)																
2017	-	-	4.2	0.0	0.0	-	0.0	0.0	-	-	0.6	-	1.1	-	-	-	-
2022	0.0	0.5	3.4	0.0	0.0	0.0	0.3	-	0.0	0.2	2.0	0.0	1.5	0.0	0.0	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus argenteus (silvery lupine)	Orogenia linearifolia (Great Basin Indian potato)	Penstemon watsonii (Watson's penstemon)	Petroradia pumila (rock goldenrod)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla concinna (elegant cinquefoil)	Taraxacum officinale (common dandelion)	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
2017	113	-	133	15	40	-	1	48	-
2022	127	1	120	36	100	19	27	62	1
year	Average Cover (%)								
2017	4.2	-	4.4	0.3	0.1	-	0.0	0.3	-
2022	6.1	0.0	5.5	0.9	0.4	0.1	0.4	1.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia arbuscula ^p (little sagebrush)	Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus scopulorum ^t (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Populus tremuloides ^t (quaking aspen)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)									
2017	-	30.5	0.1	1.2	2.5	3.2	-	0.1	-	2
2022	-	25.9	0.3	1.7	1.6	3.3	-	-	-	2
year	Quadrat Cover (%)									
2017	-	22.3	0.4	2.1	2.4	5.1	0.1	0.1	0.0	0.7
2022	0.0	22.5	0.4	1.9	1.4	1.7	0.0	0.1	0.0	2.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies concolor^t -- (white fir)									
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	- / -
Artemisia arbuscula^p -- (little sagebrush)									
2017	10820	320	14	85	1	21	2	0	28/55
2022	13660	760	28	69	3	2	0	3	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2017	360	20	33	67	0	0	0	0	21/26
2022	880	-	2	91	7	11	9	7	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	520	-	0	100	0	0	0	4	33/53
2022	1680	-	26	73	1	7	5	1	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2017	4400	-	2	98	0	1	1	1	13/23
2022	2360	20	18	82	0	27	39	0	- / -
Ericameria parryi -- (Parry's rabbitbrush)									
2017	2480	-	4	96	0	0	0	0	25/36
2022	1540	740	12	88	0	12	40	0	- / -
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
2017	20	-	100	0	0	0	0	0	- / -
2022	20	-	100	0	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2017	1000	-	0	100	0	0	0	0	8/10
2022	840	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2017	1540	-	1	99	0	5	0	0	31/55
2022	2020	-	34	66	0	32	41	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-09.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

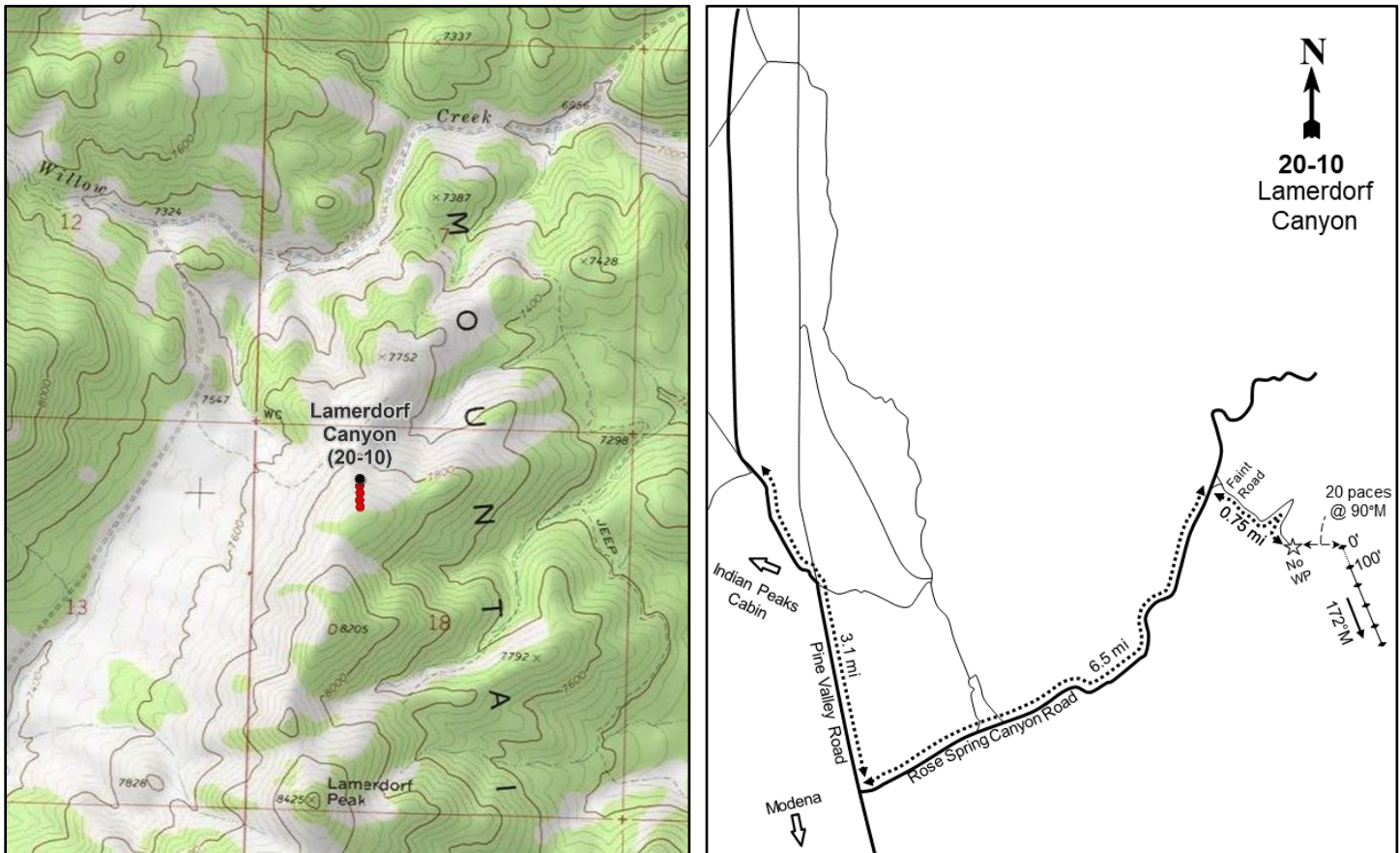
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2017	60	100	-	-	-	0	0	0
2022	200	100	-	-	-	0	0	0

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 20-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies concolor (white fir)							
2017	4	25	50	25	-	-	4.3
2022	5	40	40	-	20	-	3.0
Juniperus scopulorum (Rocky Mountain juniper)							
2017	14	50	50	-	-	-	2.5
2022	14	50	50	-	-	-	1.5
Populus tremuloides (quaking aspen)							
2017	3	-	100	-	-	-	2.5
2022	3	100	-	-	-	-	1.0

LAMERDORF CANYON - STUDY NO. 20-10

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Lamerdorf Peak SW; Township 29S, Range 15W, Section 18
NAD 83 UTM ZONE 12, 274679 East 4241381 North

Transect Information

Browse Tag # (0' Stake)	267
Transect Bearing	175° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

From Pine Valley Road, turn onto Rose Spring Canyon Road. Follow this road for 7 miles, at which point there will be a road on the right-hand side of the main canyon road. Turn onto this road and drive for almost 1.0 miles up to the ridgetop (or the nearest flat parking area); the site is on the left and down the hill.

NOTE: A UTV is advisable for the rough and narrow road leading up-slope to the site.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BUCKET RANCH
Elevation	7,900ft (2,408m)
Aspect	North
Slope	26%
Sample Dates	06/13/2017, 06/14/2022

Wildlife Habitat and Vegetation History**Table 20-10.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Rocky Mountain Elk	substantial	year-long

Table 20-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils**Table 20-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	38.2	33.1	28.8	5.7	18.0	306.0	0.5	06/13/2017

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XB460UT
States and Transitions	No state and transition model is available for this ecological site.

Since the time of study establishment in 2017, this site has existed as a mixed mountain brush plant community with mountain snowberry (*Symphoricarpos oreophilus*) contributing the most cover; other major components include Utah serviceberry (*Amelanchier utahensis*) and black sagebrush (*Artemisia nova*) (Table 20-10.12). The forb species on the site are not diverse, with cover provided mostly by the annual species desert madwort (*Alyssum desertorum*) and perennial forbs being sparse (Table 20-10.11). Grasses are also not diverse, but cover is typical for this ecological type, with muttongrass (*Poa fendleriana*) being the dominant species (Table 20-10.10). There are multiple tree species on the site, namely Utah juniper (*Juniperus osteosperma*), twoneedle pinyon (*Pinus edulis*), and singleleaf pinyon (*P. monophylla*) (Table 20-10.14). The site is currently considered to be within Phase I of woodland succession and it is likely that encroachment will continue to occur. A successional transition into Phase II would likely suppress the understory and shrub communities of this site.

Trend Summary Tables

Table 20-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	32.9	2.5	3.3	41.6	3.4	5.6
2022	30.4	3.0	3.5	40.6	5.8	5.5

Table 20-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	13	200	40	249	0.1	2.9	0.7	8.2
2022	5	190	8	275	0.0	4.3	0.0	9.3

Table 20-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	18.4	-	36.9	18.0	10.5	46.3
2022	28.4	0.0	35.1	10.0	11.9	41.8

Table 20-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2017	6	14	7	3
2022	3	15	7	3
Year	Days Use Per Acre (ha)			
2017	4.0 (9.9)	12.1 (29.8)	8.1 (20.1)	-
2022	5.3 (13.2)	45.6 (112.6)	2.3 (5.7)	-

Table 20-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum ^a (cheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
2017	-	40	18	13	88	40	56
2022	10	26	28	5	99	17	60
year	Average Cover (%)						
2017	-	0.5	0.1	0.1	1.4	0.2	0.8
2022	0.1	0.3	0.4	0.0	2.7	0.1	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Amaranthus ^{ai} (pigweed)																	
Arenaria macradenia ssp. ferrisiae (Ferris' sandwort)																	
Astragalus argophyllus (silverleaf milkvetch)																	
Astragalus ciliaris (browse milkvetch)																	
Astragalus drummondii (Drummond's milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja linarifolia (Wyoming Indian paintbrush)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	
Cymopterus (springparsley)																	
Delphinium nuttallianum (twolobe larkspur)																	
Erigeron eatonii (Eaton's fleabane)																	
Eriogonum racemosum (redroot buckwheat)																	
year	Nested Frequency																
2017	15	3	-	55	4	44	4	-	2	2	7	6	16	5	-	27	7
2022	7	-	2	46	16	48	2	1	-	-	5	4	-	13	3	31	7
year	Average Cover (%)																
2017	0.1	0.0	-	0.4	0.0	0.6	0.0	-	0.0	0.0	0.0	0.0	0.1	0.0	-	0.2	0.1
2022	0.0	-	0.0	0.4	0.1	0.8	0.0	0.0	-	-	0.1	0.0	-	0.1	0.0	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Galium aparine ^a (stickywilly)																	
Hackelia patens (spotted stickseed)																	
Lomatium (desertparsley)																	
Lupinus argenteus (silvery lupine)																	
Machaeranthera canescens (hoary fannyaster)																	
Pedicularis centranthera (dwarf lousewort)																	
Penstemon watsonii (Watson's penstemon)																	
Petroradia pumila (rock goldenrod)																	
Phlox austromontana (mountain phlox)																	
Phlox longifolia (longleaf phlox)																	
Physaria (twinpod)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Stachys (hedgenettle)																	
Trifolium (clover)																	
Trifolium gymnocarpon (hollyleaf clover)																	
Veronica biloba ^{ai} (twolobe speedwell)																	
year	Nested Frequency																
2017	34	2	-	20	-	-	72	67	92	65	2	3	-	32	-	-	-
2022	-	16	18	30	1	3	62	45	93	78	-	2	5	14	32	4	-
year	Average Cover (%)																
2017	0.6	0.0	-	0.3	-	-	1.9	2.6	1.1	0.6	0.0	0.0	-	0.1	-	-	-
2022	-	0.1	0.0	1.2	0.0	0.0	1.7	1.6	2.0	0.6	-	0.0	0.0	0.1	0.3	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia nova ^p (black sagebrush)	Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis ^p (mormon tea)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Pinus edulis ⁱ (twoneedle pinyon)	Pinus monophylla ⁱ (singleleaf pinyon)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)														
2017	6.3	8.5	-	1.2	3.2	0.3	0.1	-	0	-	0.1	1.9	3.7	25.3	0
2022	4.9	12.1	0.6	1.7	5.2	0.1	0.2	-	0.4	0	-	3.2	2.3	21.2	-
year	Quadrat Cover (%)														
2017	6.2	8.0	0.4	0.7	1.9	0.5	0.1	0.0	0.3	-	0.2	2.0	1.3	17.1	0.0
2022	2.4	9.8	0.4	2.3	2.2	0.5	0.2	0.1	0.5	0.1	0.0	1.7	1.7	14.8	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2017	1200	-	53	43	3	18	57	3	69/99
2022	1340	120	30	70	0	22	46	3	- / -
Artemisia nova^p -- (black sagebrush)									
2017	3520	360	22	69	10	37	1	7	32/61
2022	5400	260	36	57	8	7	1	9	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2017	40	-	50	50	0	0	0	0	93/79
2022	60	-	33	67	0	33	33	0	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2017	140	-	14	86	0	0	100	0	60/117
2022	260	40	15	77	8	8	85	8	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	1820	20	3	97	0	1	0	0	30/42
2022	2800	60	45	51	4	1	0	4	- / -
Ephedra viridis^p -- (mormon tea)									
2017	60	-	0	100	0	33	33	0	58/88
2022	20	-	0	0	100	0	0	100	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2017	60	-	0	67	33	33	67	0	10/22
2022	140	20	29	71	0	14	43	0	- / -
Ericameria parryi -- (Parry's rabbitbrush)									
2017	340	-	59	41	0	0	77	0	20/20
2022	380	-	63	37	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	380	-	0	100	0	0	0	5	17/25
2022	480	-	8	92	0	0	0	0	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	- / -
2022	20	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
2017	700	-	0	100	0	0	0	0	10/10
2022	460	-	52	48	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2017	-	-	-	-	-	-	-	-	11/10
2022	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2017	100	20	40	60	0	0	0	0	- / -
2022	160	-	25	75	0	0	0	0	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
2017	200	20	60	40	0	0	0	0	- / -
2022	240	-	50	50	0	0	0	0	- / -
Ribes^p -- (currant)									
2017	-	-	-	-	-	-	-	-	82/78
2022	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2017	11840	-	8	92	0	44	18	0	23/58
2022	17040	120	39	61	0	15	56	1	- / -
Tetradymia canescens -- (spineless horsebrush)									
2017	40	-	100	0	0	0	50	0	- / -
2022	20	-	0	0	100	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

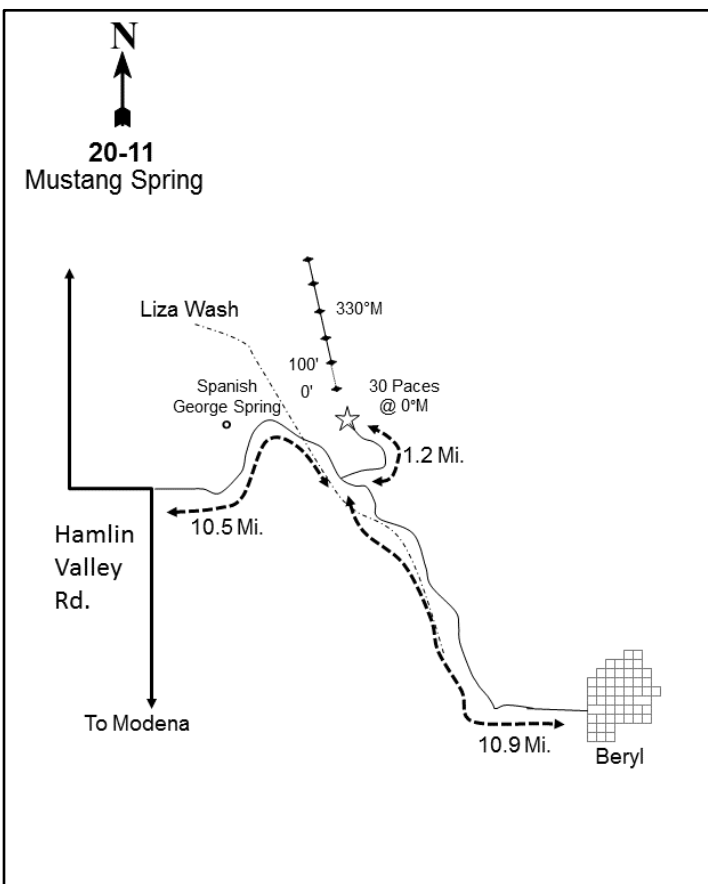
Table 20-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	15	-	9	91	-	-	8.4
2022	12	-	9	64	18	9	11.7
Juniperus scopulorum (Rocky Mountain juniper)							
2022	1	100	-	-	-	-	1.0
Pinus edulis (twoneedle pinyon)							
2017	55	6	50	31	13	-	6.3
2022	50	20	60	7	13	-	4.4
Pinus monophylla (singleleaf pinyon)							
2017	84	-	47	32	21	-	8.3
2022	94	5	35	30	15	15	9.1

Table 20-10.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	30.0	14.3	9.0	5.9	0.0	10.0	0.0	69.1	Fair-Good
2022	30.0	14.1	15.0	8.6	0.0	10.0	0.0	77.7	Good

MUSTANG SPRING - STUDY NO. 20-11



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Steamboat Mountain S; Township 32S, Range 17W, Section 19
NAD 83 UTM ZONE 12, 254580 East 4210210 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

588
330° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the corner of Hamlin Valley Road and Modena Canyon Road, turn onto Spanish George Road. Follow this for 6 miles, and then bear right onto Liza Road. Continue through a small canyon for 4.4 miles until you reach Wilson Canyon Road. Drive on this road for 0.5 miles to a "Y," bear left onto West Fork Wilson Canyon, and drive 1.0 miles to the site.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SHEEP SPRING
Elevation	6,260ft (1,908m)
Aspect	South
Slope	3-5%
Sample Dates	08/09/2017, 06/13/2022

Table 20-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Mustang Spring Bullhog	-	2005	-

Table 20-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Wilson Canyon Aerial Seeding			Aerial	Mar 2006	770
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.51	0.00
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	2.51	0.00
G	Bouteloua curtipendula	Sideoats Grama		0.51	0.00
G	Bromus inermis	Smooth Brome	Lincoln	0.51	0.00
G	Elymus lanceolatus	Thickspike Wheatgrass	Bannock	0.51	0.00
G	Poa secunda	Sandberg Bluegrass		0.51	0.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.51	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass	Oahe	2.51	0.00
F	Linum lewisii	Blue Flax		0.51	0.00
F	Lupinus sericeus	Silky Lupine		0.02	0.00
F	Medicago sativa	Alfalfa	Ladak	0.51	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.51	0.00
F	Sanguisorba minor	Small Burnet		0.51	0.00
S	Bassia prostrata	Forage Kochia		1.01	0.00
S	Krascheninnikovia lanata	Winterfat		0.25	0.00

Wildlife Habitat and Vegetation History**Table 20-11.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long

Table 20-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Rubber Rabbitbrush/Annual Weeds	Phase I
2022	Rubber Rabbitbrush/Annual Grass	Phase I

Site Notes

An elk shed was found on the site in 2017. A group of feral horses was also seen on site in the same sample year.

Soils**Table 20-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.8	42.2	34.1	23.8	6.4	48.0	349.0	0.6	08/09/2017

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

This site was treated with a bullhog in 2005 to reduce tree cover and increase herbaceous production (Table 20-11.1). In 2017, shrubs -- primarily rubber rabbitbrush (*Ericameria nauseosa*) -- were a co-dominant vegetation component along with annual forbs. However, in 2022 rubber rabbitbrush increased in cover significantly while annual forbs decreased (Table 20-11.6, Table 20-11.7). Grasses were primarily composed of the introduced species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) in 2017. These perennial grasses were initially co-dominant with the annual species cheatgrass (*Bromus tectorum*), but cheatgrass became the major understory component in 2022 (Table 20-11.10). The weedy annual forbs common mullein (*Verbascum thapsus*) and prickly Russian thistle (*Salsola tragus*) contributed most of the forb cover in 2017, but few were observed in 2022 (Table 20-11.11). Utah juniper (*Juniperus osteosperma*) has remained on the site (albeit with low density values) as well as in the general vicinity following the treatment (Photos, Table 20-11.14). The site can experience heavy utilization by feral horses (Table 20-11.9), which can lead to degradation of the system and the propensity to remain in a state dominated by rabbitbrush and annual weeds.

Trend Summary Tables**Table 20-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	6.5	0.1	-	8.2	-	-
2022	17.6	0.6	-	20.2	0.4	-

Table 20-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	238	221	267	92	2.5	6.2	8.1	2.4
2022	375	93	42	54	7.7	0.7	0.3	2.0

Table 20-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	5.6	0.0	68.5	18.2	2.7	20.6
2022	11.1	0.2	69.8	8.9	3.5	26.5

Table 20-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2017	5	1	23	12
2022	2	2	17	7
Year	Days Use Per Acre (ha)			
	2017	4.7 (11.6)	1.3 (3.3)	42.4 (104.7)
2022	-	1.3 (3.3)	23.2 (57.4)	-

Table 20-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Agropyron cristatum ⁱ (crested wheatgrass)										
Aristida purpurea (purple threeawn)										
Bouteloua gracilis (blue grama)										
Bromus inermis ⁱ (smooth brome)										
Bromus tectorum ^{ai} (cheatgrass)										
Elymus elymoides (squirreltail)										
Pascopyrum smithii (western wheatgrass)										
Sporobolus cryptandrus (sand dropseed)										
Thinopyrum intermedium ⁱ (intermediate wheatgrass)										
Vulpia octoflora ^a (sixweeks fescue)										
year	Nested Frequency									
2017	100	10	35	15	238	25	-	8	62	-
2022	15	16	2	1	375	6	9	10	43	14
year	Average Cover (%)									
2017	2.8	0.3	0.9	0.4	2.5	0.4	-	0.1	1.4	-
2022	0.1	0.2	0.0	0.0	7.7	0.1	0.0	0.0	0.2	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 20-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Amaranthus ^{ai} (pigweed)																	
Arabis (rockcress)																	
Chaenactis douglasii (Douglas' dusty maiden)																	
Cryptantha (cryptantha)																	
Dalea searlsiae (Searls' prairie clover)																	
Descurainia pinnata ^a (western tansymustard)																	
Eriogonum caespitosum (matted buckwheat)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Gayophytum racemosum ^a (blackfoot groundsmoke)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
Gilia inconspicua ^a (shy gilia)																	
Lotus utahensis (Utah bird's-foot trefoil)																	
Melilotus officinalis ⁱ (sweetclover)																	
Penstemon (beardtongue)																	
Physalis (groundcherry)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Salsola tragus ^{ai} (prickly Russian thistle)																	
year	Nested Frequency																
2017	66	7	33	10	21	-	28	4	12	-	-	13	6	-	1	83	172
2022	-	-	2	-	11	3	29	3	4	11	7	20	-	1	-	9	2
year	Average Cover (%)																
2017	0.4	0.0	0.8	0.0	0.4	-	0.8	0.0	0.1	-	-	0.2	0.0	-	0.0	0.6	3.9
2022	-	-	0.0	-	0.4	0.0	1.3	0.0	0.0	0.0	0.0	0.2	-	0.1	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency			
Sanguisorba minor ⁱ (small burnet)	1	54	4	63
Sisymbrium altissimum ^{ai} (tall tumblemustard)	-	1	1	8
Taraxacum officinale (common dandelion)				
Verbascum thapsus ^{ai} (common mullein)				
year	Average Cover (%)			
2017	0.0	0.7	0.2	2.4
2022	-	0.0	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 20-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	-	-	8.2	-
Ericameria nauseosa ssp. consimilis (rubber rabbitbrush)	-	0.4	20.2	0
Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)				
Polygala subspinosa (spiny milkwort)				
year	Quadrat Cover (%)			
2017	0.1	-	6.3	0.1
2022	-	0.4	17.6	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 20-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2017	380	-	0	100	0	0	0	0	59/109
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. consimilis -- (rubber rabbitbrush)									
2017	-	-	-	-	-	-	-	-	-/-
2022	220	-	64	36	0	0	0	0	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
2017	9800	260	85	15	0	0	0	0	53/80
2022	7320	120	39	59	3	0	2	3	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	-/-
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Polygala subspinoso -- (spiny milkwort)									
2017	160	-	0	100	0	0	0	0	3/7
2022	40	-	0	100	0	100	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
2017	-	-	-	-	-	-	-	-	29/66

t - Tree Species; p - Preferred Browse; i - Introduced Species

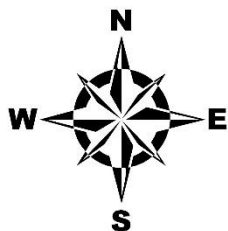
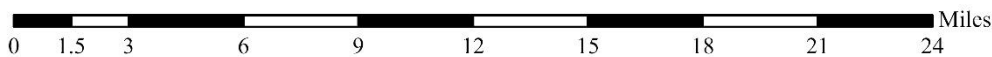
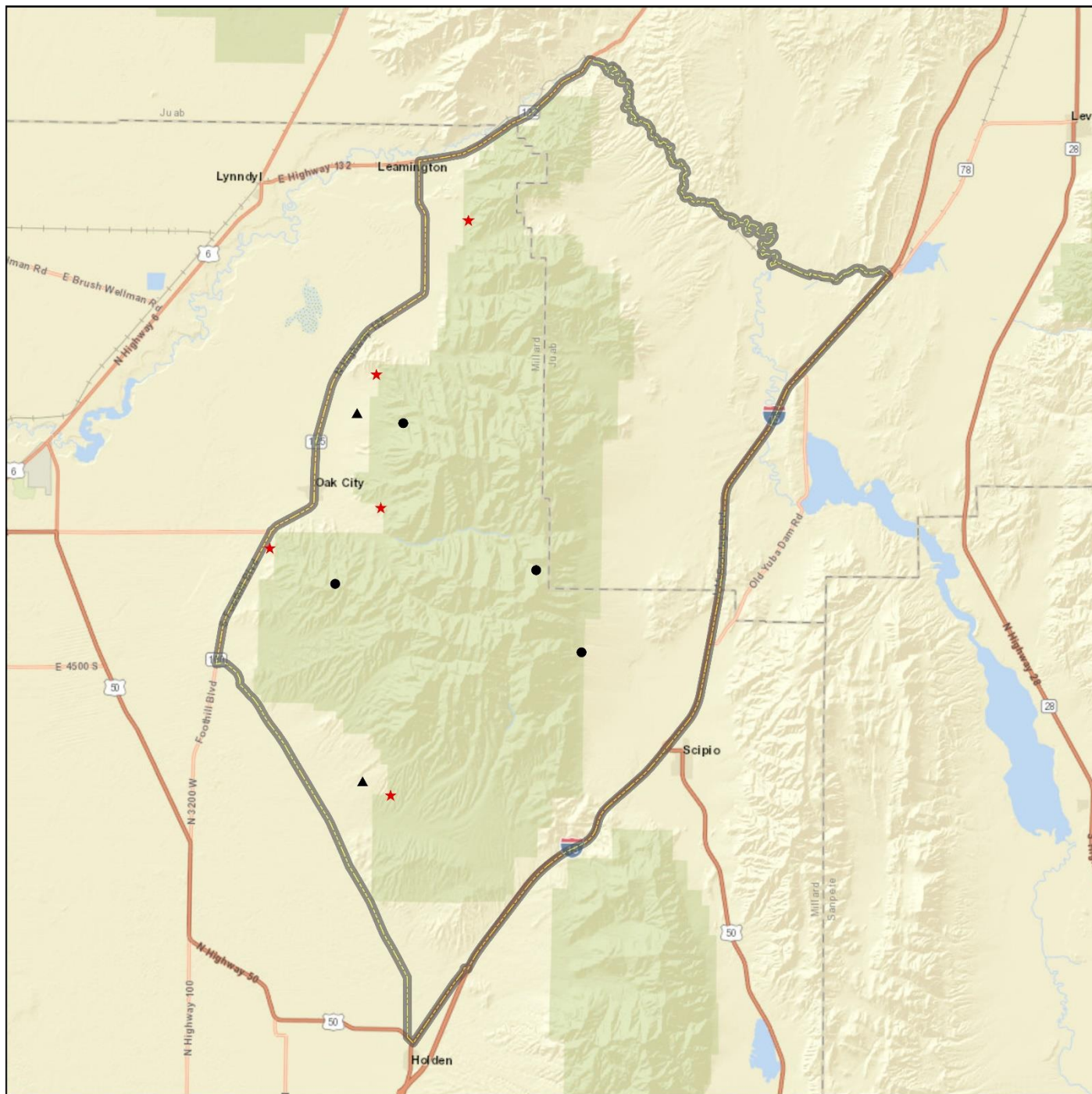
Table 20-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	8	-	13	50	25	13	20.1
2022	15	9	9	64	9	9	13.5

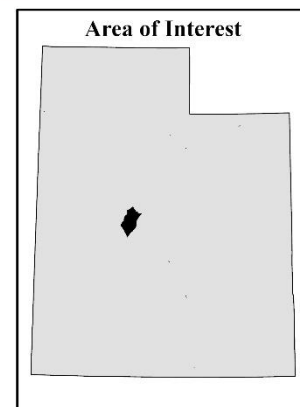
Table 20-11.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	10.3	15.0	15.0	12.3	-1.8	4.9	0.0	55.6	Fair
2022	25.3	14.2	15.0	1.3	-5.8	4.1	0.0	54.1	Fair

WILDLIFE MANAGEMENT UNIT 21A – FILLMORE, OAK CREEK

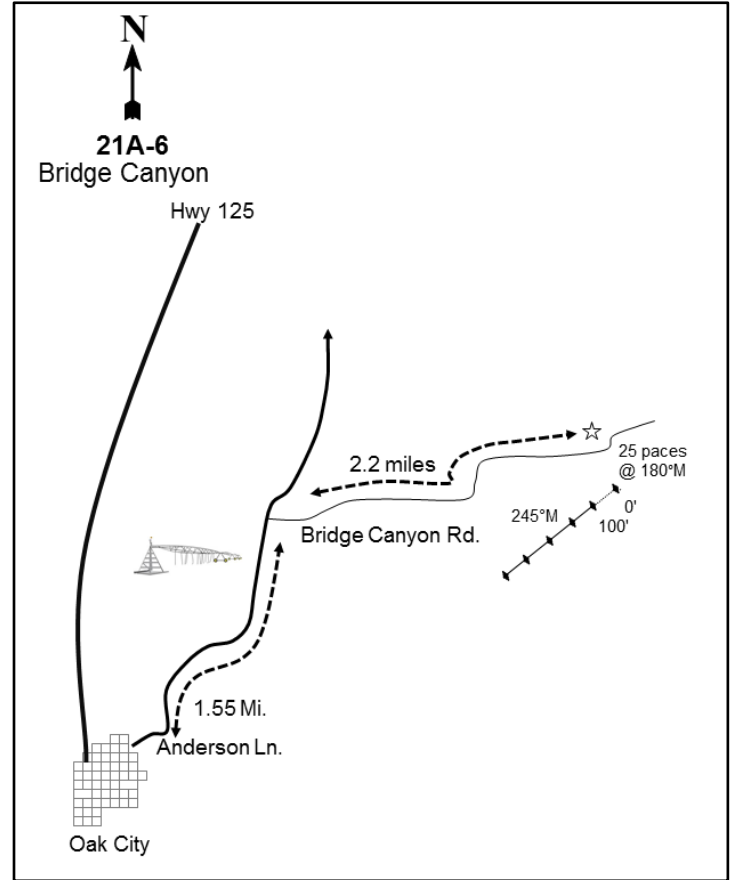
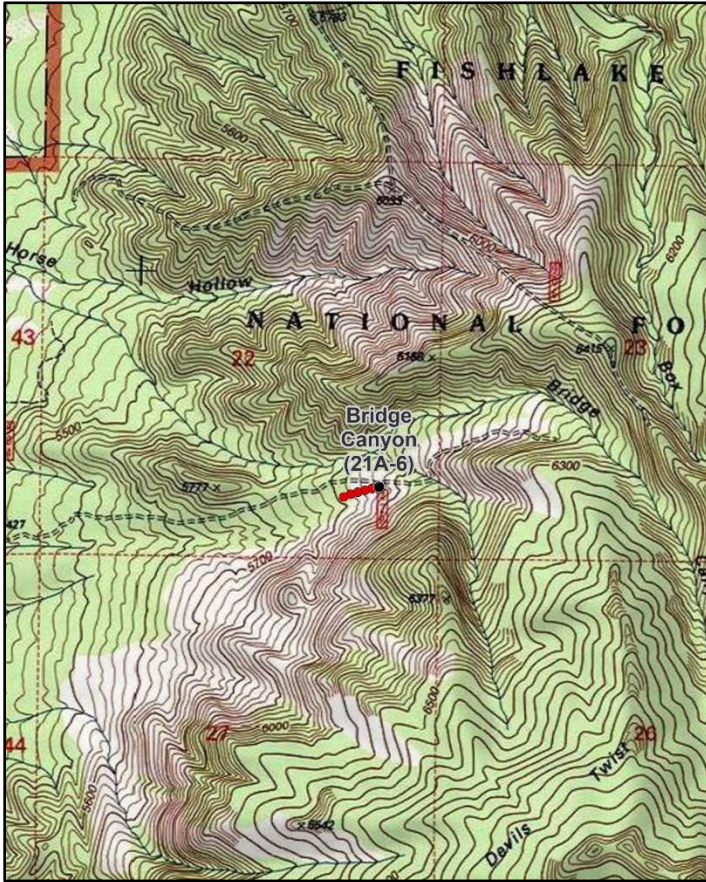


Study Locations Project, Status	Unit Boundary
● RT, Active	Unit - 21A
★ RT, Suspended	
▲ WRI, Active	



Credits: Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS

BRIDGE CANYON - STUDY NO. 21A-6

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Oak City North SE; Township 16S, Range 4W, Section 22
NAD 83 UTM ZONE 12, 389709 East 4362923 North

Transect Information

Browse Tag # (0' Stake)	139
Transect Bearing	245° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

Take Highway 125 to Oak City. From W 100 N, proceed east for one block to N 100 E. Follow this road out of town until it turns into N Anderson Lane. From the north edge of town, drive for 2.2 miles to Bridge Canyon Road. Turn right and drive for 1.6 miles to the site, which is approximately 75 feet away from the south side of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Oak Creek Allotment
Elevation	5,826ft (1,776m)
Aspect	Southwest
Slope	10%
Sample Dates	06/20/2017, 06/01/2022

Table 21A-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs Fire	-	June-August 2012	107847
Fire - Wildfire	Devils Den Fire	-	August 2006	14371
Fire - Wildfire	Clay Springs Fire	-	1981	15840
Seeding - Aerial After	Devils Den Fire Rehab	660	December 2006	3976

Table 21A-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Devil's Den			Aerial	Dec 2006	3976
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	CDII	1.01	0.88
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.99	0.81
G	Dactylis glomerata	Orchardgrass	Paiute	0.12	0.11
G	Dactylis glomerata	Orchardgrass	Paiute	0.13	0.11
G	Poa secunda	Canby Bluegrass	Canbar	0.25	0.22
G	Poa secunda	Sandberg Bluegrass	Toole MT	0.25	0.21
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Medicago sativa	Alfalfa	Ladak	0.38	0.36
F	Medicago sativa	Alfalfa	Ladak	0.28	0.25
F	Medicago sativa	Alfalfa	Ranger	0.67	0.58
F	Medicago sativa	Alfalfa	Spredor 4	0.65	0.62
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.44	0.10
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15

Mix Name			Application Type	Application Date	Acres
Devil's Den Sagebrush			Aerial	Dec 2006	3876
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
		Rice Hulls		0.10	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.45	0.10

Wildlife Habitat and Vegetation History**Table 21A-06.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	CABS	year-long
Mule Deer	substantial	winter

Table 21A-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Perennial Grass	No Encroachment
2022	Perennial Grass	No Encroachment

Site Notes

No Notes

Soils**Table 21A-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.8	46.2	33.1	20.8	3.3	24.0	392.0	0.5	06/20/2017

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY334UT
States and Transitions	No state and transition model is available for this ecological site.

Shrubs have remained rare on this site since study establishment in 2017, with broom snakeweed (*Gutierrezia sarothrae*) contributing the most cover in both sample years (Table 21A-06.12, Table 21A-06.13); this depleted shrub component may be due to multiple wildfires that occurred prior to study establishment (Table 21A-06.1). Perennial grasses -- mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and purple threeawn (*Aristida purpurea*) -- have been the dominant vegetation component since 2017. The introduced and weedy perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed in both sample years, but cover and frequency decreased between 2017 and 2022. The introduced annual grass species cheatgrass (*Bromus tectorum*) is also present with high cover as of 2022 (Table 21A-06.10); increased amounts of annual grasses can lead to altered fire regimes due to increased fine fuel loads and reduced ecological resistance and resilience. Forb diversity has remained depauperate, but cover has remained high, primarily being contributed by the introduced annual species redstem stork's bill (*Erodium cicutarium*) (Table 21A-06.11).

Trend Summary Tables**Table 21A-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	-	1.4	-	-	3.6	-
2022	-	0.5	-	-	1.2	-

Table 21A-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	183	385	418	10	2.9	28.8	15.5	0.1
2022	374	384	388	59	9.3	32.5	15.7	0.4

Table 21A-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	15.8	0.4	27.1	23.3	10.3	50.3
2022	16.6	1.3	41.0	10.7	11.9	48.3

Table 21A-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
2017	12	4	3
2022	11	6	-
Year	Days Use Per Acre (ha)		
2017	15.3 (37.7)	-	-
2022	17.4 (43.0)	12.8 (31.5)	-

Table 21A-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Agropyron cristatum ⁱ (crested wheatgrass)									
Aristida purpurea (purple threeawn)									
Bromus tectorum ^{ai} (cheatgrass)									
Pleuraphis jamesii (James' galleta)									
Poa bulbosa ⁱ (bulbous bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Sporobolus cryptandrus (sand dropseed)									
Thinopyrum intermedium ⁱ (intermediate wheatgrass)									
year	Nested Frequency								
2017	66	163	183	40	196	12	174	-	44
2022	5	171	374	6	135	217	149	19	53
year	Average Cover (%)								
2017	1.8	6.5	2.9	1.6	4.3	0.1	13.1	-	1.5
2022	0.1	11.2	9.3	0.1	2.5	8.0	8.9	0.2	1.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21A-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES												
Agoseris glauca (pale agoseris)												
Calochortus nuttallii (sego lily)												
Collinsia parviflora ^a (maiden blue eyed Mary)												
Crepis acuminata (tapertip hawkbeard)												
Draba ^a (draba)												
Eriogonum racemosum (redroot buckwheat)												
Erodium cicutarium ^{ai} (redstem stork's bill)												
Helianthus annuus ^a (common sunflower)												
Lactuca scariola ^{ai} (prickly lettuce)												
Lomatium (desertparsley)												
Phlox longifolia (longleaf phlox)												
Tragopogon dubius ^{ai} (yellow salsify)												
year	Nested Frequency											
2017	-	-	11	-	34	2	415	1	10	7	1	24
2022	4	12	-	10	2	-	388	-	-	24	21	12
year	Average Cover (%)											
2017	-	-	0.1	-	0.1	0.0	15.2	0.0	0.0	0.0	0.0	0.1
2022	0.0	0.1	-	0.1	0.0	-	15.7	-	-	0.2	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21A-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept	
	Gutierrezia sarothrae (broom snakeweed)	3.6
Opuntia polyacantha (plains pricklypear)	1.2	-
year	Quadrat Cover (%)	
	2017	1.4 0.0
2022	0.5 -	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

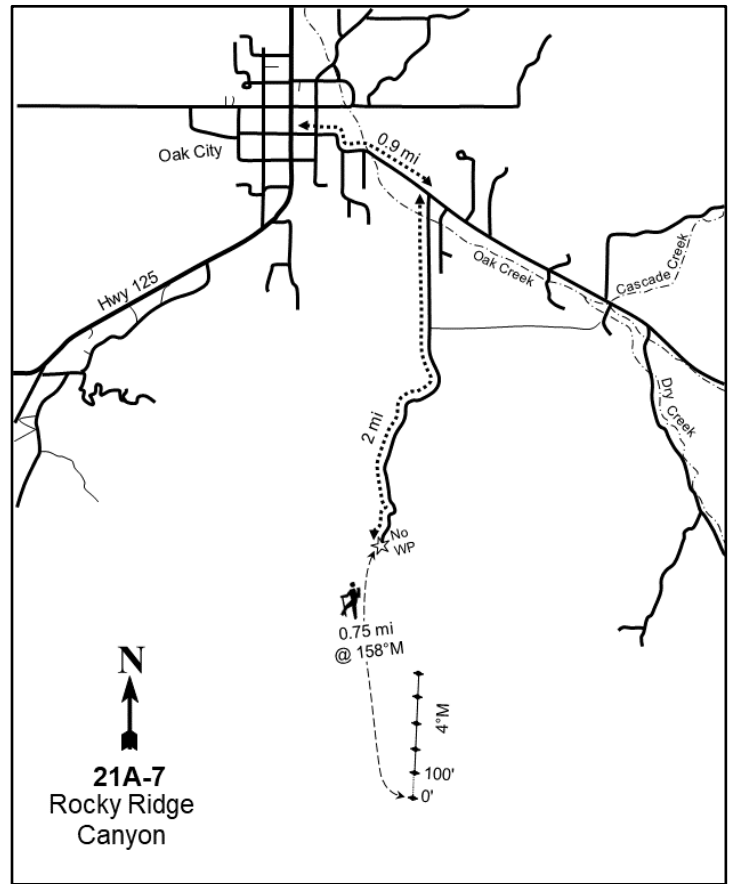
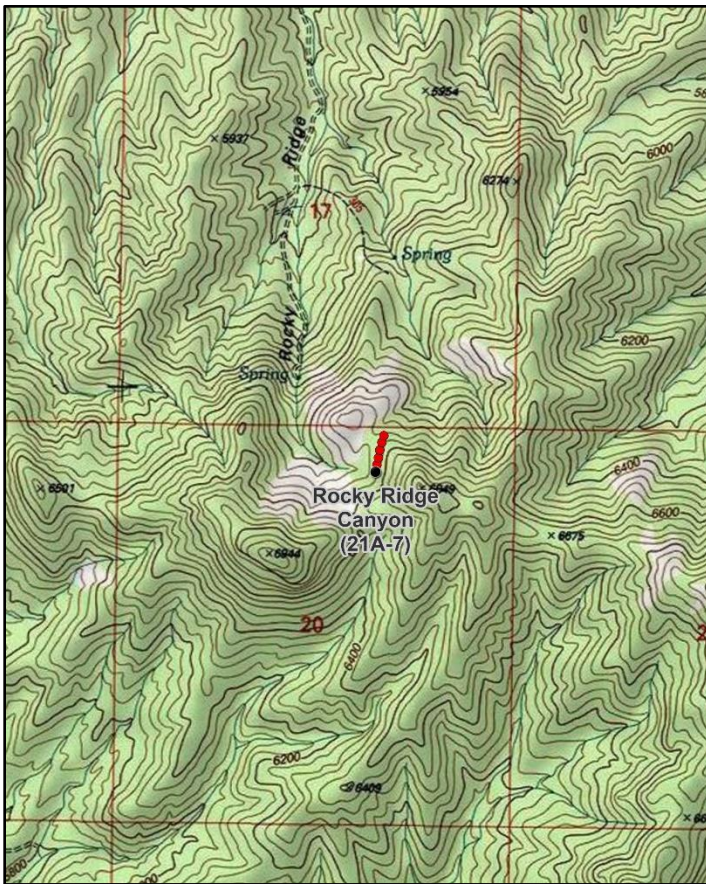
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2017	1320	80	15	85	0	0	0	0	26/48
2022	1140	20	12	84	4	0	0	4	- / -
Opuntia polyacantha -- (plains pricklypear)									
2017	20	-	0	100	0	0	0	0	21/72

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-06.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	0.0	0.0	0.0	30.0	-2.2	0.1	0.0	27.9	Very Poor
2022	0.0	0.0	0.0	30.0	-7.0	0.9	0.0	23.9	Very Poor

ROCKY RIDGE CANYON - STUDY NO. 21A-7



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Oak City South NW; Township 17S, Range 4W, Section 20
NAD 83 UTM ZONE 12, 386046 East 4354267 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
4° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the intersection of Main Street and E. Center Street in Oak City, take E. Center Street (which turns into E. Oak Creek Canyon Road) for about 0.9 miles to Rocky Ridge Road. Turn right (south) onto Rocky Ridge Road, then drive 2 miles south to the end of the road near the base of the hill. Park here and hike 3/4 of a mile to a small bowl at the top of the ridge: the site is located on the east side of this small bowl.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Oak Creek Allotment
Elevation	6,578ft (2,005m)
Aspect	West
Slope	25%
Sample Dates	06/14/2017, 06/22/2022

Table 21A-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs Fire	-	June-August 2012	107847
Fire - Wildfire	Clay Springs Fire	-	1981	15840

Wildlife Habitat and Vegetation History**Table 21A-07.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	CABS	year-long
Mule Deer	substantial	summer

Table 21A-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I
2022	Mixed Mountain Brush	Phase I

Site Notes

Two bucks were observed on the site in 2017.

Soils**Table 21A-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	50.2	25.1	24.8	3.5	7.0	209.0	0.5	06/14/2017

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

This site has existed as a mountain brush community type since study establishment in 2017. Much of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) component of this ecological type is no longer present on the site due to multiple fires that have burned in this area, with the most recent occurring in 2012 (Table 21A-07.1). The browse species on this site are shrubs that are resilient to fire; alderleaf mountain mahogany (*Cercocarpus montanus*) has not only provided the most cover in both sample years, but increased in cover and density between 2017 and 2022 (Table 21A-07.12, Table 21A-07.13). Perennial forbs are diverse and plentiful, with most of the cover provided by arrowleaf balsamroot (*Balsamorhiza sagittata*) throughout the duration of the study (Table 21A-07.11). There is also good cover provided by perennial grasses, being predominantly contributed by bluebunch wheatgrass (*Pseudoroegneria spicata*). The introduced annual grass species field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) are also present, and contributed 11% cover in 2022 (Table 21A-07.7, Table 21A-07.10). Annual grasses have the potential to increase fuel loads and alter fire regimes when present in high amounts. This community will likely remain in this state without further disturbance. Furthermore and although with minimal values, sagebrush was observed in line-intercept and quadrat cover measurements in 2022. Although density decreased (Table 21A-07.12, Table 21A-07.13), there may be potential for sagebrush cover to continue to return over time if there are no further vegetation-removing disturbances.

Trend Summary Tables

Table 21A-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	9.2	3.2	-	13.0	3.0	-
2022	14.2	1.0	-	19.0	2.3	-

Table 21A-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	267	340	110	210	7.6	23.1	0.7	12.4
2022	344	296	84	159	11.5	14.8	0.8	10.5

Table 21A-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	16.4	0.2	41.7	8.4	24.3	49.8
2022	18.9	0.1	41.0	6.2	17.0	45.4

Table 21A-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
2017	-	9	-
2022	1	20	-
Year	Days Use Per Acre (ha)		
2017	-	21.5 (53.0)	2.0 (5.0)
2022	1.5 (3.6)	20.8 (51.3)	-

Table 21A-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ¹ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex geyeri (Geyer's sedge)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ¹ (intermediate wheatgrass)
year	Nested Frequency										
2017	10	1	208	51	210	-	4	95	80	248	13
2022	2	-	265	56	255	1	8	27	100	182	41
year	Average Cover (%)										
2017	0.2	0.0	2.3	2.6	5.3	-	0.1	4.2	1.6	14.0	0.3
2022	0.2	-	5.0	2.0	6.6	0.0	0.2	0.3	2.3	9.1	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21A-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Arenaria (sandwort)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cryptantha ^a (annual cryptantha)	Descurainia pinnata ^a (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)
year	Nested Frequency																
2017	38	7	7	85	21	-	81	31	3	3	16	1	4	13	3	3	4
2022	6	-	6	82	1	4	10	10	-	-	46	-	8	7	-	1	-
year	Average Cover (%)																
2017	0.2	0.0	0.7	9.1	0.0	-	0.4	1.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1
2022	0.1	-	0.7	8.9	0.0	0.0	0.0	0.1	-	-	0.3	-	0.3	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
2017	52	6	5	1	74	-	5	5
2022	47	1	1	3	49	2	16	-
year	Average Cover (%)							
2017	0.3	0.2	0.2	0.0	0.5	-	0.1	0.0
2022	0.4	0.0	0.0	0.0	0.3	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21A-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)				
2017	-	9.9	2.8	0.2	3.1
2022	0.2	16.1	2.3	-	2.7
year	Quadrat Cover (%)				
2017	-	6.2	3.1	0.0	3.0
2022	0.1	12.4	1.0	-	1.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

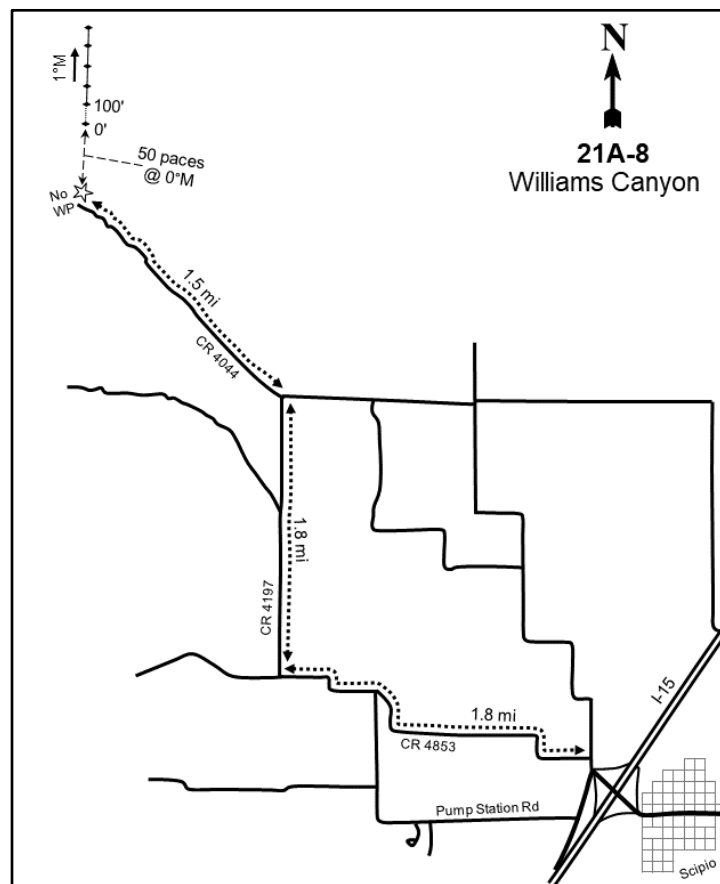
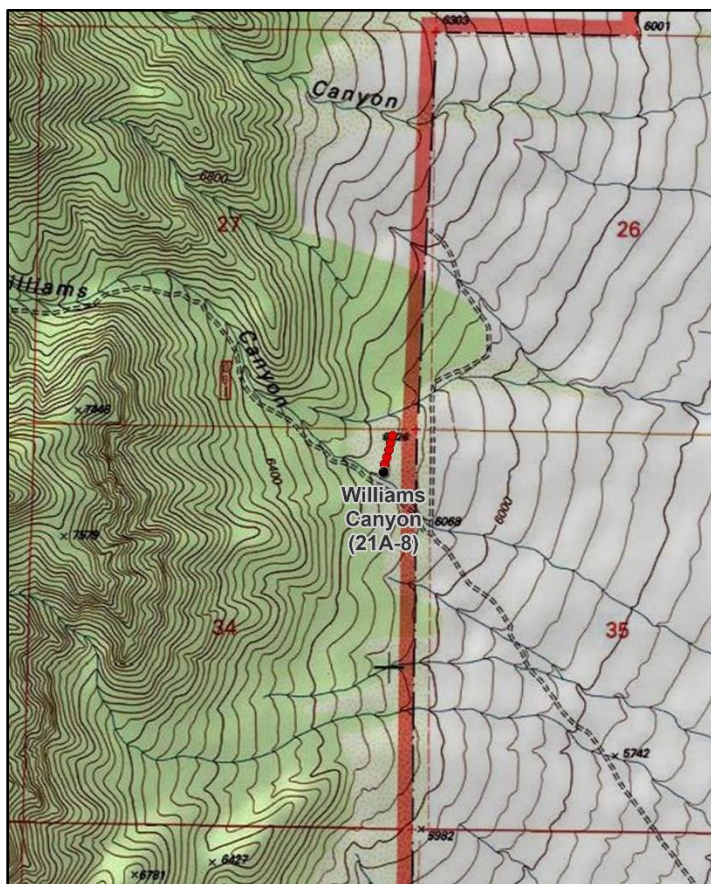
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	60	-	67	33	0	33	0	33	15/12
2022	40	-	50	50	0	0	0	0	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2017	1880	-	0	97	3	22	14	2	61/81
2022	2440	60	2	93	5	34	35	7	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	900	-	0	100	0	0	0	0	39/63
2022	700	-	17	80	3	9	0	3	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	200	-	0	100	0	80	0	80	19/27
2022	420	-	5	95	0	0	100	0	- / -
Quercus gambelii^p -- (Gambel oak)									
2017	800	-	0	100	0	0	0	25	59/63
2022	560	-	36	29	36	0	96	36	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	1	-	-	-	-	100	33.0
2022	1	-	-	-	-	100	31.0

WILLIAMS CANYON - STUDY NO. 21A-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Williams Peak SE; Township 17S, Range 3W, Section 34
NAD 83 UTM ZONE 12, 399306 East 4350578 North

Transect Information

Browse Tag # (0' Stake)	125
Transect Bearing	1° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Scipio exit (exit #188) off of I-15, turn west onto County Road 4558, and continue for 2.5 miles through several right-angle turns. At County Road 4044, turn left and proceed for approximately 2.8 miles to the site: there is no witness post. The site is 200 feet to the north of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Dry Creek Allotment
Elevation	6,167ft (1,880m)
Aspect	East
Slope	10%
Sample Dates	06/20/2017, 06/02/2022

Table 21A-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Clay Springs Fire Rehab	2454	Fall 2012	13505

Table 21A-08.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Clay Springs Chaining			Aerial	Oct 2012	1522
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.04	1.92
G	Dactylis glomerata	Orchardgrass		1.31	1.15
G	Elymus lanceolatus	Thickspike wheatgrass		3.02	2.85
G	Elymus wawawaiensis	Snake River wheatgrass		0.99	0.92
G	Poa secunda	Sandberg bluegrass		1.18	1.12
G	Poa secunda	Big bluegrass		0.72	0.63
G	Pseudoroegneria spicata	Bluebunch Wheatgrass		2.00	1.86
F	Linum perenne	Blue Flax	Appar	0.49	0.47
F	Medicago sativa	Alfalfa	Ladak NC	2.00	1.88
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.13	0.11
F	Sanguisorba minor	Small Burnet	Delar	1.51	1.46

Mix Name			Application Type	Application Date	Acres
Clay Springs - Shrub Mix			Aerial	Feb 2013	8273
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Medicago sativa	Alfalfa	Ladak DL	0.12	0.11
F	Medicago sativa	Alfalfa	Ladak NC	0.39	0.33
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sevier UT	0.15	0.03
S	Bassia prostrata	Forage Kochia	Beaver UT	0.05	0.04
S	Bassia prostrata	Forage Kochia	Beaver/Millard UT	0.27	0.17
S	Bassia prostrata	Forage Kochia	Beaver UT	0.16	0.09
S	Bassia prostrata	Forage Kochia	Beaver UT	0.17	0.12

Wildlife Habitat and Vegetation History**Table 21A-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	CABS	year-long
Mule Deer	substantial	winter

Table 21A-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Annual Grass/Mountain Big Sagebrush	Phase I
2022	Annual-Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils**Table 21A-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	48.2	29.7	22.1	4.6	11.0	154.0	0.4	06/20/2017

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 2017, it was in an annual grass and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community state; introduced perennial grasses increased in 2022, becoming co-dominant with annual grasses. This site was treated as part of a fire rehabilitation project (Table 21A-08.1), but did not actually burn: this treatment potentially introduced crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) through aerial seeding (Table 21A-08.2). Introduced annual and perennial grasses, namely cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*), dominate the herbaceous understory as of 2022. Forbs were sparse in 2017, but the introduced annual weedy species redstem stork's bill provided over 10% cover in 2022 (Table 21A-08.7, Table 21A-08.10, Table 21A-08.11). Mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*) provide a majority of the browse species cover, although cover and density for both species decreased between 2017 and 2022 (Table 21A-08.12, Table 21A-08.13). Point-quarter density of Utah juniper (*Juniperus osteosperma*) decreased over the study period (Table 21A-8.14). However, the presence of trees indicates that there may be potential for future encroachment.

Trend Summary Tables**Table 21A-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	19.5	-	-	32.4	-	0.8
2022	16.5	0.0	-	24.4	-	-

Table 21A-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	375	355	290	63	22.8	19.7	5.2	1.0
2022	383	406	352	71	17.2	25.3	16.8	1.5

Table 21A-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	3.5	0.1	52.9	4.7	11.3	62.4
2022	4.6	0.1	45.6	1.8	9.8	63.2

Table 21A-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2017	7	6	1	19
2022	5	10	1	5
Year	Days Use Per Acre (ha)			
2017	3.6 (9.0)	11.4 (28.1)	-	-
2022	18.1 (44.8)	23.4 (57.9)	-	-

Table 21A-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Agropyron cristatum ⁱ (crested wheatgrass)	91	109	375	4	112	123	53	113
Bromus inermis ⁱ (smooth brome)	20	142	383	5	217	131	62	117
Bromus tectorum ^{ai} (cheatgrass)	Average Cover (%)							
Elymus elymoides (squirreltail)	1.5	3.2	22.8	0.1	5.8	4.0	1.9	3.3
Poa bulbosa ⁱ (bulbous bluegrass)	0.9	5.3	17.2	0.1	10.1	3.8	1.4	3.9
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)								

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21A-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	5	46	4	1	159	1	20	5	149	22	12	7	7	47	11	4	9
Alyssum desertorum ^{ai} (desert madwort)	23	130	9	3	85	-	15	0	249	21	14	-	-	131	8	11	-
Calochortus nuttallii (sego lily)	Average Cover (%)																
Ceratocephala testiculata ^{ai} (curveseed butterwort)	0.0	0.2	0.0	0.0	0.6	0.0	0.0	0.1	3.7	0.4	0.3	0.0	0.0	0.7	0.2	0.0	0.0
Collinsia parviflora ^a (maiden blue eyed Mary)	0.2	1.4	0.1	0.0	1.1	-	0.0	0.0	10.6	0.4	0.5	-	-	3.6	0.3	0.1	-
Crepis acuminata (tapertip hawkbeard)																	
Draba ^a (draba)																	
Eriogonum racemosum (redroot buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Lathyrus brachycalyx (Bonneville pea)																	
Lomatium (desertparsley)																	
Phlox longifolia (longleaf phlox)																	
Polygonum douglasii ^a (Douglas' knotweed)																	
Silene antirrhina ^a (sleepy silene)																	
Sphaeralcea coccinea (scarlet globemallow)																	
Tragopogon dubius ^{ai} (yellow salsify)																	
unknown annual forb ^a (unknown forb)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Zigadenus paniculatus (foothill deathcamas)
year	Nested
2017	-
2022	0
year	Average Cover (%)
2017	-
2022	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21A-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (platins pricklypear)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
2017	21.2	-	0.8	-	11.2
2022	14.6	-	-	-	9.8
year	Quadrat Cover (%)				
2017	15.1	-	0.0	-	4.3
2022	10.1	0.6	-	0.0	5.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	1560	40	3	80	18	13	0	35	93/132
2022	1280	-	3	66	31	22	2	36	-/-
Bassia prostrata^{pi} -- (forage kochia)									
2017	20	-	0	100	0	0	0	0	13/22
2022	-	-	-	-	-	-	-	-	-/-
Echinocereus -- (hedgehog cactus)									
2017	-	-	-	-	-	-	-	-	9/37
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2017	-	-	-	-	-	-	-	-	24/35
2022	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
2017	20	-	0	100	0	0	0	0	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
2017	-	-	-	-	-	-	-	-	17/47
2022	40	-	0	100	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2017	440	-	0	100	0	77	0	0	124/223
2022	320	-	0	94	6	38	56	6	-/-
Quercus gambelii^p -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	81/152

t - Tree Species; p - Preferred Browse; i - Introduced Species

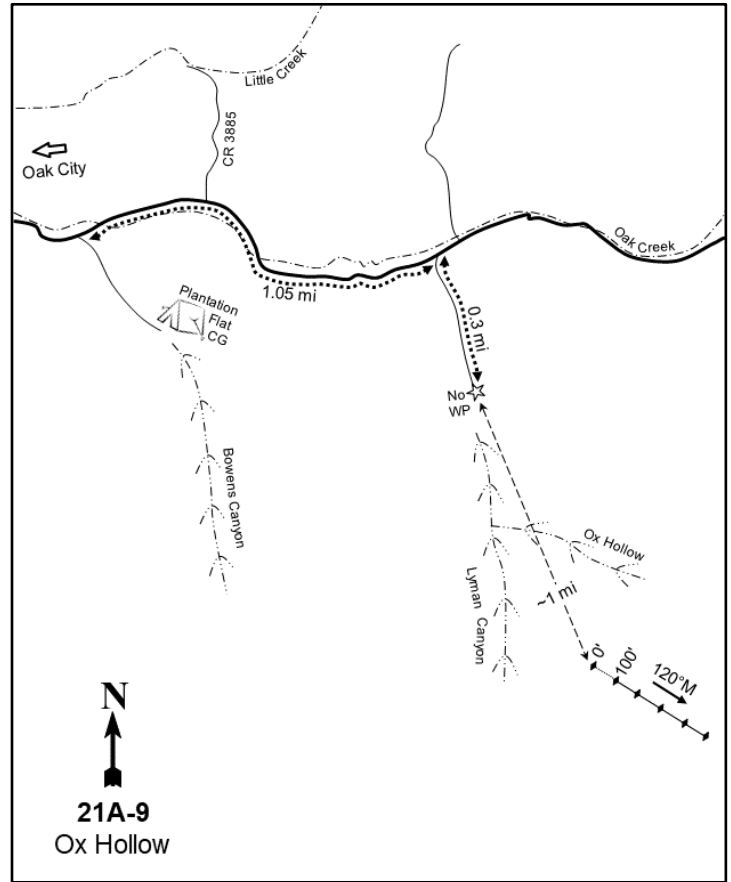
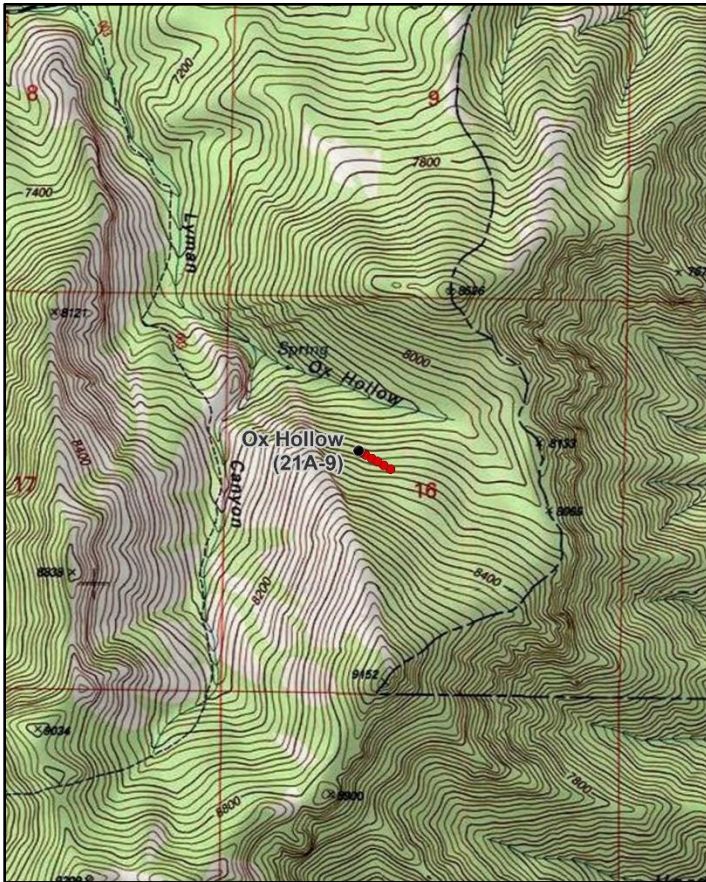
Table 21A-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	7	-	-	17	50	33	25.3
2022	1	-	100	-	-	-	8.0

Table 21A-08.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	30.0	11.5	0.9	27.8	-17.1	2.0	0.0	55.0	Fair
2022	30.0	8.6	0.9	30.0	-12.9	3.1	0.0	59.7	Fair

OX HOLLOW - STUDY NO. 21A-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Williams Peak NW; Township 17S, Range 3W, Section 16
NAD 83 UTM ZONE 12, 396866 East 4355001 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
120° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From Oak City, follow Center Street east until the road turns into Oak Creek Canyon Road. Travel along Oak Creek Canyon Road for approximately 9.1 miles until Lyman Canyon is reached. Turn right onto Lyman Canyon Road and drive for another 0.3 miles to a parking spot. From here, while using a GPS, hike for another mile to the location of the 0-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Dry Creek Allotment
Elevation	8,000ft (2,438m)
Aspect	North
Slope	58%
Sample Dates	06/22/2022

Table 21A-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs	-	2012	107767

Wildlife Habitat and Vegetation History**Table 21A-09.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	CABS	year-long
Deer	substantial	summer
Elk	substantial	summer

Site Notes

No Notes

Soils**Table 21A-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	38.5	40.2	21.3	6.0	49.0	356.0	0.4	06/22/2022

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	High Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA530UT
States and Transitions	No state and transition model is available for this ecological site.

This site was dominated by perennial grasses and forbs upon study establishment in 2022. Herbaceous diversity was fairly high, but much of the cover was provided by two species: the native species Sandberg bluegrass (*Poa secunda*) provided almost 21% cover, while the introduced forb alfalfa (*Medicago sativa*) contributed nearly 24%. The introduced annual grass species cheatgrass (*Bromus tectorum*) was also present in the understory, but in very low amounts (Photos, Table 21A-09.7, Table 21A-09.10, Table 21A-09.11). Four shrub species were captured in the data: mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Martin's ceanothus (*Ceanothus martinii*), creeping barberry (*Mahonia repens*), and Woods' rose (*Rosa woodsii*). Shrub cover and density were low (Table 21A-09.12, Table 21A-09.13), which could be a result of the 2012 Clay Springs wildfire (Table 21A-09.1). Depending on precipitation, competition with grasses, and time without disturbance, this (possibly extant) browse component indicates that there may be potential for this community to transition to one dominated by shrubs in the future.

Trend Summary Tables

Table 21A-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	0.4	0.0	-	0.9	0.3	-

Table 21A-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	4	334	122	250	0.1	24.9	1.4	27.7

Table 21A-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	16.1	0.9	24.1	1.9	39.2	46.7

Table 21A-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Mule Deer	Rocky Mountain Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
Year	Days Use Per Acre (ha)			
2022	-	28	8	2
2022	0.7 (1.8)	96.5 (238.4)	8.1 (19.9)	-

Table 21A-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex geyeri (Geyer's sedge)	Dactylis glomerata ⁱ (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
2022	0	4	9	11	34	25	302	10
year	Average Cover (%)							
2022	0.0	0.1	0.5	0.3	2.0	0.5	20.7	0.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21A-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Arabis holboellii ^a (Holboell's rockcress)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Hydrophyllum capitatum (ballhead waterleaf)	Iliamna rivularis (streambank wild hollyhock)	Lactuca serriola ^{ai} (prickly lettuce)	Linum perenne ⁱ (blue flax)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Penstemon whippleanus (Whipple's penstemon)
year	Nested Frequency																
2022	7	17	9	60	7	5	37	0	18	5	5	41	18	5	3	184	8
year	Average Cover (%)																
2022	0.0	0.0	0.2	0.6	0.0	0.1	0.1	0.0	0.1	0.0	0.2	2.2	0.0	0.3	0.0	23.8	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Pseudostellaria jamesiana (tuber starwort)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency							
2022	20	15	2	2	5	12	4	4
year	Average Cover (%)							
2022	0.1	0.3	0.1	0.0	0.1	0.3	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21A-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ceanothus martinii (Martin's ceanothus)	Mahonia repens (creeping barberry)	Rosa woodsii ^p (Wood's rose)
year	Line Intercept Cover (%)			
2022	0.4	-	0.3	0.5
year	Quadrat Cover (%)			
2022	0.4	0.0	0.0	0.0

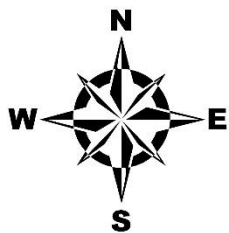
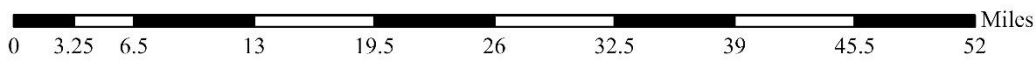
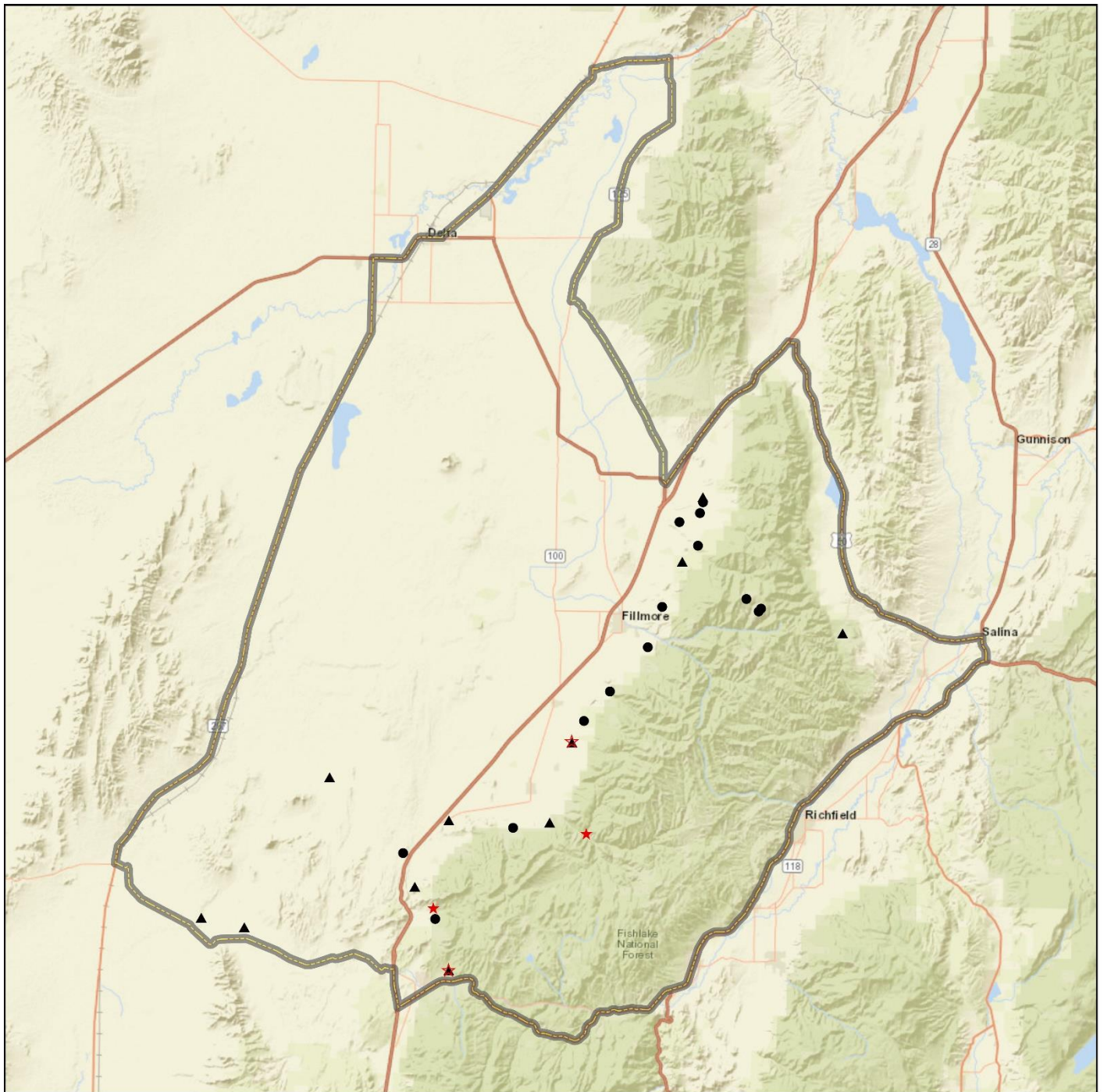
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21A-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

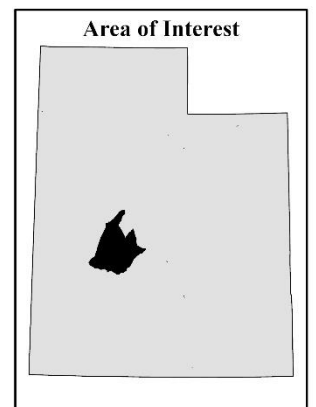
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2022	100	80	20	80	0	0	0	0	- / -
Ceanothus martinii -- (Martin's ceanothus)									
2022	80	-	50	50	0	0	75	0	- / -
Mahonia repens -- (creeping barberry)									
2022	440	-	0	100	0	0	0	0	- / -
Rosa woodsii ^p -- (Woods' rose)									
2022	80	-	0	100	0	0	100	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

WILDLIFE MANAGEMENT UNIT 21B – FILLMORE, FILLMORE

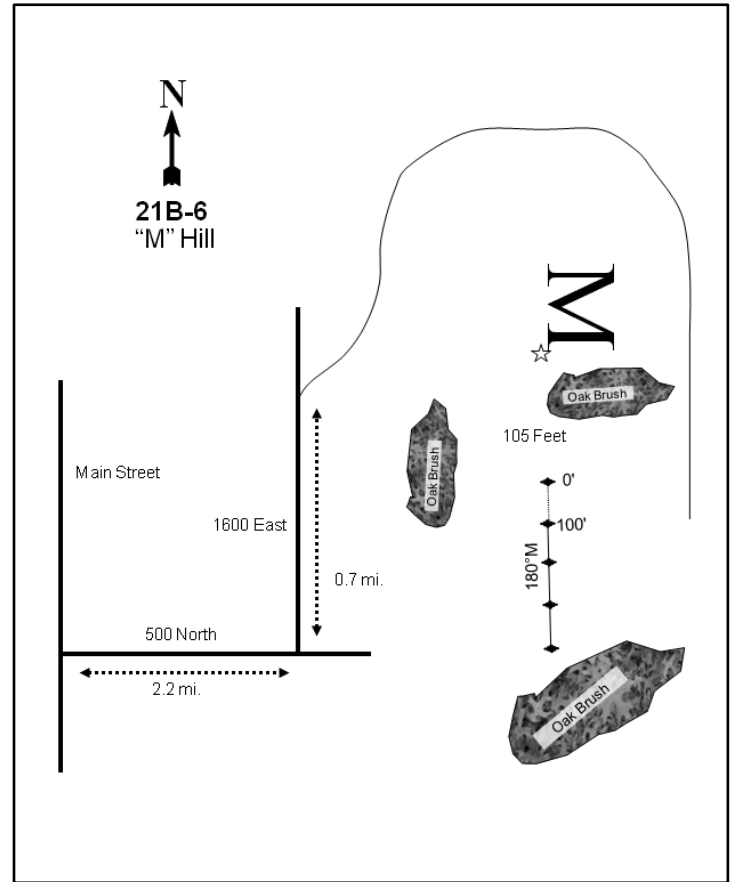
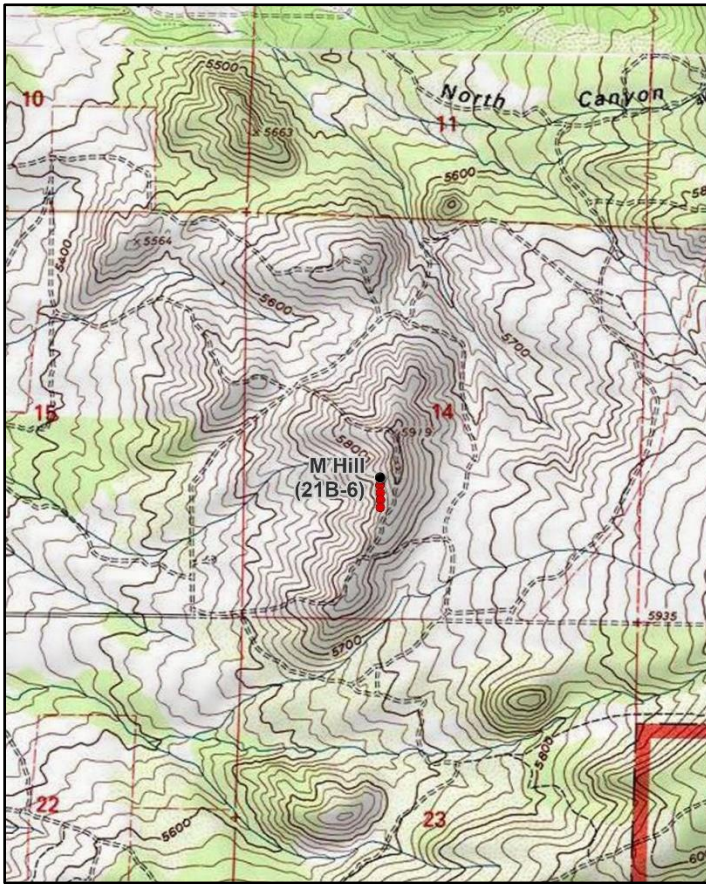


Study Locations Project, Status	Unit Boundary
● RT, Active	▭ Unit - 21B
★ RT, Suspended	
▲ WRI, Active	
★ WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

M HILL - STUDY NO. 21B-6

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Fillmore NE; Township 21S, Range 4W, Section 14
NAD 83 UTM ZONE 12, 389814 East 4315807 North

Transect Information

Browse Tag # (0' Stake)	7112
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

This transect is located near the 'M' on the hill northeast of Fillmore. Starting at the junction of 500 North and Main Street in Fillmore, go east for 2.2 miles to the base of 'M' Hill; the road that goes to the top of 'M' Hill has been closed. Turn left (north) at the gun range and drive for 0.7 miles to the closed road, park, and hike to the 'M'. The frequency baseline starts 105 feet due south of the bottom of the south leg of the concrete 'M'. The baseline is marked by 2 ½-foot-tall steel rebar. The 0-foot baseline stake is marked with browse tag #7112.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,850ft (1,783m)
Aspect	West
Slope	30-35%
Sample Dates	06/24/1998, 06/09/2003, 07/22/2008, 08/09/2012, 06/20/2017, 06/23/2022

Table 21B-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History**Table 21B-06.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I transitioning to Phase II
2008	Mixed Mountain Brush	Phase I transitioning to Phase II
2012	Mixed Mountain Brush	Phase I transitioning to Phase II
2017	Mixed Mountain Brush	Phase I transitioning to Phase II
2022	Mixed Mountain Brush/Utah Juniper	Phase II

Site Notes

No Notes

Soils**Table 21B-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	51.3	27.4	21.3	4.0	8.4	89.6	0.7	06/24/1998

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1985 through the most recent sample year, the primary shrubs on this site have been Gambel oak (*Quercus gambelii*) and alderleaf mountain mahogany (*Cercocarpus montanus*). The browse species Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have also been observed in lesser amounts (Photos, Table 21B-06.12, Table 21B-06.13). Grasses provide good cover, with bluebunch wheatgrass (*Pseudoroegneria spicata*) as the dominant species (Table 21B-06.10). Forbs are diverse, although overall cover is not high and the introduced annual species desert madwort (*Alyssum desertorum*) provides the most cover of any species (Table 21B-06.11). Utah juniper (*Juniperus osteosperma*) has been present on the site since the initial sampling and cover has increased in subsequent sample years (Table 21B-06.12, Table 21B-06.14). It is probable that without a tree-removing disturbance, tree cover will increase in the future and potentially lead to reduced understory productivity.

Trend Summary Tables

Table 21B-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	14.8	2.6	6.0	0.5	-	0.9
2003	11.9	0.3	3.2	20.0	0.5	9.9
2008	10.8	0.5	3.4	20.2	0.6	10.0
2012	14.9	0.1	5.4	27.0	0.6	14.3
2017	10.9	0.1	1.4	21.0	0.2	11.0
2022	13.8	-	5.4	24.9	-	14.1

Table 21B-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	201	243	296	201	2.2	9.3	2.1	6.2
2003	31	230	19	107	0.1	12.0	0.1	2.3
2008	66	245	247	90	0.3	13.2	1.7	2.8
2012	84	281	293	73	0.3	21.6	1.8	2.2
2017	95	283	402	145	2.1	17.3	10.0	2.8
2022	55	267	360	65	0.2	12.4	4.0	2.1

Table 21B-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.0	0.1	52.8	22.4	11.1	40.9
2003	18.3	0.3	46.0	9.5	12.2	27.5
2008	4.7	0.5	45.4	17.0	13.3	32.0
2012	9.0	0.4	51.1	11.3	11.1	46.0
2017	13.1	1.0	50.0	20.1	11.7	42.1
2022	21.8	1.7	51.2	17.8	12.7	35.5

Table 21B-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	-	16	3	16
2003	-	24	1	15
2008	-	27	2	39
2012	-	6	2	3
2017	-	6	1	14
2022	-	9	-	3
Year	Days Use Per Acre (ha)			
1998	5.8 (14.3)	22.8 (56.3)	4.0 (9.9)	-
2003	0.7 (1.8)	48.9 (120.8)	6.7 (16.6)	-
2008	-	22.8 (56.3)	3.4 (8.3)	-
2012	-	11.4 (28.1)	5.3 (13.2)	-
2017	-	15.4 (38.1)	2.0 (5.0)	-
2022	-	33.5 (82.8)	0.7 (1.7)	-

Table 21B-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Achnatherum hymenoides (Indian ricegrass)								
Bromus arvensis ^{ai} (field brome)								
Bromus tectorum ^{ai} (cheatgrass)								
Elymus elymoides (squirreltail)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Poa fendleriana (muttongrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
year	Average Cover (%)							
1998	2	14	199	7	-	0	39	232
2003	2	-	31	1	8	-	77	206
2008	1	10	57	4	2	-	63	235
2012	0	-	84	4	59	-	72	247
2017	3	5	92	5	70	-	50	252
2022	6	-	55	1	85	0	67	223
year	Average Cover (%)							
1998	0.4	0.2	2.0	0.1	-	0.0	0.5	8.3
2003	0.2	-	0.1	0.0	0.0	-	1.0	10.8
2008	0.2	0.0	0.2	0.1	0.0	-	0.4	12.5
2012	0.0	-	0.3	0.2	2.4	-	1.9	17.1
2017	0.2	0.0	2.1	0.0	1.7	-	0.8	14.6
2022	0.2	-	0.2	0.1	2.4	0.0	0.5	9.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)																		
Alyssum alyssoides ^{ai} (pale madwort)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Arabis (rockcress)																		
Astragalus calycosus (Torrey's milkvetch)																		
Astragalus eurekaensis (Eureka milkvetch)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Cirsium (thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Cryptantha (cryptantha)																		
Descurainia pinnata ^a (western tansymustard)																		
Draba ^a (draba)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Galium multiflorum (shrubby bedstraw)																		
Gilia inconspicua ^a (shy gilia)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
year	Average Cover (%)																	
1998	7	-	279	1	-	19	-	8	3	-	6	24	3	1	49	-	12	
2003	-	-	3	-	-	2	-	-	1	4	3	12	-	-	12	3	-	
2008	-	-	242	1	-	2	2	-	5	5	3	3	-	3	8	-	-	
2012	-	-	293	-	-	-	-	9	-	7	2	-	3	-	-	-	-	
2017	-	156	365	-	-	14	1	22	-	6	-	-	12	-	40	-	4	
2022	-	107	336	-	3	-	4	33	-	9	1	1	16	-	11	-	-	
year	Average Cover (%)																	
1998	0.0	-	1.8	0.0	-	0.2	-	0.0	0.1	-	0.1	0.1	0.0	0.0	0.5	-	0.1	
2003	-	-	0.0	-	-	0.0	-	-	0.0	0.0	0.0	0.1	-	-	0.2	0.0	-	
2008	-	-	1.7	0.0	-	0.1	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2	-	-	
2012	-	-	1.7	-	-	-	-	0.0	-	0.0	0.0	-	0.0	-	-	-	-	
2017	-	0.7	9.2	-	-	0.1	0.0	0.0	-	0.0	-	-	0.1	-	0.4	-	0.0	
2022	-	0.7	3.1	-	0.0	-	0.0	0.1	-	0.0	0.0	0.0	0.0	-	0.4	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multiflora (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon eatoni (firecracker penstemon)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physaria chambersii (Chambers' twinpod)	Silene antirrhina ^a (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency													
1998	-	4	0	29	-	9	-	80	44	25	4	-	18	0
2003	-	-	-	-	5	4	-	42	33	16	-	-	3	3
2008	-	-	-	-	3	-	-	32	28	5	-	3	14	-
2012	-	-	-	-	-	-	-	35	29	18	-	-	1	-
2017	1	-	10	17	-	-	-	28	41	28	5	3	7	3
2022	-	-	-	6	-	-	3	12	29	14	-	10	-	-
year	Average Cover (%)													
1998	-	0.1	0.0	0.1	-	0.1	-	2.9	1.9	0.1	0.0	-	0.2	0.0
2003	-	-	-	-	0.0	0.0	-	1.2	0.6	0.2	-	-	0.0	0.0
2008	-	-	-	-	0.0	-	-	1.7	0.7	0.0	-	0.0	0.1	-
2012	-	-	-	-	-	-	-	1.3	0.6	0.2	-	-	0.0	-
2017	0.0	-	0.0	0.1	-	-	-	1.2	0.9	0.1	0.0	0.0	0.0	0.0
2022	-	-	-	0.0	-	-	0.1	0.6	0.8	0.1	-	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Linanthus pungens (granite prickly phlox)	Purshia stansburiana ^p (Stansbury cliffrose)	Quercus gambelii ^p (Gambel oak)	Rhus trilobata var. trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)								
1998	-	-	-	-	-	-	-	-	-
2003	-	0.2	6.1	0.5	9.9	0	1.7	12	-
2008	-	0.7	5.4	0.6	10	-	0.9	13.2	-
2012	-	1	7.5	0.6	14.3	-	1.7	16.8	-
2017	-	1	5.1	0.2	11	-	1.2	13.7	-
2022	1.9	0.9	9.3	-	14.1	-	1.1	11.7	-
year	Quadrat Cover (%)								
1998	-	1.0	3.5	1.3	6.0	1.3	1.6	8.8	-
2003	0.4	0.0	3.9	0.1	3.2	0.2	1.1	6.5	-
2008	-	0.8	2.9	0.5	3.4	0.0	0.1	6.9	-
2012	-	0.9	6.3	0.1	5.4	-	0.4	7.4	-
2017	-	0.4	2.8	0.1	1.4	-	0.4	7.3	-
2022	1.2	0.9	4.8	-	5.4	-	0.5	6.3	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	244/265
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	220	-	0	82	18	9	0	0	73/92
2003	80	-	0	75	25	0	0	0	63/102
2008	60	-	0	100	0	0	0	0	78/115
2012	100	-	20	80	0	0	0	20	71/109
2017	100	20	0	100	0	0	0	20	61/100
2022	80	-	0	50	50	50	0	75	-/-
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1998	260	80	54	39	8	0	0	0	177/179
2003	300	-	20	73	7	27	27	0	190/221
2008	200	-	10	60	30	60	0	10	196/212
2012	120	20	17	83	0	0	17	50	199/230
2017	120	2520	17	83	0	0	17	0	179/202
2022	340	20	6	94	0	71	6	41	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	30/37
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	19/10
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	1740	80	13	87	0	0	0	0	28/31
2003	400	-	0	95	5	0	0	5	23/29
2008	1000	20	0	96	4	0	0	0	26/36
2012	420	-	10	43	48	0	0	48	18/29
2017	620	40	29	68	3	0	0	3	26/29
2022	60	-	0	100	0	0	0	0	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1998	160	-	25	63	13	0	0	0	-/-
2003	260	20	39	62	0	0	0	0	-/-
2008	200	40	30	70	0	0	0	0	-/-
2012	320	20	25	75	0	0	0	0	-/-
2017	220	-	46	55	0	0	0	0	-/-
2022	280	20	21	79	0	0	0	0	-/-
Linanthus pungens -- (granite prickly phlox)									
1998	3400	20	8	79	12	0	0	0	5/15
2003	380	-	5	84	11	0	0	11	5/14
2008	20	-	0	0	100	0	0	100	-/-
2012	-	-	-	-	-	-	-	-	24/35
2017	-	-	-	-	-	-	-	-	14/33
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia polyacantha -- (plains pricklypear)									
1998	-	-	-	-	-	-	-	-	18/39
2003	-	-	-	-	-	-	-	-	16/50
2008	20	-	0	100	0	0	0	0	12/15
2012	-	-	-	-	-	-	-	-	15/40
2017	-	-	-	-	-	-	-	-	16/30
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana ^p -- (Stansbury cliffrose)									
1998	160	20	0	63	38	75	0	0	125/118
2003	120	-	0	17	83	17	83	17	166/175
2008	80	-	25	50	25	25	0	0	118/103
2012	140	20	0	71	29	29	14	29	110/111
2017	120	-	0	67	33	50	33	33	104/112
2022	180	-	0	78	22	33	44	22	-/-
Quercus gambelii ^p -- (Gambel oak)									
1998	3020	60	46	53	1	19	0	0	138/111
2003	3080	100	38	52	10	0	0	6	93/66
2008	4700	260	13	83	4	1	0	0	98/106
2012	2740	60	64	34	2	4	1	2	94/100
2017	4420	260	69	29	2	2	0	1	90/88
2022	2540	420	54	45	2	44	0	54	-/-
Rhus trilobata var. trilobata ^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	140/316

t - Tree Species; p - Preferred Browse; i - Introduced Species

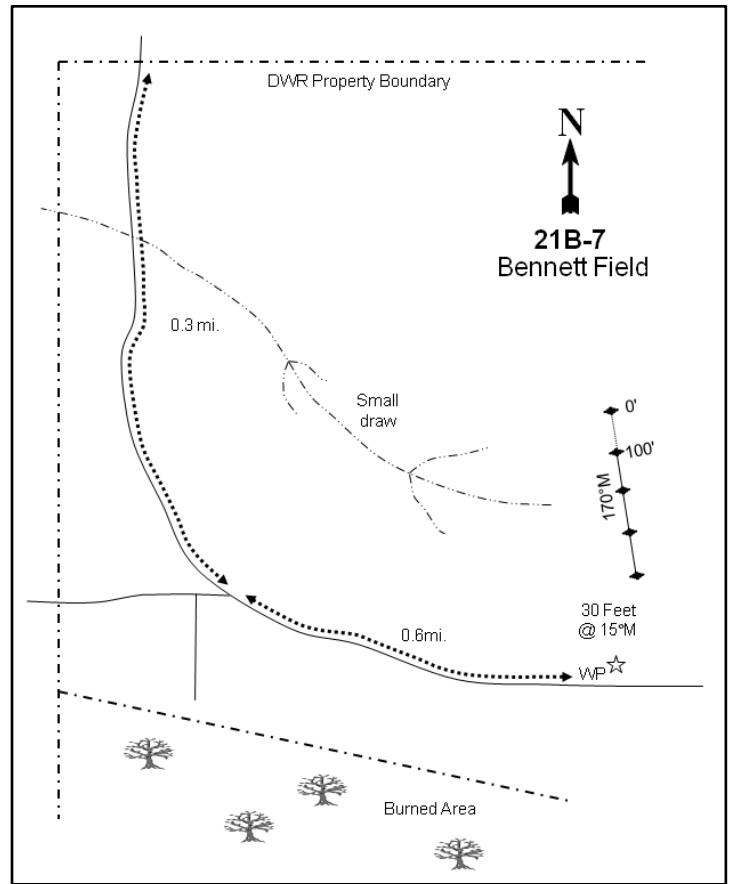
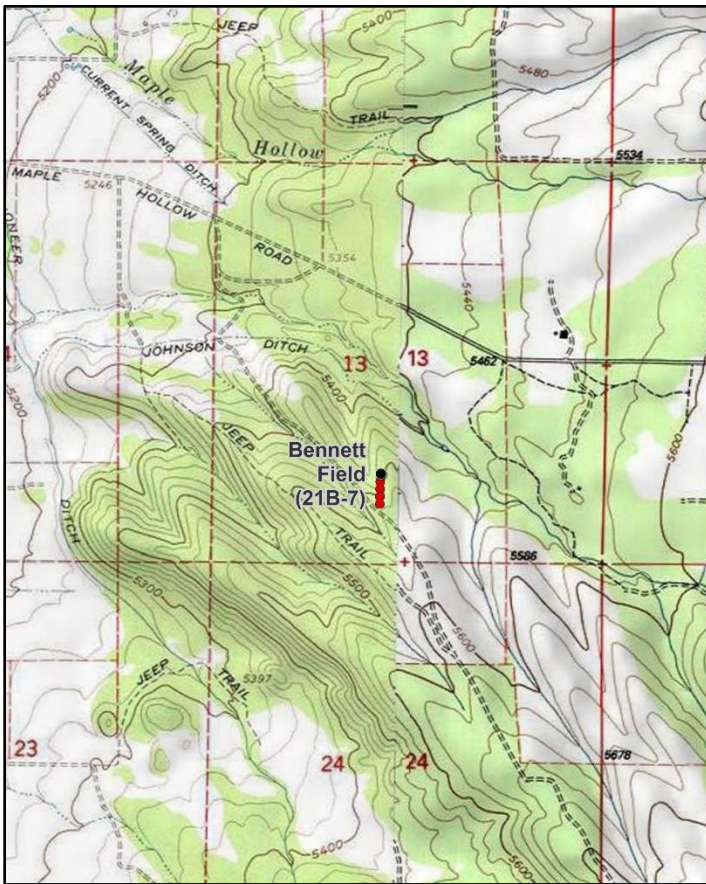
Table 21B-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	132	-	-	-	-	-	17.2
2003	140	-	32	16	37	16	14.6
2008	144	11	-	21	32	37	13.4
2012	149	11	5	16	53	16	14.3
2017	161	5	11	16	32	37	19.3
2022	145	5	11	11	-	74	18.9

Table 21B-06.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	17.6	12.8	15.0	18.5	-1.6	10.0	0.0	72.3	Good
2003	24.0	10.3	14.4	24.0	-0.1	4.6	0.0	77.1	Good
2008	23.5	11.4	6.2	26.4	-0.2	5.5	0.0	72.8	Good
2012	30.0	14.0	15.0	30.0	-0.2	4.3	0.0	93.1	Excellent
2017	24.4	14.0	15.0	30.0	-1.6	5.6	0.0	87.4	Good
2022	30.0	13.9	13.7	20.1	-0.2	4.2	0.0	81.7	Good

BENNETT FIELD - STUDY NO. 21B-7



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Holden NE; Township 20S, Range 4W, Section 13
NAD 83 UTM ZONE 12, 391734 East 4325279 North

Transect Information

Browse Tag # (0' Stake)	7184
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Take exit 174 off of I-15 south of Holden. From the interchange, proceed 0.9 miles straight east on a dirt road (towards Maple Canyon). Just after the cattle guard, turn right. Continue for 0.1 miles to a gate to DWR property. Proceed 0.3 miles down across a wash and over to a three-way split. Follow the main road, which bends to the left, and continue for 0.6 miles near the top of a small ridge. There is a witness post (steel rebar three feet tall) on the left (north) side of the road. The 400-foot stake is 30 feet away from the witness post at a bearing of 15 degrees magnetic. The frequency baseline starts 400 feet further north and the 0-foot stake is marked with browse tag #7184.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	10%
Sample Dates	06/24/1998, 05/15/2003, 07/25/2008, 08/13/2012, 06/21/2017, 06/22/2022

Table 21B-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1958	-

Wildlife Habitat and Vegetation History

Table 21B-07.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
1991	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
1998	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2008	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I transitioning to Phase II
2017	Mountain Big Sagebrush/Stansbury Cliffrose/Bulbous Bluegrass	Phase I transitioning to Phase II
2022	Mountain Big Sagebrush/Stansbury Cliffrose/Bulbous Bluegrass	Phase I transitioning to Phase II

Site Notes

A deer carcass was found on the site in 2012.

Soils

Table 21B-07.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	48.7	27.7	23.6	3.2	7.5	140.8	0.8	06/23/1998

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1985, this site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Stansbury cliffrose (*Purshia stansburiana*) (Photos, Table 21B-07.6, Table 21B-07.12, Table 21B-07.13). The herbaceous understory has maintained high amounts of cheatgrass (*Bromus tectorum*), which can reduce the resiliency of the site through the loss of diversity and increased fire regimes. Native perennial grasses contribute little cover, and forb diversity and cover is low overall (Table 21B-07.10, Table 21B-07.11). The introduced perennial grass species (*Poa bulbosa*) and annual forb species desert madwort (*Alyssum alyssoides*) and redstem stork's bill (*Erodium cicutarium*) became dominant in 2017 (Table 21B-10, Table 21B-11). The site was chained in 1958 (Table 21B-07.1) and since that treatment, infilling by Utah juniper (*Juniperus osteosperma*) has steadily occurred (Photos, Table 21B-07.14). Barring a tree-removing disturbance, this site will likely continue to transition into a Phase II woodland community.

Trend Summary Tables

Table 21B-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	14.4	0.8	0.2	0.3	-	0.1
2003	18.0	0.1	0.7	27.4	-	1.8
2008	10.9	0.5	1.0	20.6	0.7	5.4
2012	10.1	0.1	3.3	21.9	-	3.7
2017	11.1	0.1	2.5	20.8	-	8.6
2022	15.7	-	4.9	22.1	-	12.2

Table 21B-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	392	211	422	16	27.4	4.6	13.2	0.7
2003	371	331	390	68	13.0	12.6	12.2	0.6
2008	391	244	303	13	14.7	9.5	2.9	0.0
2012	382	361	379	13	22.0	28.0	5.8	0.3
2017	291	398	422	24	19.2	31.6	13.6	0.2
2022	305	418	361	30	10.0	28.4	7.0	0.5

Table 21B-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	5.7	2.0	70.1	5.2	2.9	54.1
2003	14.6	5.8	39.1	1.3	3.2	53.9
2008	3.1	0.7	54.8	2.3	3.9	47.6
2012	2.2	0.3	58.5	1.1	2.4	70.0
2017	3.5	2.0	55.9	4.9	4.0	66.6
2022	7.2	1.3	58.7	6.8	4.3	59.0

Table 21B-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	3	55	1	20
2003	-	55	2	16
2008	-	55	-	49
2012	-	34	-	21
2017	-	35	2	21
2022	1	30	-	9
Year	Days Use Per Acre (ha)			
1998	-	131.3 (324.4)	2.0 (5.0)	-
2003	-	160.9 (397.3)	-	-
2008	1.5 (3.6)	145.4 (359.2)	0.7 (1.7)	-
2012	-	89.1 (220.2)	3.4 (8.3)	-
2017	0.7 (1.8)	60.3 (149.0)	10.0 (24.8)	-
2022	1.5 (3.6)	111.3 (274.8)	3.4 (8.3)	-

Table 21B-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)
year	Nested Frequency								
1998	-	3	392	9	4	-	179	44	2
2003	-	-	371	-	89	-	304	38	-
2008	0	10	391	3	77	28	167	38	-
2012	-	7	377	-	221	13	188	40	-
2017	-	17	290	4	348	27	142	53	-
2022	-	14	303	-	297	1	240	56	-
year	Average Cover (%)								
1998	-	0.0	27.4	0.1	0.0	-	3.5	1.0	0.0
2003	-	-	13.0	-	2.9	-	7.9	1.8	-
2008	0.0	0.0	14.7	0.0	3.0	0.7	3.0	2.8	-
2012	-	0.0	22.0	-	11.7	0.8	11.9	3.5	-
2017	-	0.1	19.1	0.1	23.5	0.5	3.9	3.7	-
2022	-	0.2	9.8	-	16.3	0.0	9.4	2.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chamaesyce (sandmat)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)
year	Nested Frequency																
1998	5	-	422	-	-	2	-	-	-	-	-	-	53	-	2	6	-
2003	7	-	367	0	18	-	83	-	2	10	2	-	135	3	-	3	28
2008	4	-	266	-	-	3	12	4	-	6	-	-	98	-	-	-	-
2012	-	-	379	-	-	-	-	-	-	4	5	-	3	-	-	1	-
2017	-	-	403	-	10	-	4	-	2	8	-	-	133	-	-	-	4
2022	-	46	249	5	5	-	-	-	2	4	-	34	142	-	3	-	10
year	Average Cover (%)																
1998	0.1	-	12.9	-	-	0.0	-	-	-	-	-	-	0.1	-	0.0	0.1	-
2003	0.1	-	8.2	0.0	0.1	-	0.2	-	0.0	0.0	0.0	-	3.8	0.0	-	0.0	0.2
2008	0.0	-	1.5	-	-	0.0	0.0	0.0	-	0.0	-	-	1.4	-	-	-	-
2012	-	-	5.7	-	-	-	-	-	-	0.0	0.0	-	0.0	-	-	0.0	-
2017	-	-	10.6	-	0.0	-	0.0	-	0.0	0.0	-	-	3.0	-	-	-	0.0
2022	-	0.3	2.8	0.0	0.0	-	-	-	0.0	0.0	-	0.1	3.6	-	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES						
Petradoria pumila (rock goldenrod)						
Phlox austromontana (mountain phlox)						
Phlox longifolia (longleaf phlox)						
Silene antirrhina ^a (sleepy silene)						
Tragopogon dubius ^{ai} (yellow salsify)						
Zigadenus paniculatus (foothill deathcamas)						
year	Nested Frequency					
1998	4	-	1	-	7	-
2003	3	-	12	10	5	4
2008	-	-	2	-	-	0
2012	4	-	1	6	3	2
2017	5	1	3	3	3	-
2022	3	1	4	49	2	4
year	Average Cover (%)					
1998	0.4	-	0.0	-	0.2	-
2003	0.1	-	0.1	0.0	0.0	0.0
2008	-	-	0.0	-	-	0.0
2012	0.3	-	0.0	0.0	0.0	0.0
2017	0.1	0.0	0.0	0.0	0.0	-
2022	0.1	0.1	0.1	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)				
Gutierrezia sarothrae (broom snakeweed)				
Juniperus osteosperma ⁱ (Utah juniper)				
Purshia stansburiana ^p (Stansbury cliffrose)				
year	Line Intercept Cover (%)			
1998	-	-	-	-
2003	17.4	-	1.8	10
2008	12.6	0.7	5.4	8
2012	15.2	-	3.7	6.7
2017	14.4	-	8.6	6.4
2022	13.2	-	12.2	8.9
year	Quadrat Cover (%)			
1998	10.3	0.8	0.2	4.1
2003	15.4	0.1	0.7	2.6
2008	9.3	0.5	1.0	1.6
2012	8.5	0.1	3.3	1.6
2017	10.3	0.1	2.5	0.8
2022	11.7	-	4.9	4.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	1960	-	3	56	41	26	3	14	89/107
2003	1800	-	1	54	44	24	6	20	90/108
2008	1360	-	3	40	57	32	4	38	98/124
2012	1440	-	1	63	36	38	40	40	94/124
2017	1300	-	0	60	40	32	15	45	85/110
2022	1200	-	0	55	45	0	5	47	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	60	-	33	67	0	0	0	0	21/25
2003	-	-	-	-	-	-	-	-	33/41
2008	-	-	-	-	-	-	-	-	34/62
2012	-	-	-	-	-	-	-	-	46/62
2017	-	-	-	-	-	-	-	-	42/68
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	62/98
2017	-	-	-	-	-	-	-	-	48/67
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	1080	40	22	76	2	0	0	2	26/28
2003	220	-	9	82	9	0	0	9	14/20
2008	260	-	0	92	8	0	0	8	26/35
2012	120	-	0	100	0	0	0	0	30/44
2017	120	-	0	100	0	0	0	0	25/23
2022	60	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	40	-	0	50	50	0	0	0	- / -
2003	20	-	0	0	100	0	0	100	- / -
2008	20	-	0	0	100	0	0	0	- / -
2012	40	-	0	100	0	0	0	0	- / -
2017	20	20	0	0	100	0	0	0	- / -
2022	60	-	0	67	33	0	0	33	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1998	480	20	13	75	13	21	0	0	198/164
2003	360	-	0	56	44	11	61	17	211/188
2008	400	-	20	20	60	20	35	25	197/170
2012	280	-	0	79	21	50	14	29	172/162
2017	320	40	13	50	38	44	19	13	194/148
2022	300	-	0	60	40	20	13	40	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	20	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	133/270

t - Tree Species; p - Preferred Browse; i - Introduced Species

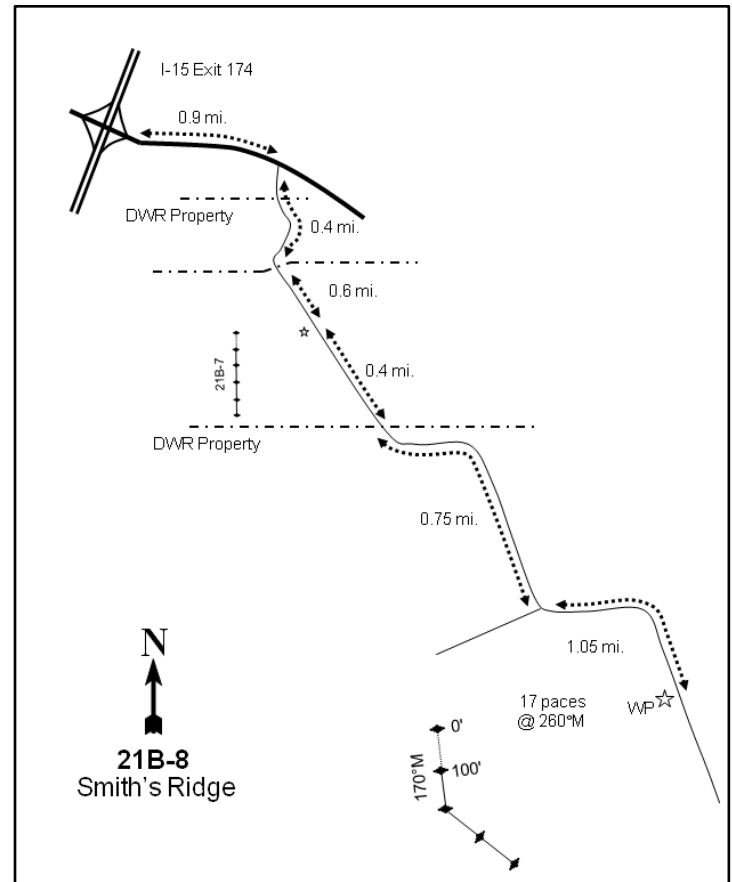
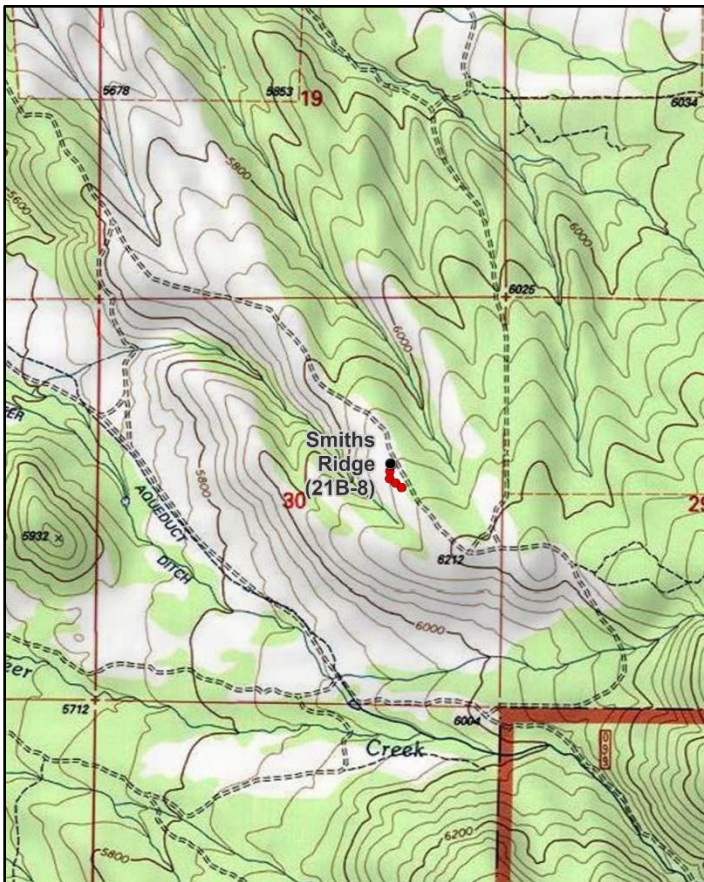
Table 21B-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	13	-	-	-	-	-	10.3
2003	18	-	-	-	-	-	16.4
2008	32	-	30	20	30	20	13.7
2012	29	9	18	9	27	36	12.7
2017	26	-	10	-	50	40	23.5
2022	30	9	-	18	36	36	18.0
Purshia stansburiana (Stansbury cliffrose)							
2003	169	-	-	-	-	-	22.1

Table 21B-07.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	19.0	5.2	2.9	9.0	-20.0	1.4	0.0	17.5	Very Poor
2003	30.0	1.7	0.3	19.4	-9.7	1.2	0.0	42.8	Poor
2008	27.8	-2.5	4.8	12.9	-11.1	0.1	0.0	31.9	Very Poor
2012	29.1	5.5	0.5	30.0	-16.5	0.7	0.0	49.3	Poor-Fair
2017	27.6	3.2	1.9	16.2	-14.4	0.5	0.0	35.0	Very Poor-Poor
2022	29.9	2.1	0.0	24.1	-7.5	1.0	0.0	49.6	Poor-Fair

SMITHS RIDGE - STUDY NO. 21B-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Coffee Peak SW; Township 20S, Range 3W, Section 30
NAD 83 UTM ZONE 12, 393805 East 4322630 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

511
170° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From exit 174 on I-15 south of Holden, proceed to the east side of the freeway, then east on the Maple Canyon Road for 0.9 miles to a cattle guard. Just beyond the cattle guard, turn right and go 0.1 miles to DWR property. Proceed for 0.3 miles across a wash and to a three-way split in the road. Stay left and continue for 0.6 miles to the Bennett Field transect (21-7). From there, continue for 0.4 miles to a gate at the eastern boundary of DWR property. Go another 0.75 miles through two more gates to a two-track road. Turn left and drive for 1.05 miles to the witness post on the west side of the road. From the witness post, walk 17 paces at 260 degrees magnetic. The frequency baseline starts 100 feet due west of the cliffrose. The 0-foot stake is a 3-foot rebar with browse tag #511 attached.

NOTE: If the road is closed, the hike to the site is 0.7 miles from the main gravel road.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	6,110ft (1,862m)
Aspect	West
Slope	8-10%
Sample Dates	08/10/1998, 06/13/2003, 07/25/2008, 08/13/2012, 06/21/2017, 06/22/2022

Table 21B-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Late 1950s or early 1960s	-
Fire - Wildfire	Swains Fire	-	August 2000	7898
Seeding - Aerial	Fire Rehabilitation-Swains Fire Q-619	-	2001	1000

Table 21B-08.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Swain Aerial			Aerial	Oct 2000	1000
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	3.00	0.00
G	Bromus inermis	Smooth Brome		3.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Pseudoroegneria spicata	Bluebunch Wheatgrass		2.00	0.00
G	Thinopyrum ponticum	Tall Wheatgrass		3.00	0.00
F	Medicago sativa	Alfalfa	Ladak	0.50	0.00
S	Purshia tridentata	Bitterbrush		0.50	0.00

Wildlife Habitat and Vegetation History**Table 21B-08.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
1991	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
1998	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
2003	Mountain Big Sagebrush	Phase I
2008	Mountain Big Sagebrush	Phase I
2012	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2022	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I transitioning to Phase II

Site Notes

No Notes

Soils**Table 21B-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4	08/10/1998

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This site is currently a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated ecological site. Prior to the fire in 2000 (Table 21B-08.1), the dominant browse species were both mountain big sagebrush and Stansbury cliffrose (*Purshia stansburiana*). However, the fire reduced the amount of other browse species present while sagebrush recovered well (Table 21B-08.12, Table 21B-08.13). The composition of the understory has shifted through the years. Prior to 2012, the herbaceous component was dominated by perennial grasses in moderate amounts. In 2012, the introduced perennial species bulbous bluegrass (*Poa bulbosa*) exhibited significantly increased cover values and established dominance in the understory: this grass will likely maintain or increase in cover and lead to reduced overall species diversity (Table 21B-08.10). Introduced annual forbs have also established dominance between 2012 to 2022. Prior to the 2012 sample year, forbs were diverse, but generally not abundant (Table 21B-08.7, Table 21B-08.11). Utah juniper (*Juniperus osteosperma*) is present in significant numbers, and the site is currently in transition to Phase II of woodland succession (Table 21B-08.4, Table 21B-08.14). Encroachment will likely continue without a tree-removing disturbance.

Trend Summary Tables**Table 21B-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	20.4	1.7	5.9	0.1	-	1.3
2003	5.5	1.6	5.3	5.2	3.2	8.5
2008	5.7	0.6	5.2	7.0	0.3	11.9
2012	6.1	1.4	4.2	9.3	1.5	10.5
2017	7.2	1.1	1.9	13.5	0.6	17.0
2022	8.1	1.1	2.6	12.0	0.9	18.7

Table 21B-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	354	270	83	19	9.3	9.0	0.4	0.1
2003	308	205	193	46	11.9	10.1	9.4	1.7
2008	324	258	287	-	6.4	9.3	3.4	-
2012	163	408	367	42	2.7	31.7	4.3	0.4
2017	117	416	433	54	1.2	30.8	13.5	0.5
2022	166	406	419	64	2.8	26.0	6.5	0.7

Table 21B-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	11.8	4.1	52.7	7.6	5.5	45.6
2003	17.3	0.1	35.5	6.8	9.8	47.0
2008	11.7	0.2	49.5	4.4	8.6	35.5
2012	9.9	0.1	41.0	4.6	9.7	53.6
2017	14.2	0.4	47.6	9.5	9.4	50.2
2022	13.1	1.5	48.3	9.1	10.4	46.2

Table 21B-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	-	-	13	11	8
2003	3	-	41	3	10
2008	3	-	66	5	44
2012	1	-	31	5	20
2017	6	-	36	1	33
2022	7	-	36	1	13
Year	Days Use Per Acre (ha)				
1998	-	-	70.4 (173.8)	28.1 (69.5)	-
2003	1.5 (3.6)	-	89.8 (221.8)	12.1 (29.8)	-
2008	11.6 (28.7)	8.7 (21.5)*	140.1 (346.0)	3.4 (8.3)	-
2012	1.5 (3.6)	-	26.8 (66.2)	2.7 (6.6)	-
2017	13.8 (34.1)	-	37.5 (92.7)	4.0 (9.9)	-
2022	8.7 (21.5)	-	53.0 (130.8)	7.4 (18.2)	-

*Pellets per acre (ha)

Table 21B-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
1998	-	-	-	354	60	-	17	-	152	113	-
2003	-	-	3	308	61	2	57	-	112	63	6
2008	-	-	5	324	41	1	16	25	139	89	32
2012	-	-	5	158	19	8	251	7	182	89	74
2017	-	2	7	110	32	5	319	2	108	167	68
2022	2	4	13	155	24	-	328	3	104	165	62
year	Average Cover (%)										
1998	-	-	-	9.3	1.2	-	0.5	-	2.6	4.7	-
2003	-	-	0.6	11.3	1.8	0.0	2.4	-	1.8	3.8	0.2
2008	-	-	0.0	6.4	1.0	0.0	0.3	0.2	2.5	3.7	1.6
2012	-	-	0.0	2.7	0.2	0.2	17.3	0.3	6.2	4.0	3.4
2017	-	0.0	0.0	1.2	1.0	0.2	17.3	0.0	2.4	8.1	1.8
2022	0.0	0.2	0.1	2.7	0.3	-	15.1	0.0	1.4	7.5	1.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
1998	-	-	-	68	7	4	2	-	14	-	-	-	4	-	-	-	-
2003	3	6	-	1	-	-	1	-	-	0	-	-	191	-	2	1	3
2008	-	-	-	213	-	-	-	-	5	-	3	-	126	-	-	-	-
2012	-	6	-	350	-	-	1	-	-	0	21	-	49	-	3	-	6
2017	-	3	320	285	3	8	6	3	13	-	19	-	169	8	-	-	-
2022	-	2	341	208	2	12	18	4	12	-	2	27	85	-	-	-	-
year	Average Cover (%)																
1998	-	-	-	0.3	0.1	0.0	0.0	-	0.0	-	-	-	0.1	-	-	-	-
2003	0.1	0.0	-	0.0	-	-	0.0	-	-	0.0	-	-	9.4	-	0.0	0.0	0.0
2008	-	-	-	0.9	-	-	-	-	0.0	-	0.0	-	2.3	-	-	-	-
2012	-	0.0	-	3.2	-	-	0.0	-	-	0.0	0.0	-	0.8	-	0.0	-	0.0
2017	-	0.0	4.3	3.2	0.0	0.0	0.0	0.0	0.0	-	0.0	-	5.8	0.2	-	-	-
2022	-	0.0	3.5	1.1	0.1	0.2	0.1	0.0	0.0	-	0.0	0.1	1.7	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Medicago sativa ^a (alfalfa)	Microsteris gracilis ^{ai} (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ^a (small burnet)	Silene antirrhina ^a (sleepy silene)	Tragopogon dubius ^{ai} (yellow safsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency										
1998	8	-	-	-	-	-	-	-	3	-	-
2003	3	15	15	1	-	-	3	-	-	-	0
2008	-	-	-	-	-	-	-	-	2	-	-
2012	3	17	11	2	1	-	-	38	7	-	1
2017	3	20	5	-	9	3	-	3	15	1	1
2022	-	24	-	-	9	-	-	39	4	-	-
year	Average Cover (%)										
1998	0.0	-	-	-	-	-	-	-	0.0	-	-
2003	0.0	0.1	1.4	0.0	-	-	0.1	-	-	-	0.0
2008	-	-	-	-	-	-	-	-	0.1	-	-
2012	0.0	0.1	0.3	0.0	0.0	-	-	0.1	0.1	-	0.0
2017	0.0	0.1	0.2	-	0.1	0.0	-	0.0	0.1	0.0	0.0
2022	-	0.1	-	-	0.0	-	-	0.1	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)							
1998	-	-	-	-	-	-	-	-
2003	0.8	1.8	3.2	8.5	0	1.4	1.1	0.1
2008	3.2	1.6	0.2	11.9	0.1	1.8	0.3	0.1
2012	7.1	0.9	1.5	10.5	-	0.8	0.5	-
2017	9.9	0.3	0.6	17	0	2.8	0.5	-
2022	11.2	-	0.9	18.7	-	-	0.8	-
year	Quadrat Cover (%)							
1998	6.1	-	1.7	5.9	-	5.2	8.6	0.5
2003	1.0	2.0	1.5	5.3	0.0	1.1	1.3	0.0
2008	2.3	1.8	0.5	5.2	0.1	1.4	0.2	0.0
2012	4.0	1.4	1.3	4.2	0.0	0.4	0.3	-
2017	5.8	0.5	0.6	1.9	0.5	0.8	0.1	-
2022	7.7	0.3	0.9	2.6	0.2	-	0.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	2040	-	14	73	14	48	1	12	52/72
2003	1440	40	61	31	8	31	8	3	31/38
2008	1400	20	27	70	3	20	0	1	40/54
2012	1320	80	6	94	0	44	38	6	47/74
2017	1280	-	5	88	8	31	30	6	53/95
2022	1220	-	2	72	26	28	2	39	- / -
Bassia prostrata^{pi} -- (forage kochia)									
1998	-	-	-	-	-	-	-	-	- / -
2003	4020	100	46	54	0	57	2	0	22/33
2008	6000	780	35	62	3	36	22	2	16/26
2012	3540	1920	23	77	1	24	33	4	12/24
2017	1580	-	11	89	0	25	0	0	8/12
2022	300	-	20	80	0	7	0	7	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	80	-	0	100	0	0	0	0	27/27
2008	-	-	-	-	-	-	-	-	62/78
2012	20	-	0	0	100	100	0	100	78/130
2017	-	-	-	-	-	-	-	-	58/73
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1998	3160	-	20	80	0	0	0	0	24/31
2003	2740	-	2	92	6	3	0	5	27/32
2008	1500	300	13	60	27	0	1	21	19/29
2012	2060	-	2	98	0	0	0	25	19/31
2017	2420	20	19	77	4	0	0	3	20/26
2022	1180	20	2	92	7	0	2	19	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	100	20	0	100	0	0	0	0	- / -
2003	80	-	0	100	0	0	0	0	- / -
2008	40	-	0	100	0	0	0	0	- / -
2012	60	-	0	100	0	0	0	0	- / -
2017	100	60	0	100	0	0	0	0	- / -
2022	60	-	0	67	33	0	0	33	- / -
Opuntia polyacantha -- (plains pricklypear)									
1998	20	-	0	0	100	0	0	100	21/42
2003	80	-	50	50	0	0	0	0	16/23
2008	80	-	0	100	0	0	0	0	14/38
2012	140	-	29	71	0	0	0	43	13/48
2017	140	-	0	100	0	0	0	0	13/42
2022	80	-	75	25	0	0	0	0	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1998	220	-	18	82	0	64	0	0	152/273
2003	60	-	0	67	33	67	33	0	135/171
2008	80	-	25	25	50	0	0	25	147/156
2012	40	-	0	100	0	100	0	0	103/132
2017	160	-	63	38	0	13	25	0	104/113
2022	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1998	600	-	3	97	0	67	20	0	118/208
2003	60	-	0	100	0	67	33	0	117/223
2008	240	-	67	0	33	0	33	8	75/141
2012	100	20	0	20	80	0	100	0	48/92
2017	80	-	0	25	75	0	100	0	51/135
2022	120	-	17	0	83	17	17	83	- / -
Quercus gambelii^P -- (Gambel oak)									
1998	-	-	-	-	-	-	-	-	211/174
2003	20	-	0	100	0	0	0	0	41/31
2008	40	-	50	50	0	0	0	0	- / -
2012	-	40	0	0	0	0	0	0	35/52
2017	-	-	-	-	-	-	-	-	121/80
2022	20	-	100	0	0	0	0	0	- / -
Rhus glabra^P -- (smooth sumac)									
1998	60	-	0	0	100	100	0	67	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	46/88
2012	-	-	-	-	-	-	-	-	35/30
2017	-	-	-	-	-	-	-	-	32/33
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	163/82
2022	-	-	-	-	-	-	-	-	-/-
Ribes^p -- (currant)									
1998	200	-	0	100	0	0	0	0	28/35

t - Tree Species; p - Preferred Browse; i - Introduced Species

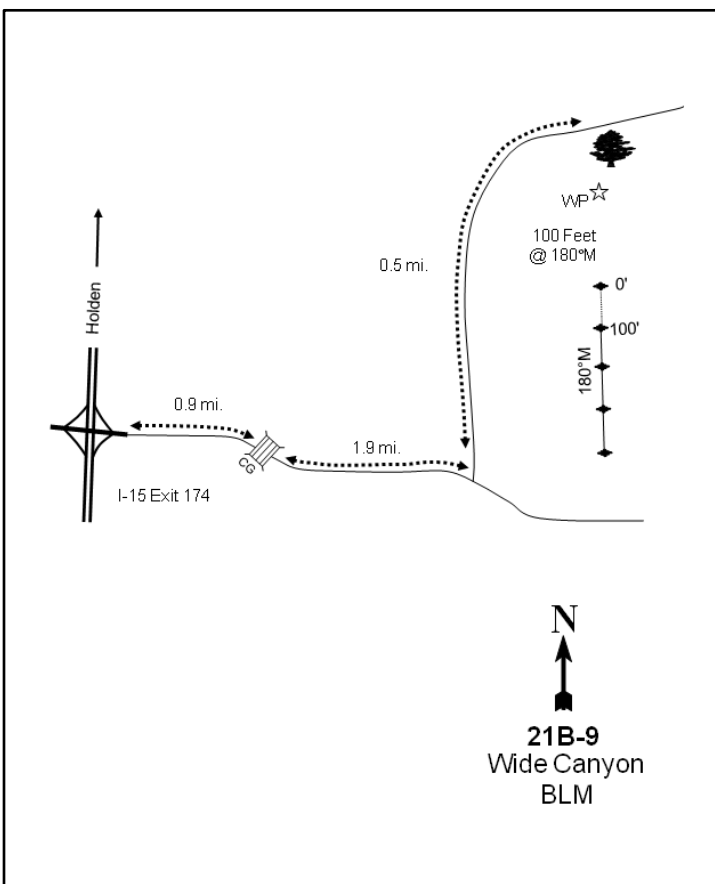
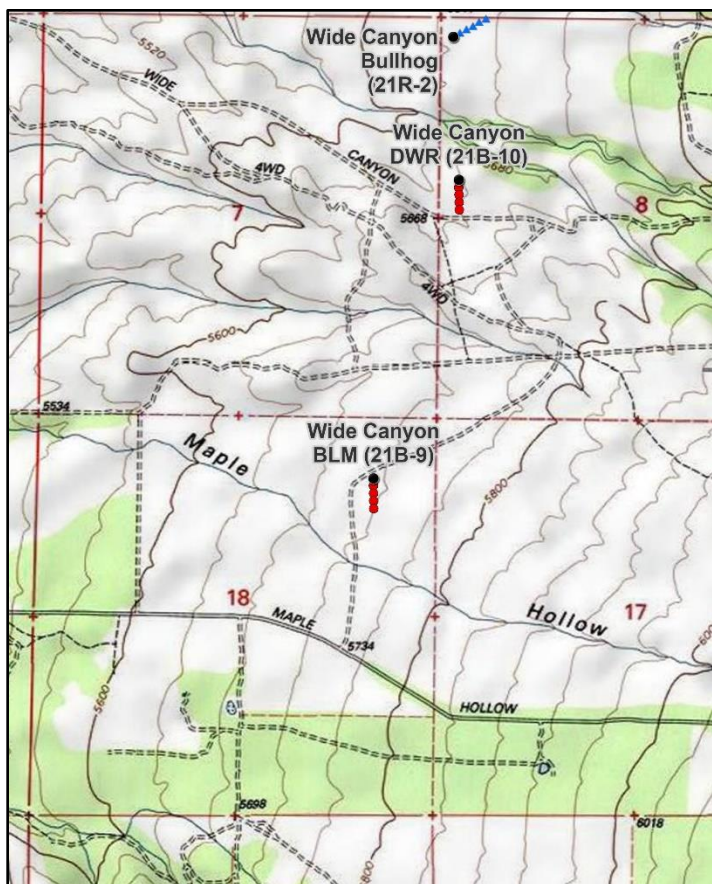
Table 21B-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	47	-	-	-	-	-	17.1
2003	24	-	8	8	42	42	30.2
2008	24	-	8	8	31	54	34.2
2012	25	-	-	15	-	85	26.4
2017	25	-	-	23	31	46	29.5
2022	25	7	7	-	7	79	40.0

Table 21B-08.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	28.8	13.4	5.1	17.1	-7.0	0.3	0.0	57.7	Fair
2003	7.6	11.9	12.7	15.4	-8.9	3.5	0.0	42.1	Poor
2008	9.7	10.1	15.0	18.1	-4.8	0.0	0.0	48.0	Poor
2012	12.2	13.7	3.4	28.8	-2.0	0.9	0.0	56.9	Fair
2017	17.8	12.5	8.3	27.0	-0.9	1.0	0.0	65.7	Fair-Good
2022	15.2	6.0	1.3	22.0	-2.1	1.4	0.0	43.7	Poor

WIDE CANYON BLM - STUDY NO. 21B-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Coffee Peak NW; Township 20S, Range 3W, Section 18
NAD 83 UTM ZONE 12, 394027 East 4326278 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

7107
180° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 4: 4ft

Directions to Site

From exit 174 on I-15 south of Holden, go 0.9 miles east to a cattle guard. Continue for 1.9 miles to a dirt road turning off to the left. Follow this dirt road for 0.5 miles to a witness post (rebar) three feet off of the right (south) side of the road, about 10 feet beyond a juniper. The frequency baseline starts 100 feet south of the witness post. The 0-foot stake is rebar with browse tag #7107 attached.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HOLDEN SPRING
Elevation	5,710ft (1,740m)
Aspect	Southwest
Slope	2-5%
Sample Dates	08/24/1998, 05/15/2003, 07/21/2008, 08/06/2012, 06/19/2017, 06/21/2022

Table 21B-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	Holden Seeding	-	1965	2668
Seeding - Aerial Before	Holden Seeding	-	1965	2668
Mechanical - Bullhog	BLM Project	-	2006	1500

Table 21B-09.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Holden Seeding			Aerial	Aug 1965	2668
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		7.87	5.84

Wildlife Habitat and Vegetation History**Table 21B-09.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
1991	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
1998	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
2003	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I transitioning to Phase II
2008	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Annual Grass/Stansbury Cliffrose	Phase I
2017	Mountain Big Sagebrush/Annual Grass/Stansbury Cliffrose	Phase I
2022	Mountain Big Sagebrush/Annual Grass/Stansbury Cliffrose	Phase I

Site Notes

No Notes

Soils**Table 21B-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.9	56.7	25.7	17.6	2.9	18.4	163.2	0.7	08/24/1998

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1985 through the 2008 sample year, the native species Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated the browse component of this site. After 2008, Stansbury cliffrose exhibited decreases in cover and increased mortality, resulting in mountain big sagebrush becoming the dominant browse species (Table 21B-09.12, Table 21B-09.13). The understory has been dominated by the introduced annual and perennial grasses cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*) (Table 21B-09.10). Forbs have remained depleted and dominated by introduced annuals -- primarily redstem stork's bill (*Erodium cicutarium*) (Table 21B-09.7, Table 21B-09.11). Utah juniper (*Juniperus osteosperma*) has been present in all sample years, although cover and density have decreased following a 2006 bullhog treatment (Table 21B-09.12, Table 21B-09.14); it is likely that tree cover will increase in future samplings barring a disturbance event. In addition, the high cover of annual grass puts the site at risk for wildfire, which could affect the species composition and resiliency of the site.

Trend Summary Tables

Table 21B-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	13.8	6.0	1.5	-	-	0.5
2003	20.5	0.1	2.3	21.9	0.1	5.9
2008	13.1	0.2	-	21.6	0.5	-
2012	10.6	0.2	0.1	17.8	0.3	0.6
2017	13.0	0.2	0.0	22.8	-	-
2022	19.6	0.1	-	27.7	-	1.1

Table 21B-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	456	156	301	4	15.1	2.6	1.6	0.2
2003	399	256	285	31	18.9	8.3	11.9	0.1
2008	411	212	251	-	17.5	5.0	7.5	-
2012	409	300	234	11	21.8	15.2	3.1	0.0
2017	454	304	373	13	39.4	15.4	14.4	0.2
2022	367	372	291	9	16.0	29.8	10.8	0.0

Table 21B-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.0	2.2	56.2	1.1	10.5	47.8
2003	16.0	1.5	34.4	0.2	10.4	57.8
2008	4.8	0.0	48.7	0.4	8.2	49.4
2012	4.5	0.3	63.9	0.1	9.2	56.4
2017	4.5	0.6	57.1	0.6	9.3	67.8
2022	6.1	0.4	51.0	0.5	8.9	67.2

Table 21B-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1998	1	57	-	-	22
2003	5	58	1	-	22
2008	1	73	6	1	40
2012	-	45	-	-	10
2017	2	37	2	-	35
2022	2	37	1	-	5
Year	Days Use Per Acre (ha)				
1998	12.3 (30.5)	155.5 (384.0)	-	-	-
2003	2.2 (5.4)	167.5 (413.8)	-	-	-
2008	10.9 (26.9)	140.1 (346.0)	13.4 (33.1)	-	-
2012	15.3 (37.7)	54.3 (134.1)	0.7 (1.7)	-	-
2017	0.7 (1.8)	39.6 (97.7)	-	-	-
2022	0.7 (1.8)	85.1 (210.2)	-	-	-

Table 21B-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency								
1998	27	-	456	-	37	3	109	-	-
2003	8	-	399	3	-	33	227	-	-
2008	27	-	411	-	12	27	188	-	-
2012	26	-	409	-	10	50	260	-	-
2017	37	-	454	-	6	178	200	-	3
2022	26	5	365	-	7	274	263	6	-
year	Average Cover (%)								
1998	0.9	-	15.1	-	0.4	0.0	1.3	-	-
2003	0.3	-	18.9	0.1	-	0.8	7.1	-	-
2008	0.5	-	17.5	-	0.1	1.0	3.4	-	-
2012	1.3	-	21.8	-	0.0	3.4	10.4	-	-
2017	1.5	-	39.4	-	0.1	7.9	5.9	-	0.0
2022	1.2	0.0	16.0	-	0.2	15.8	12.2	0.4	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium ^a (goosefoot)	Claytonia perfoliata ssp. perfoliata (miner's lettuce)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Lactuca serriola ^{ai} (prickly lettuce)	Lepidium ^a (pepperweed)	Microsteris gracilis ^a (slender phlox)	Phacelia ^a (phacelia)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1998	-	-	-	4	-	28	2	-	40	-	-	28	-	255	18	-	-
2003	5	-	5	-	6	9	-	19	34	1	-	261	3	-	5	8	3
2008	-	-	44	-	-	12	-	-	15	-	-	219	24	5	2	-	-
2012	1	-	130	-	3	1	-	-	99	4	47	104	10	4	28	-	5
2017	6	40	236	-	6	3	-	-	87	3	16	326	1	-	4	-	-
2022	2	3	104	-	3	5	-	-	7	-	22	248	1	-	-	-	3
year	Average Cover (%)																
1998	-	-	-	0.1	-	0.1	0.0	-	0.2	-	-	0.1	-	1.1	0.1	-	-
2003	0.0	-	0.2	-	0.0	0.0	-	0.1	0.1	0.0	-	11.5	0.0	-	0.0	0.0	0.0
2008	-	-	0.8	-	-	0.0	-	-	0.1	-	-	6.4	0.3	0.0	0.0	-	-
2012	0.0	-	0.3	-	0.0	0.0	-	-	0.3	0.0	0.1	2.1	0.0	0.0	0.1	-	0.0
2017	0.2	0.8	3.3	-	0.0	0.0	-	-	0.3	0.0	0.1	9.8	0.0	-	0.0	-	-
2022	0.0	0.0	0.3	-	0.0	0.0	-	-	0.0	-	0.1	8.7	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene amirrhina ^a (sleepy silene)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1998	-	2	0
2003	-	-	1
2008	-	-	-
2012	61	2	2
2017	10	8	2
2022	87	9	1
year	Average Cover (%)		
1998	-	0.0	0.0
2003	-	-	0.0
2008	-	-	-
2012	0.1	0.0	0.0
2017	0.0	0.1	0.0
2022	1.1	0.5	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia stansburiana ^p (Stansbury cliffrose)
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	10	0.4	-	5.9	0.1	11.5
2008	7.8	0.8	0.5	-	-	13
2012	12.2	1.5	0.3	0.6	-	4.1
2017	16.3	0.7	-	-	-	5.8
2022	20.5	0.8	-	1.1	-	6.4
year	Quadrat Cover (%)					
1998	9.5	0.6	6.0	1.5	0.0	3.7
2003	13.7	0.0	0.1	2.3	0.0	6.8
2008	7.3	1.0	0.2	-	-	4.8
2012	8.1	1.4	0.2	0.1	-	1.1
2017	11.2	0.7	0.2	0.0	-	1.2
2022	15.7	1.0	0.1	0.0	-	2.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	2400	60	26	52	23	23	0	6	78/98
2003	1900	-	3	72	25	35	25	13	72/92
2008	1440	-	3	54	43	18	3	18	80/93
2012	1340	40	15	63	22	45	12	25	68/103
2017	1560	2540	5	81	14	54	9	27	81/118
2022	1360	-	4	71	25	4	2	34	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
1998	140	-	0	86	14	14	0	0	72/103
2003	80	-	0	75	25	0	50	0	52/69
2008	60	-	0	100	0	0	0	0	66/95
2012	60	-	0	100	0	0	0	0	74/150
2017	80	-	0	50	50	0	0	25	72/108
2022	60	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	5720	-	2	98	0	0	0	0	34/43
2003	220	-	9	91	0	0	0	0	12/13
2008	300	20	7	93	0	0	0	0	29/44
2012	340	-	24	77	0	0	0	0	25/46
2017	220	-	36	64	0	0	0	0	23/30
2022	60	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
1998	60	-	0	100	0	0	0	0	- / -
2003	60	-	0	100	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
1998	20	20	0	100	0	0	0	0	17/30
2003	20	-	0	100	0	0	0	0	15/36
2008	-	-	-	-	-	-	-	-	18/46
2012	20	-	0	100	0	0	0	0	15/45
2017	-	-	-	-	-	-	-	-	18/39
2022	-	-	-	-	-	-	-	-	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
1998	180	-	0	100	0	33	0	0	214/236
2003	160	-	0	100	0	25	50	0	209/228
2008	480	-	50	33	17	13	17	4	226/242
2012	40	-	0	100	0	50	0	50	231/327
2017	100	-	0	80	20	60	20	20	248/199
2022	60	-	0	67	33	0	0	33	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

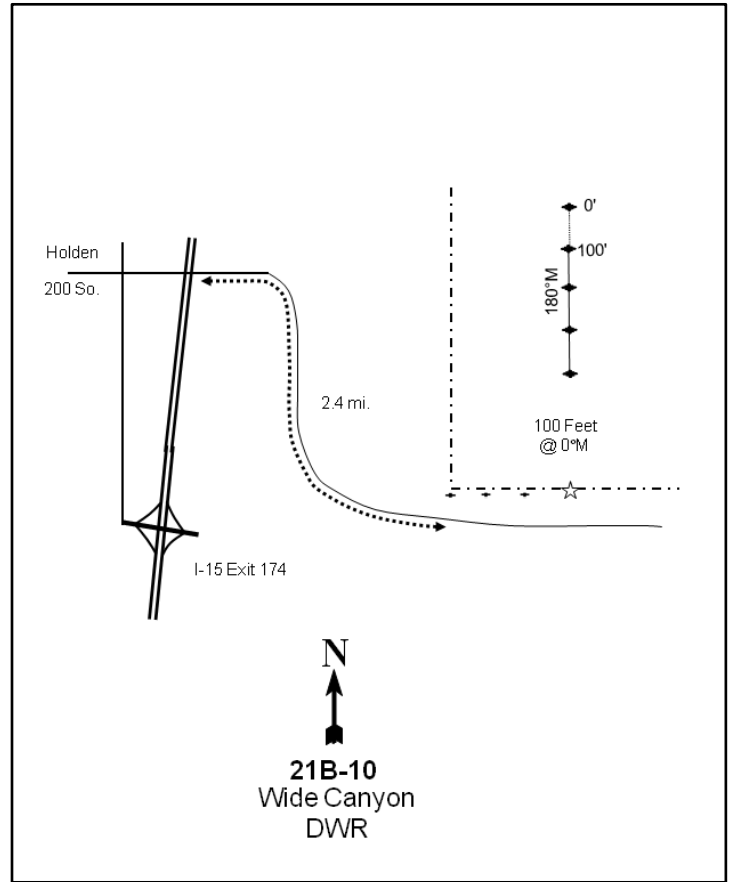
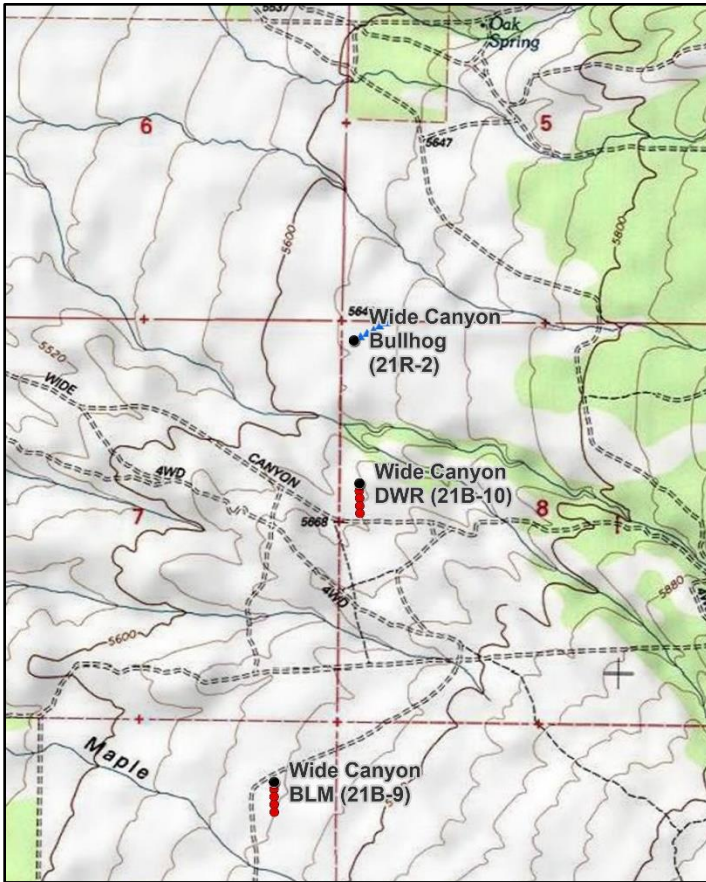
Table 21B-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	25	-	-	-	-	-	18.5
2003	22	-	-	-	-	-	16.5
2008	9	-	33	17	17	33	14.5
2012	9	-	33	17	17	33	16.3
2017	14	-	25	25	38	13	11.9
2022	14	-	-	38	25	38	17.8
Purshia stansburiana (Stansbury cliffrose)							
2003	152	-	-	-	-	-	10.4

Table 21B-09.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	18.2	10.2	8.9	5.2	-11.3	0.3	0.0	31.5	Very Poor
2003	30.0	11.4	0.7	15.0	-14.2	0.3	0.0	43.2	Poor
2008	30.0	7.3	15.0	8.1	-13.1	0.0	0.0	47.3	Poor
2012	23.3	10.4	5.1	23.5	-16.3	0.1	0.0	46.1	Poor
2017	30.0	10.0	1.8	15.0	-20.0	0.4	0.0	37.1	Poor
2022	30.0	7.1	1.6	27.8	-12.0	0.1	0.0	54.7	Fair

WIDE CANYON DWR - STUDY NO. 21B-10



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Coffee Peak NW; Township 20S, Range 3W, Section 08
NAD 83 UTM ZONE 12, 394374 East 4327487 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

7070
165° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From the south Holden exit off of I-15, travel north into town and turn right at 200 South. Follow the road for one block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass, go 2.4 miles east to the fence corner of DWR property. Not including the corner posts, count to the third wooden post to the east. Measure 100 feet due north of the fence to the 400-foot stake. The 0-foot stake is a 2-foot-tall fencepost marked with browse tag #7070. The other stakes are rebar.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,640ft (1,719m)
Aspect	Southwest
Slope	5-10%
Sample Dates	08/24/1998, 06/19/2003, 07/21/2008, 08/06/2012, 06/19/2017, 06/02/2022

Table 21B-10.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1998-2003	-
Chaining - Chain Unknown	-	-	1950s	-
Seeding - Seed Unknown	-	-	1950s	-

Wildlife Habitat and Vegetation History**Table 21B-10.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose/Bitterbrush	Phase I
1991	Mountain Big Sagebrush/Stansbury Cliffrose/Bitterbrush	Phase I
1998	Mountain Big Sagebrush	Phase I transitioning to Phase II
2003	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2008	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2012	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2022	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils**Table 21B-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	36.7	34.7	28.6	2.6	9.7	92.8	1.0	08/24/1998

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This site is currently in a degraded Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecological state, with the high cover of the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) threatening the plant community. The community was previously a mixed Wyoming big sagebrush, antelope bitterbrush (*Purshia tridentata*), and Stansbury cliffrose (*P. stansburiana*) community which has since transitioned to a system primarily dominated by sagebrush (Table 21B-10.12, Table 21B-10.13). The herbaceous understory is robust, but the dominant species are introduced perennial grasses (Table 21B-10.10). Forbs are not diverse and cover is scant (Table 21B-10.11). A chaining between 1998 and 2003 (Table 21B-10.1) reduced the cover of Utah juniper (*Juniperus osteosperma*), but cover has increased in recent sample years (Table 21B-10.12).

Trend Summary Tables

Table 21B-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	10.4	1.2	3.9	-	-	0.2
2003	10.2	0.0	2.0	11.2	-	3.3
2008	7.5	0.2	3.1	11.0	0.4	5.5
2012	6.0	0.1	0.7	10.3	0.4	7.8
2017	10.5	0.4	1.9	11.4	0.6	6.8
2022	8.4	0.7	3.9	10.5	0.3	10.1

Table 21B-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	45	450	64	9	0.2	20.7	0.3	0.2
2003	58	436	78	14	0.8	30.2	0.4	0.2
2008	89	450	47	5	1.1	34.1	0.2	0.1
2012	31	472	55	7	0.1	59.9	0.3	0.0
2017	9	459	159	9	0.7	55.1	1.9	0.2
2022	9	456	186	35	0.0	42.6	1.9	0.3

Table 21B-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	10.8	1.2	56.8	2.5	2.7	42.8
2003	11.6	1.2	47.9	4.4	3.0	48.3
2008	6.9	1.1	48.9	1.1	1.3	52.7
2012	3.5	1.5	65.8	1.0	1.8	67.4
2017	10.1	2.6	44.0	0.9	1.3	63.5
2022	13.0	3.0	47.9	0.9	3.0	53.5

Table 21B-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	4	-	51	1	51
2003	1	-	45	1	23
2008	3	-	71	-	32
2012	-	-	28	3	7
2017	1	-	31	2	9
2022	1	-	43	7	4
Year	Days Use Per Acre (ha)				
1998	8.7 (21.5)	-	122.6 (302.9)	3.4 (8.3)	-
2003	2.9 (7.2)	26.2 (64.6)*	164.9 (407.2)	-	-
2008	8.7 (21.5)	-	297.5 (734.9)	-	-
2012	8.0 (19.7)	-	41.5 (102.6)	-	-
2017	-	-	20.8 (51.3)	2.0 (5.0)	-
2022	1.5 (3.6)	-	68.3 (168.8)	10.7 (26.5)	-

*Pellets per acre (ha)

Table 21B-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Agropyron cristatum ⁱ (crested wheatgrass)	19	-	45	11	183	150	198	173	
Bromus arvensis ^{ai} (field brome)	1	-	58	5	319	120	215	105	
Bromus tectorum ^{ai} (cheatgrass)	7	-	89	5	353	36	252	146	
Elymus elymoides (squirreltail)	2	-	31	1	392	32	118	272	
Poa bulbosa ⁱ (bulbous bluegrass)	1	2	7	-	372	27	122	237	
Poa secunda (Sandberg bluegrass)	-	-	9	-	347	35	204	169	
Pseudoroegneria spicata (bluebunch wheatgrass)	Average Cover (%)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	1998	0.3	-	0.2	0.0	5.0	4.0	6.1	5.3
	2003	0.1	-	0.8	0.0	13.5	2.4	9.5	4.6
	2008	0.2	-	1.1	0.1	15.6	0.3	12.0	5.9
	2012	0.0	-	0.1	0.0	38.9	0.5	5.7	14.8
	2017	0.1	0.0	0.7	-	31.9	1.1	8.5	13.5
	2022	-	-	0.0	-	22.9	0.8	11.5	7.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	-	50	-	3	-	-	9	11	-	-	-	-	-	3	6	-
Alyssum alyssoides ^{ai} (pale madwort)	-	-	25	2	2	-	0	29	24	-	5	-	-	-	11	3	-
Alyssum desertorum ^{ai} (desert madwort)	-	-	42	1	-	-	3	-	2	-	-	-	-	-	7	1	-
Astragalus (milkvetch)	-	-	46	-	3	-	-	-	-	-	2	-	1	-	-	1	-
Astragalus calycosus (Torrey's milkvetch)	-	81	54	-	-	1	0	-	35	3	4	-	-	-	5	2	-
Astragalus lentiginosus (freckled milkvetch)	5	78	73	-	3	-	21	-	19	-	16	14	6	2	-	-	2
Calochortus nuttallii (sego lily)	Average Cover (%)																
Ceratocephala testiculata ^{ai} (curveseed butterwort)	1998	-	-	0.2	-	0.0	-	-	0.0	0.0	-	-	-	-	0.0	0.2	-
Collinsia parviflora ^a (maiden blue eyed Mary)	2003	-	-	0.1	0.0	0.0	-	0.0	0.1	0.2	-	0.0	-	-	0.0	0.1	-
Crepis acuminata (tapertip hawksbeard)	2008	-	-	0.2	0.0	-	0.0	-	0.0	-	-	-	-	-	0.0	0.0	-
Descurainia pinnata ^a (western tansymustard)	2012	-	-	0.2	0.0	-	-	-	-	-	0.0	-	0.0	-	-	0.0	-
Draba ^a (draba)	2017	-	81	0.1	-	-	0.0	-	0.3	0.0	0.0	-	-	-	0.0	0.0	-
Erodium cicutarium ^{ai} (redstem stork's bill)	2022	0.0	0.7	0.3	-	0.0	-	0.1	-	0.2	-	0.1	0.0	0.2	0.0	0.0	0.1
Lactuca serriola ^{ai} (prickly lettuce)																	
Microsteris gracilis ^a (slender phlox)																	
Petrorhiza pumila (rock goldenrod)																	
Phacelia hastata (silverleaf phacelia)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
Silene antirrhina ^a (sleepy silene)					
Streptanthus cordatus (heartleaf twistflower)					
Townsendia (Townsend daisy)					
Tragopogon dubius ^{ai} (yellow salsify)					
Zigadenus paniculatus (foothill deathcamas)					
year	Nested Frequency				
1998	-	-	-	0	-
2003	3	3	-	-	4
2008	-	-	-	-	-
2012	4	-	-	3	3
2017	25	-	1	-	3
2022	61	-	-	3	6
year	Average Cover (%)				
1998	-	-	-	0.0	-
2003	0.0	0.0	-	-	0.0
2008	-	-	-	-	-
2012	0.0	-	-	0.0	0.0
2017	0.6	-	0.0	-	0.1
2022	0.4	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)							
Gutierrezia sarothrae (broom snakeweed)							
Juniperus osteosperma ⁱ (Utah juniper)							
Linanthus pungens (granite prickly phlox)							
Opuntia polyacantha (plains pricklypear)							
Purshia stansburiana ^p (Stansbury cliffrose)							
Purshia tridentata ^p (antelope bitterbrush)							
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	6.2	-	3.3	-	-	2.7	2.3
2008	6.5	0.4	5.5	0	-	2.4	2.1
2012	7.3	0.4	7.8	-	-	2.8	0.2
2017	7.9	0.6	6.8	-	-	1.5	2
2022	7.7	0.3	10.1	-	-	2.2	0.6
year	Quadrat Cover (%)						
1998	8.9	1.2	3.9	0.0	-	1.5	-
2003	5.0	0.0	2.0	-	0.0	2.7	2.5
2008	4.0	0.2	3.1	0.0	-	1.9	1.6
2012	4.5	0.1	0.7	-	-	1.0	0.6
2017	7.3	0.3	1.9	-	0.0	0.4	2.8
2022	6.6	0.7	3.9	-	-	1.1	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	2180	-	1	42	57	40	5	20	72/89
2003	1080	-	0	48	52	41	15	20	80/87
2008	920	-	2	44	54	33	9	46	81/99
2012	760	-	3	63	34	53	40	42	81/127
2017	660	80	6	46	49	24	15	42	76/120
2022	900	720	29	53	18	20	0	20	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	58/56
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	40/85
2017	-	-	-	-	-	-	-	-	63/92
2022	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1998	20	-	0	0	100	0	100	0	42/120
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	35/55
2012	-	-	-	-	-	-	-	-	59/78
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	1960	20	6	93	1	0	0	0	28/29
2003	100	-	20	60	20	0	0	0	24/17
2008	360	60	0	100	0	0	0	0	21/30
2012	200	-	10	90	0	0	0	80	21/33
2017	320	-	56	44	0	0	0	0	25/36
2022	200	460	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	100	20	20	60	20	0	0	0	- / -
2003	60	20	100	0	0	0	0	0	- / -
2008	80	-	75	25	0	0	0	0	- / -
2012	40	-	50	50	0	0	0	0	- / -
2017	40	-	0	100	0	0	0	0	- / -
2022	80	-	0	100	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
1998	140	-	0	0	100	0	0	86	20/24
2003	80	-	0	100	0	0	0	0	5/9
2008	120	-	17	67	17	0	0	100	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia polyacantha -- (plains pricklypear)									
1998	20	-	0	100	0	0	0	0	14/23
2003	20	-	0	100	0	0	0	0	22/33
2008	20	-	0	0	100	0	0	0	15/35
2012	20	-	0	100	0	0	0	0	15/39
2017	40	-	0	100	0	0	0	100	16/39
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
1998	260	20	8	62	31	39	15	0	143/164
2003	200	-	0	90	10	20	60	10	124/128
2008	240	-	17	42	42	0	8	8	154/153
2012	140	-	29	71	0	57	14	14	180/187
2017	60	20	33	0	67	67	0	33	167/162
2022	80	60	25	50	25	0	25	25	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1998	40	-	0	0	100	50	50	0	76/104
2003	140	-	14	86	0	29	43	0	100/163
2008	100	-	0	100	0	20	40	0	88/127
2012	120	-	0	100	0	33	67	50	83/129
2017	80	-	25	75	0	0	100	0	98/167
2022	60	-	0	100	0	33	67	0	-/-
Ribes^p -- (currant)									
1998	20	-	0	100	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

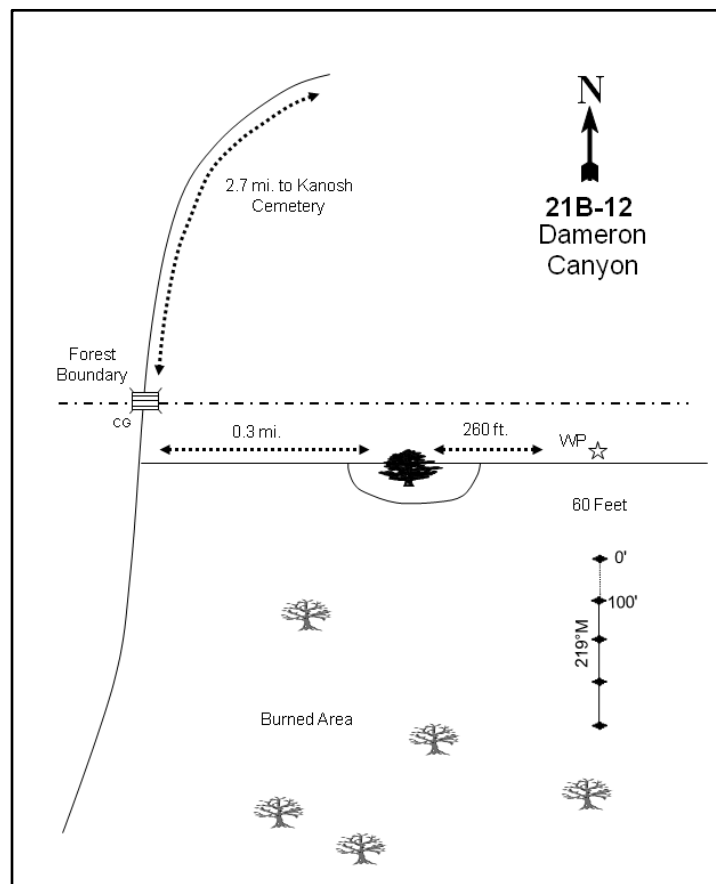
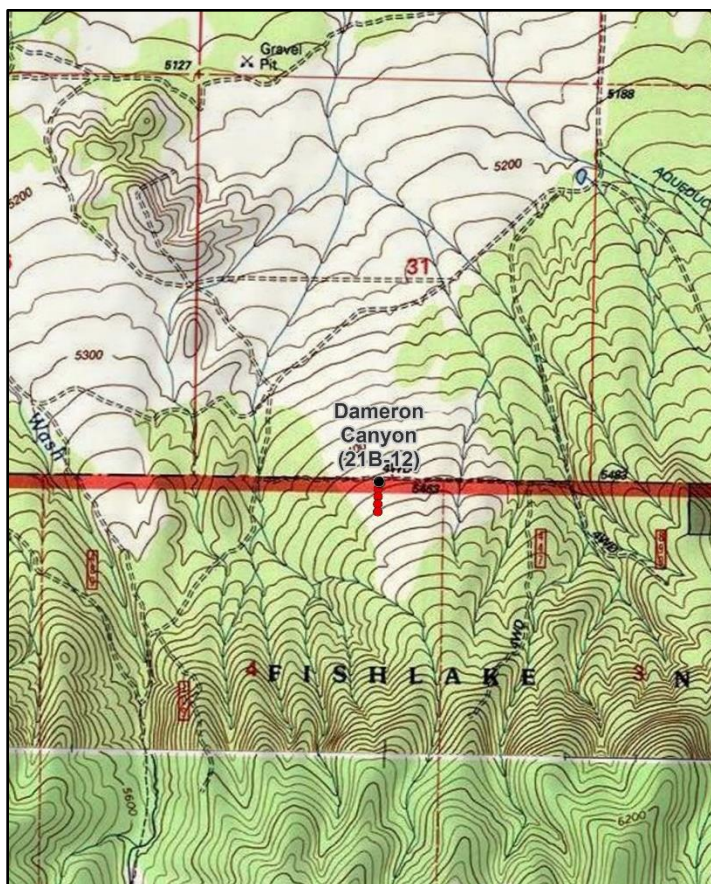
Table 21B-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	74	-	-	-	-	-	11.9
2003	51	-	42	26	16	16	10.0
2008	50	-	31	31	13	25	11.9
2012	66	-	37	37	11	16	8.6
2017	60	-	5	42	47	5	16.3
2022	67	5	-	32	47	16	15.6

Table 21B-10.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	13.4	-1.0	0.9	30.0	-0.1	0.4	0.0	43.6	Poor
2003	15.3	5.7	1.5	30.0	-0.6	0.5	0.0	52.2	Fair
2008	14.9	2.6	2.5	30.0	-0.9	0.1	0.0	49.3	Poor-Fair
2012	13.6	7.7	4.8	30.0	0.0	0.1	0.0	56.2	Fair
2017	15.1	2.3	6.5	30.0	-0.5	0.4	0.0	53.8	Fair
2022	13.8	9.5	13.2	30.0	0.0	0.6	0.0	67.1	Good

DAMERON CANYON - STUDY NO. 21B-12

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Kanosh SW; Township 24S, Range 5W, Section 04
NAD 83 UTM ZONE 12, 373188 East 4291142 North

Transect Information

Browse Tag # (0' Stake)	137
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar, Belt 4: 1ft; Line 1: 98ft Long

Directions to Site

Travel south on the main road from Kanosh. Continue south on a dirt road towards the cemetery when the main road turns west towards the interstate. From the northeast corner of the Kanosh cemetery (1/2 mile south of town), follow the main road south for 2.7 miles to a cattle guard. Just past the cattle guard, turn left and continue 0.3 miles along the fence to a faint road. Where the road rejoins, continue for 260 feet to a witness post on the left (north) side of the road by the fence. The witness post is a steel rebar stake that is 2 1/2 feet tall. From the witness post, walk 60 feet due south to the start of the frequency baseline. The 0-foot baseline stake is tagged with browse tag #7109. The 100-foot end of the baseline is marked by a stake that is actually only 98 feet south, so the tape must be adjusted at that end.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Kanosh Allotment
Elevation	5,450ft (1,661m)
Aspect	West-Northwest
Slope	3-5%
Sample Dates	06/16/1998, 06/12/2003, 08/27/2008, 08/14/2012, 06/22/2017, 05/25/2022

Table 21B-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Dry Wash	-	July 2008	324
Chaining - Chain Unknown	-	-	1985	-

Wildlife Habitat and Vegetation History**Table 21B-12.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Bitterbrush	Phase I
1991	Mountain Big Sagebrush/Bitterbrush	Phase I
1998	Mountain Big Sagebrush/Bitterbrush	Phase I
2003	Mountain Big Sagebrush/Bitterbrush	Phase I
2008	Barren/Fire	No Encroachment
2012	Smooth Sumac	No Encroachment
2017	Smooth Sumac	No Encroachment
2022	Smooth Sumac	No Encroachment

Site Notes

In 2022, jagged chickweed (*Holosteum umbellatum*) and sleepy silene (*Silene antirrhina*) were both present on site. However, both species were called jagged chickweed due to difficulties differentiating between the two.

Soils**Table 21B-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.8	44.7	30.7	24.6	3.7	11.9	163.2	0.9	06/16/1998

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This site was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) dominated plant community upon study establishment in 1985. After the Dry Wash Fire in 2008 (Table 21B-12.1), the site transitioned to a smooth sumac (*Rhus glabra*) dominated community (Photos, Table 21B-12.12, Table 21B-12.13). The study site has produced copious amounts of cheatgrass (*Bromus tectorum*) following the burn that threaten the integrity of the ecosystem and can cause a dramatic shift in the fire regime (Table 21B-12.10). The forb component is sparse and not diverse, with most cover being contributed by introduced annual forbs, namely desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 21B-12.7, Table 21B-12.11). Without a disturbance to shift the trajectory of the community, it is unlikely that this site will change from the current degraded ecological state.

Trend Summary Tables

Table 21B-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	19.4	9.7	1.6	-	-	-
2003	23.6	1.7	0.8	29.6	1.1	2.4
2008	-	-	-	-	-	-
2012	3.0	0.1	-	3.8	0.4	-
2017	22.0	2.6	-	29.3	3.6	-
2022	17.0	3.7	-	26.9	4.9	-

Table 21B-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	439	198	306	34	19.9	5.0	3.5	0.1
2003	304	367	80	-	8.3	14.6	0.6	-
2008	3	48	-	-	0.0	0.5	-	-
2012	464	41	399	28	35.9	0.5	21.2	2.2
2017	495	83	323	14	63.6	3.0	9.5	0.0
2022	476	278	428	78	27.7	12.1	6.1	0.4

Table 21B-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.6	1.3	60.8	6.5	5.4	49.5
2003	15.5	0.0	40.1	6.2	4.4	51.5
2008	45.8	0.0	10.9	41.9	9.5	0.5
2012	4.6	0.6	40.0	14.5	6.8	58.9
2017	5.6	0.3	53.2	6.4	6.1	75.7
2022	8.9	1.4	50.7	5.1	6.2	54.7

Table 21B-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	47	2	8
2003	1	37	-	1
2008	-	5	-	-
2012	1	3	-	8
2017	-	7	1	8
2022	2	31	-	8
Year	Days Use Per Acre (ha)			
1998	-	150.1 (370.8)	0.7 (1.7)	-
2003	5.1 (12.6)	191.0 (471.8)	-	-
2008	-	-	-	-
2012	4.4 (10.8)	-	-	-
2017	2.9 (7.2)	14.7 (36.4)	0.7 (1.7)	-
2022	2.9 (7.2)	13.4 (33.1)	0.7 (1.7)	-

Table 21B-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Agropyron cristatum ⁱ (crested wheatgrass)	3	-	14	-	432	14	-	185	12	2	-	-
Aristida purpurea (purple threeawn)	-	-	6	-	304	28	9	358	14	-	-	-
Bromus arvensis ^{ai} (field brome)	-	-	-	-	3	-	-	48	-	-	-	-
Bromus briziformis ^{ai} (rattlesnake brome)	-	-	-	12	463	-	10	22	10	-	-	-
Bromus tectorum ^{ai} (cheatgrass)	-	3	37	6	489	-	73	5	7	-	-	-
Elymus elymoides (squirreltail)	-	32	69	6	467	-	242	54	12	-	115	16
Poa bulbosa ⁱ (bulbous bluegrass)	Average Cover (%)											
Poa secunda (Sandberg bluegrass)	0.0	-	0.2	-	19.7	0.3	-	4.4	0.2	0.0	-	-
Pseudoroegneria spicata (bluebunch wheatgrass)	-	-	0.1	-	8.2	0.6	0.2	13.5	0.4	-	-	-
Secale cereale ^{ai} (cereal rye)	-	-	-	-	0.0	-	-	0.5	-	-	-	-
Vulpia myuros ^{ai} (annual fescue)	-	-	-	0.1	35.8	-	0.1	0.2	0.2	-	-	-
Vulpia octoflora ^a (sixweeks fescue)	-	0.0	0.4	0.4	62.8	-	2.4	0.1	0.6	-	-	-
	-	0.3	1.4	0.2	23.7	-	10.2	1.1	0.5	-	2.3	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	1	-	54	8	-	-	3	-	8	43	-	-	-	62	7	-
Allium (onion)	-	-	-	23	-	-	-	-	-	-	19	-	5	-	10	-	8
Alyssum alyssoides ^{ai} (pale madwort)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alyssum desertorum ^{ai} (desert madwort)	-	-	-	169	-	-	2	-	-	-	3	5	-	-	-	2	379
Arabis (rockcress)	-	-	31	190	-	-	-	-	-	5	-	6	4	-	3	1	261
Arenaria serpyllifolia ^{ai} (thymeleaf sandwort)	4	-	86	236	-	1	-	-	2	47	36	-	33	2	77	-	163
Argemone munita (flatbud pricklypoppy)	Average Cover (%)																
Astragalus calycosus (Torrey's milkvetch)	-	0.0	-	0.5	0.0	-	-	0.0	-	0.0	0.1	-	-	-	0.2	0.0	-
Astragalus cibirarius (browse milkvetch)	-	-	-	0.1	-	-	-	-	-	-	0.1	-	0.0	-	0.0	-	0.2
Calochortus nuttallii (sego lily)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ceratocephala testiculata ^{ai} (curvseed butterwort)	-	-	-	1.0	-	-	0.0	-	-	-	0.0	0.0	-	-	-	0.0	20.1
Chamaesyce (sandmat)	-	-	0.2	1.5	-	-	-	-	-	0.0	-	0.0	0.0	-	0.0	0.0	7.7
Collinsia parviflora ^a (maiden blue eyed Mary)	0.0	-	0.2	0.7	-	0.0	-	-	0.0	0.2	0.1	-	0.1	0.0	0.2	-	1.0
Crepis acuminata (tapertip hawksbeard)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Draba ^a (draba)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Epilobium brachycarpum ^a (tall annual willowherb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Erodium cicutarium ^{ai} (redstem stork's bill)	-	-	-	-	-	-	-	-	0.0	0.2	0.1	-	0.1	0.0	0.2	-	1.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Tragopogon dubius ^{ai} (yellow salsify)	Verbena bracteata (bigbract verbena)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency									
1998	259	1	3	10	17	5	3	15	-	-
2003	34	-	-	-	7	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-
2012	1	5	-	-	-	-	-	1	21	-
2017	3	2	-	-	-	-	-	2	-	3
2022	356	1	14	-	-	7	-	106	-	14
year	Average Cover (%)									
1998	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-	-
2003	0.2	-	-	-	0.0	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-
2012	0.0	0.0	-	-	-	-	-	0.0	2.2	-
2017	0.0	0.0	-	-	-	-	-	0.0	-	0.0
2022	3.1	0.0	0.1	-	-	0.0	-	0.7	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)	Rhus glabra ^p (smooth sumac)	Rhus trilobata var. trilobata ^p (skunkbush sumac)	Ribes cereum var. cereum ^p (wax currant)
year	Line Intercept Cover (%)								
1998	-	-	-	-	-	-	-	-	-
2003	19.4	-	1.1	2.4	-	10.2	-	-	-
2008	-	-	-	-	-	-	-	-	-
2012	-	-	0.4	-	0.1	-	3.7	-	-
2017	-	-	3.6	-	-	0.7	28.6	-	-
2022	-	-	4.9	-	-	0.9	26	-	-
year	Quadrat Cover (%)								
1998	13.4	1.0	8.7	1.6	0.3	5.5	-	-	0.1
2003	16.5	-	1.7	0.8	0.1	7.0	-	-	-
2008	-	-	-	-	-	-	-	-	-
2012	-	-	0.1	-	0.0	-	3.0	-	-
2017	-	-	2.6	-	-	0.9	21.1	-	-
2022	-	-	3.7	-	-	0.0	16.4	0.5	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	2840	60	12	70	18	17	1	2	65/79
2003	2560	-	2	74	24	31	9	9	75/92
2012	-	-	-	-	-	-	-	-	22/29
2017	-	-	-	-	-	-	-	-	54/44
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1998	80	-	75	25	0	0	0	0	86/122
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	58/90
2017	160	-	0	100	0	0	0	0	82/122
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	10540	320	9	90	1	0	0	0	22/27
2003	1320	80	2	88	11	0	0	8	22/23
2012	220	160	9	73	18	0	0	9	24/39
2017	1860	60	8	93	0	0	0	0	23/34
2022	1640	260	9	87	5	0	4	4	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1998	20	-	100	0	0	0	0	0	-/-
2003	40	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^P -- (Stansbury cliffrose)									
1998	80	-	25	75	0	100	0	0	215/246
2003	20	-	100	0	0	0	0	0	159/208
2012	20	-	100	0	0	0	100	0	32/89
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
1998	400	40	0	95	5	50	25	0	128/163
2003	360	-	0	83	17	11	67	6	143/179
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	100	0	0	35/81
2022	20	-	0	100	0	100	0	0	-/-
Rhus glabra^P -- (smooth sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	440	20	27	73	0	5	0	0	79/102
2017	3140	-	6	94	0	0	0	1	74/89
2022	3720	20	11	88	1	5	1	1	-/-
Rhus trilobata var. trilobata^P -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	183/244
2003	-	-	-	-	-	-	-	-	147/152
2012	-	-	-	-	-	-	-	-	-/-
2017	60	-	0	100	0	0	0	0	72/69
2022	300	-	0	100	0	0	0	0	-/-
Ribes cereum var. cereum^P -- (wax currant)									
1998	20	-	0	0	100	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Sambucus nigra ssp. cerulea ^p -- (blue elderberry)									
1998	40	-	0	100	0	100	0	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	175/383

t - Tree Species; p - Preferred Browse; i - Introduced Species

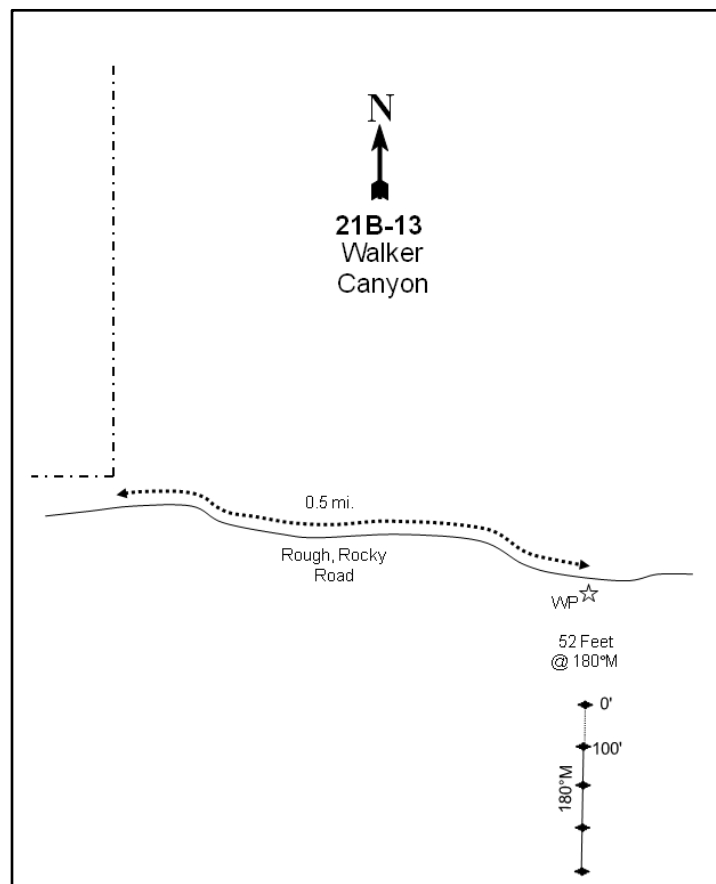
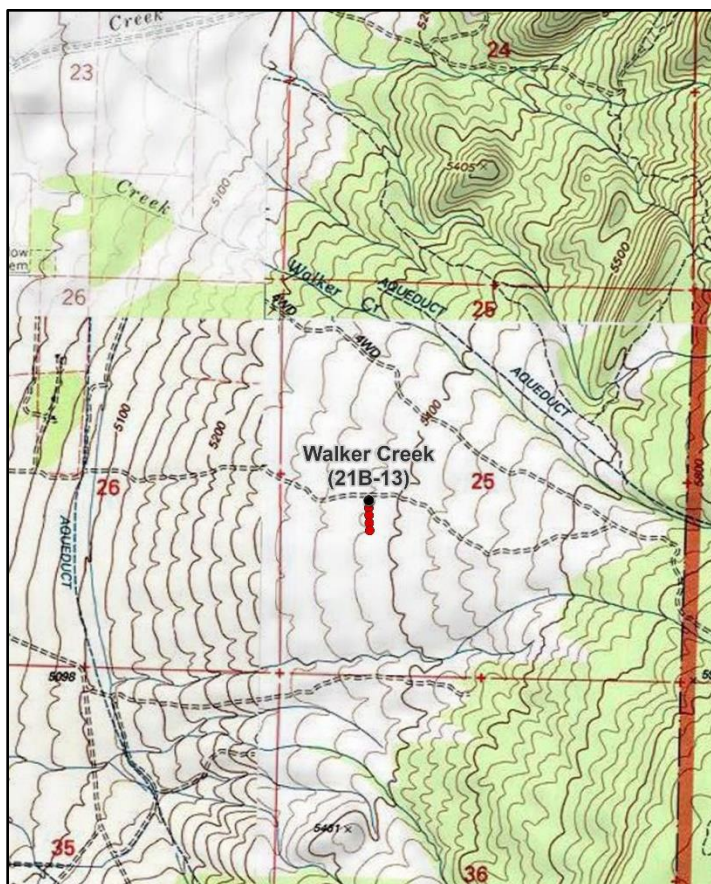
Table 21B-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	1	100	-	-	-	-	3.0
2022	1	-	-	100	-	-	7.0

Table 21B-12.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	25.7	10.7	4.4	9.9	-14.9	0.2	0.0	35.9	Very Poor-Poor
2003	30.0	8.5	0.5	28.9	-6.2	0.0	0.0	61.7	Fair
2008	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	Very Poor
2012	3.9	0.0	0.0	0.8	-20.0	4.4	0.0	-11.0	Very Poor
2017	29.7	15.0	2.8	1.3	-20.0	0.1	0.0	28.8	Very Poor
2022	27.4	14.7	5.2	3.7	-20.0	0.8	0.0	31.8	Very Poor

WALKER CREEK - STUDY NO. 21B-13

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Sunset Peak NW; Township 22S, Range 5W, Section 25
NAD 83 UTM ZONE 12, 381088 East 4303068 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

7074
180° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 2: 3ft, Belt 3: 6ft, Belt 4: 1ft, Belt 5: 6ft

Directions to Site

Travel south from Meadow (southwest of Fillmore) on SR-133 to mile marker 6. Go approximately 0.05 miles further south on SR-133 and turn east onto a gravel road (4400 S). Continue east for 0.8 miles to a junction. Turn right and follow this road (2600 W) for 1 mile around several bends until the main road turns back to the south. Instead of turning south, continue straight east for 0.1 miles to a fork. Keep right at the fork and go 0.15 miles to a concrete aqueduct. Continue on the road 0.25 miles to a fence corner on the left, then travel another 0.5 miles to a cairn on the right side of the road. The 0-foot baseline stake is 51.5 feet south of the rebar and rock cairn. The 0-foot stake is a 2 ½ foot tall rebar tagged #7074.

NOTE: A 4X4 vehicle is advisable for the rough roads.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MEADOW SPRING
Elevation	5,370ft (1,637m)
Aspect	West
Slope	2-5%
Sample Dates	06/23/1998, 06/19/2003, 08/25/2008, 08/15/2012, 06/21/2017, 06/23/2022

Table 21B-13.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed Burn	FFO Meadow Phase 2	3075	March 2016	243
Mechanical - Push	Meadow Creek Seeding	-	1966	270

Wildlife Habitat and Vegetation History**Table 21B-13.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Annual Grass	Phase I
1991	Mountain Big Sagebrush/Annual Grass	Phase I
1998	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2008	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I

Site Notes

A deer carcass was found on the site in 2008.

Soils**Table 21B-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.4	60.0	17.4	22.6	2.5	9.0	108.8	0.9	06/23/1998

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Since this study site was established in 1985, it has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with Stansbury cliffrose (*Purshia stansburiana*) being a significant, but lesser, component of the community (Photos, Table 21B-13.12, Table 21B-13.13). Annual grasses have been very abundant, with the introduced species cheatgrass (*Bromus tectorum*) providing all of the cover in most sample years (Table 21B-13.10). Annual forbs are plentiful, but the diversity and cover of perennial forbs is low (Table 21B-13.11). The site was treated to remove trees in 1966 and again in the 1990s. However, this site is likely to be further infilled by Utah juniper (*Juniperus osteosperma*) in future years without another tree-removing treatment or disturbance (Table 21B-13.1, Table 21B-13.14).

Trend Summary Tables

Table 21B-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	23.2	1.7	4.1	-	-	0.4
2003	22.2	0.3	6.7	25.7	0.7	8.5
2008	15.5	0.3	2.6	26.5	0.8	7.0
2012	18.1	0.4	6.3	32.4	0.4	7.6
2017	20.3	0.0	3.3	25.5	0.3	9.8
2022	17.8	-	2.3	21.0	-	11.6

Table 21B-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	464	157	104	15	32.4	3.7	0.4	0.1
2003	335	298	126	5	10.0	10.4	2.7	0.0
2008	442	236	81	5	13.4	6.4	0.4	0.3
2012	408	278	260	10	20.5	16.1	3.0	0.1
2017	426	216	339	16	38.9	8.8	11.5	0.4
2022	440	232	347	34	29.8	8.8	10.9	0.5

Table 21B-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	3.5	0.7	70.5	3.8	13.3	58.0
2003	5.8	0.0	46.0	2.1	15.5	54.0
2008	0.5	0.1	64.7	0.6	11.0	43.1
2012	1.6	0.1	62.4	0.4	13.2	64.5
2017	7.8	1.0	56.2	1.1	15.0	64.3
2022	8.6	0.6	53.5	0.9	16.1	56.2

Table 21B-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1998	41	-	19
2003	39	-	7
2008	43	-	21
2012	21	4	12
2017	22	3	5
2022	35	1	14
Days Use Per Acre (ha)			
1998	93.8 (231.7)	-	-
2003	124.0 (306.2)	-	-
2008	113.9 (281.4)	-	-
2012	36.2 (89.4)	12.8 (31.5)	-
2017	42.2 (104.3)	4.0 (9.9)	-
2022	60.3 (149.0)	5.3 (13.2)	-

Table 21B-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency									
1998	18	1	-	459	45	-	118	1	-	34
2003	11	12	-	335	42	-	269	5	-	1
2008	13	5	-	442	31	-	210	4	-	-
2012	11	13	-	402	14	4	257	7	19	-
2017	27	38	2	422	22	10	141	5	-	4
2022	17	17	-	440	24	44	179	8	2	-
year	Average Cover (%)									
1998	0.8	0.1	-	31.9	0.7	-	2.0	0.0	-	0.5
2003	0.2	0.8	-	10.0	0.9	-	8.3	0.1	-	0.0
2008	0.5	0.6	-	13.4	0.7	-	4.7	0.1	-	-
2012	0.5	1.1	-	19.7	0.2	0.1	13.7	0.5	0.7	-
2017	0.7	1.2	0.0	38.9	0.7	0.2	5.6	0.4	-	0.0
2022	0.2	0.8	-	29.8	0.2	1.8	5.7	0.1	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Convolvulus arvensis ⁿⁱ (field bindweed)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum cernuum ^a (nodding buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium boreale (northern bedstraw)	Helianthus annuus ⁿ (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency																
1998	-	2	-	19	26	-	15	-	-	1	-	-	20	2	41	8	-
2003	-	2	-	10	50	-	-	-	3	37	-	-	32	-	5	-	-
2008	-	27	-	-	5	-	-	-	-	52	-	-	-	-	-	-	-
2012	-	137	-	-	71	-	3	-	-	-	-	-	155	-	15	1	5
2017	-	302	-	3	89	1	-	4	9	78	10	3	11	2	6	-	2
2022	4	290	3	10	103	-	22	3	16	115	6	-	167	1	2	8	1
year	Average Cover (%)																
1998	-	0.0	-	0.1	0.1	-	0.0	-	-	0.0	-	-	0.1	0.0	0.1	0.1	-
2003	-	0.0	-	0.0	1.5	-	-	-	0.1	0.9	-	-	0.1	-	0.0	-	-
2008	-	0.1	-	-	0.0	-	-	-	-	0.3	-	-	-	-	-	-	-
2012	-	1.3	-	-	0.2	-	0.0	-	-	-	-	-	1.4	-	0.0	0.0	0.0
2017	-	8.5	-	0.0	0.6	0.0	-	0.0	0.1	2.3	0.2	0.0	0.1	0.0	0.0	-	0.0
2022	0.0	5.6	0.0	0.0	0.8	-	0.1	0.0	0.4	3.5	0.2	-	0.5	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Zigadenus paniculatus (foothill deathcamas)
year	Nested
1998	7
2003	5
2008	5
2012	9
2017	5
2022	17
year	Average Cover (%)
1998	0.1
2003	0.0
2008	0.3
2012	0.1
2017	0.1
2022	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ephedra nevadensis ^p (Nevada jointfir)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia stansburiana ^p (Stansbury cliffrose)
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	19.6	-	0.7	8.5	-	6.1
2008	20.1	-	0.8	7	-	6.4
2012	19.8	-	0.4	7.6	-	12.6
2017	16.8	-	0.3	9.8	-	8.7
2022	15.7	-	-	11.6	-	5.3
year	Quadrat Cover (%)					
1998	15.9	-	1.4	4.1	0.3	7.3
2003	18.8	-	0.3	6.7	-	3.4
2008	12.0	-	0.3	2.6	-	3.5
2012	9.8	0.4	0.4	6.3	-	7.9
2017	12.5	-	0.0	3.3	-	7.8
2022	12.3	-	-	2.3	-	5.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	2560	-	2	77	22	2	0	7	74/96
2003	2060	-	0	68	32	36	4	11	78/103
2008	2060	20	2	50	49	17	24	13	76/112
2012	1820	20	11	71	18	21	22	18	83/121
2017	1860	60	4	68	28	32	10	33	71/117
2022	1960	-	4	41	55	12	17	54	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	2080	80	16	82	2	0	0	2	20/27
2003	260	-	0	100	0	0	0	0	24/29
2008	500	-	0	92	8	0	0	4	26/36
2012	240	80	33	67	0	0	0	92	26/39
2017	120	-	0	100	0	0	0	0	24/30
2022	40	-	0	100	0	0	0	0	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
1998	80	-	50	50	0	0	0	0	- / -
2003	100	-	40	60	0	0	0	0	- / -
2008	100	-	20	80	0	0	0	20	- / -
2012	80	20	50	50	0	0	0	0	- / -
2017	60	-	0	100	0	0	0	0	- / -
2022	80	-	50	50	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1998	40	-	0	100	0	0	0	0	19/44
2003	-	-	-	-	-	-	-	-	16/47
2008	20	-	0	100	0	0	0	0	15/54
2012	-	-	-	-	-	-	-	-	4/11
2017	-	-	-	-	-	-	-	-	16/13
2022	20	-	0	100	0	0	0	0	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
1998	580	40	7	90	3	69	0	0	157/163
2003	540	20	7	48	44	19	52	4	151/177
2008	540	-	4	74	22	52	26	7	165/159
2012	600	-	10	73	17	50	17	23	179/168
2017	540	-	4	63	33	37	15	26	178/158
2022	420	-	5	33	62	33	38	71	- / -
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	140/249
2008	-	-	-	-	-	-	-	-	147/155
2012	-	-	-	-	-	-	-	-	125/279
2017	-	-	-	-	-	-	-	-	145/224

t - Tree Species; p - Preferred Browse; i - Introduced Species

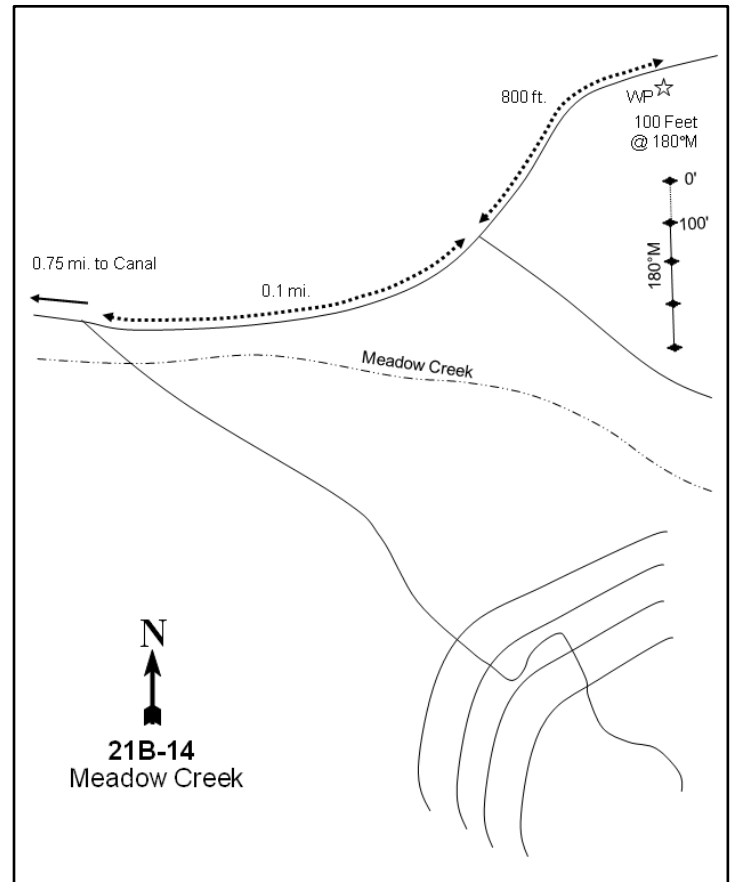
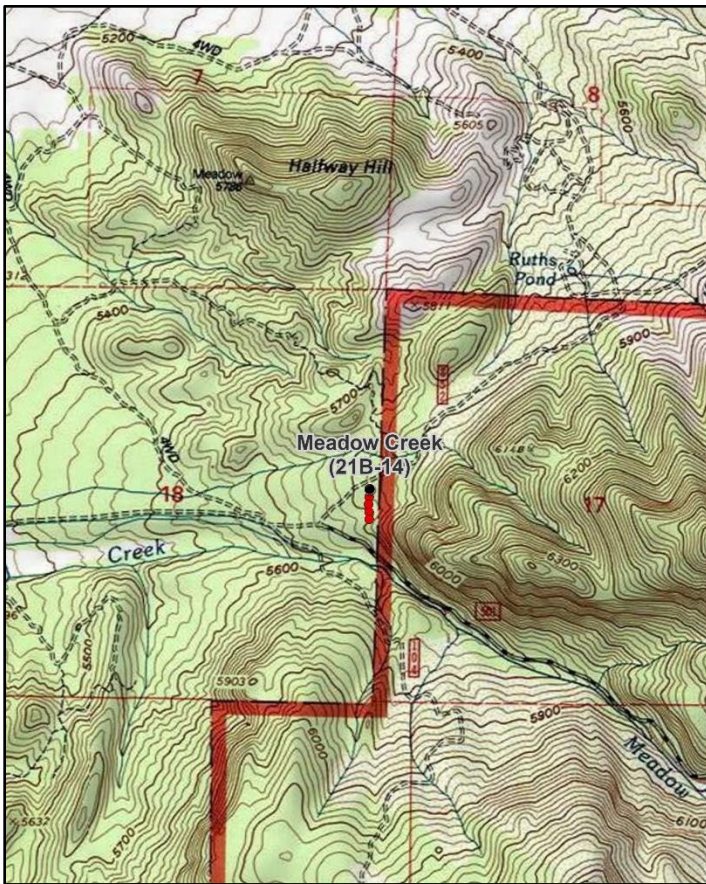
Table 21B-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	104	-	-	-	-	-	9.6
2003	102	-	22	39	6	33	11.0
2008	83	-	39	44	17	-	19.4
2012	98	6	-	53	18	24	11.1
2017	24	22	11	-	56	11	23.2
2022	47	-	44	19	-	38	11.8

Table 21B-13.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	30.0	10.2	1.6	7.4	-20.0	0.3	0.0	29.5	Very Poor
2003	30.0	4.5	0.9	20.8	-7.5	0.0	0.0	48.8	Poor-Fair
2008	30.0	2.4	1.2	12.9	-10.1	0.6	0.0	37.0	Very Poor-Poor
2012	30.0	9.8	5.3	30.0	-15.4	0.2	0.0	59.9	Fair
2017	30.0	6.1	2.0	17.3	-20.0	0.7	-2.0	34.1	Very Poor-Poor
2022	27.6	-2.0	2.1	14.0	-20.0	1.0	0.0	22.7	Very Poor

MEADOW CREEK - STUDY NO. 21B-14

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Fillmore SW; Township 22S, Range 4W, Section 18
NAD 83 UTM ZONE 12, 383982 East 4306364 North

Transect Information

Browse Tag # (0' Stake)	7110
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the corner of 100 North and 200 East in Meadow, travel 0.5 miles north to Meadow Creek Road. Turn right and go 2.75 miles east. Drive across the canal and continue for 0.75 miles to a fork in the road. Turn left and go 0.1 miles to another fork. Turn left and drive for about 0.15 miles (800 feet) to a rebar witness post on the right (south) side of the road; the baseline starts 100 feet south of the witness post. The 0-foot baseline stake is a rebar with browse tag #7110 attached.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MEADOW SPRING
Elevation	5,720ft (1,743m)
Aspect	Southwest
Slope	8-10%
Sample Dates	06/23/1998, 06/19/2003, 08/25/2008, 08/15/2012, 06/21/2017, 06/23/2022

Table 21B-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Meadow Creek Fire Rehabilitation and Stabilization Project	5148	November 2019-January 2020	1444
Seeding - Aerial After	Meadow Creek Fire Rehabilitation and Stabilization Project	5148	January 2020-June 2021	1444
Chaining - Two-Way Unknown	Meadow Creek Seeding	-	1966	1770
Seeding - Aerial Before	Meadow Creek Seeding	-	1966	1770
Seeding - Dribbler/Broadcast Before	Meadow Creek Seeding	-	1966	1770

Table 21B-14.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Meadow Seeding			Aerial	Sep 1966	1770
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		5.08	4.27
F	Astragalus cicer	Cicer Milkvetch		0.06	0.00
F	Balsamorhiza sagittata	Arrowleaf Balsamroot		0.03	0.00
F	Hedysarum boreale ssp. boreale var. boreale	Utah Sweetvetch		0.03	0.00
F	Medicago sativa	Alfalfa	Nomad	0.48	0.00
F	Melilotus officinalis	Yellow Sweetclover		1.27	0.00
F	Sanguisorba minor	Small Burnet		0.06	0.00
S	Artemisia tridentata	Big Sagebrush		0.06	0.00

Mix Name			Application Type	Application Date	Acres
Meadow Seeding			Dribbler	Sep 1966	1770
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Amelanchier utahensis	Utah Serviceberry		0.06	0.00
S	Atriplex canescens	Fourwing Saltbush		0.11	0.00
S	Cercocarpus ledifolius	Curleaf Mountain Mahogany		0.06	0.00
S	Ephedra viridis	Green Ephedra		0.06	0.00
S	Purshia stansburiana	Cliffrose		0.06	0.00
S	Purshia tridentata	Bitterbrush		0.17	0.00

Wildlife Habitat and Vegetation History**Table 21B-14.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2003	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2008	Juniper/Mountain Big Sagebrush	Phase II
2012	Juniper/Mountain Big Sagebrush	Phase II
2017	Juniper	Phase II
2022	Juniper	Phase II

Site Notes

No Notes

Soils**Table 21B-14.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.3	58.0	17.4	24.6	2.4	7.6	118.4	0.8	06/23/1998

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 1985, it was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community in Phase I of encroachment by Utah juniper (*Juniperus osteosperma*). Over the study years, this site has transitioned into a juniper-dominated ecosystem with sagebrush cover decreasing significantly; in 2008 the site was determined to be in Phase II of woodland succession (Table 21B-14.4, Table 21B-14.12). The herbaceous understory is fairly sparse, with a majority of the cover coming from perennial grasses (Table 21B-14.7, Table 21B-14.10). Forbs are moderately diverse, but limited in total cover (Table 21B-14.11). It is likely that this site will continue to transition into a Phase III woodland, with the shrub and herbaceous components fading from the system and tree dominance becoming complete.

Trend Summary Tables**Table 21B-14.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	14.6	0.0	12.0	-	-	1.4
2003	9.5	-	14.8	10.8	-	24.3
2008	5.1	0.3	17.5	8.0	0.2	32.3
2012	4.8	0.1	22.0	8.7	-	35.6
2017	5.3	0.1	22.4	7.2	-	34.3
2022	3.3	-	20.0	10.5	-	39.1

Table 21B-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	225	233	292	4	2.7	10.9	2.5	0.2
2003	158	237	200	17	1.4	5.7	1.2	0.0
2008	227	211	289	25	1.9	6.0	1.1	0.1
2012	213	260	313	16	3.1	11.8	4.1	0.1
2017	126	246	389	35	1.0	9.9	6.5	0.1
2022	209	242	367	15	4.3	9.5	6.8	0.1

Table 21B-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	18.1	3.3	55.2	6.0	5.4	42.4
2003	26.8	0.8	49.3	2.2	4.3	35.4
2008	16.8	1.8	61.1	3.7	5.3	32.9
2012	13.6	3.0	59.8	3.4	3.7	43.8
2017	20.5	6.2	53.4	4.1	4.6	39.9
2022	24.8	5.2	52.7	2.0	4.8	38.0

Table 21B-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rabbit
	Quadrat Frequency			
1998	1	-	21	43
2003	3	-	16	11
2008	3	-	34	31
2012	1	-	15	21
2017	1	-	8	15
2022	-	-	16	25
Year	Days Use Per Acre (ha)			
1998	8.0 (19.7)	-	55.6 (137.4)	-
2003	3.6 (9.0)	-	71.1 (175.5)	-
2008	-	8.7 (21.5)*	119.3 (294.6)	-
2012	-	-	45.6 (112.6)	-
2017	-	-	61.7 (152.3)	-
2022	0.7 (1.8)	-	87.8 (216.8)	-

*Pellets per acre (ha)

Table 21B-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency										
1998	170	7	220	5	-	-	1	32	72	-	13
2003	101	5	152	7	3	4	2	95	65	3	-
2008	122	18	216	1	0	-	-	69	59	-	-
2012	116	13	211	-	-	8	-	135	83	13	-
2017	133	10	124	6	-	74	-	48	45	-	-
2022	51	8	205	-	-	63	-	97	94	11	-
year	Average Cover (%)										
1998	7.9	0.0	2.6	0.2	-	-	0.0	0.4	2.4	-	0.1
2003	2.7	0.0	1.3	0.0	0.1	0.1	0.0	1.1	1.7	0.0	-
2008	4.0	0.5	1.4	0.0	0.0	-	-	0.4	1.6	-	-
2012	5.8	0.1	3.0	-	-	0.2	-	3.7	2.1	0.1	-
2017	4.9	0.0	0.9	0.0	-	2.4	-	0.6	1.9	-	-
2022	1.5	0.0	4.2	-	-	2.3	-	2.1	3.6	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Galium ^a (bedstraw)	Holosteum umbellatum ^{ai} (jagged chickweed)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Plantago patagonica ^a (woolly plantain)
year	Nested Frequency																
1998	-	-	266	2	0	-	-	2	-	3	5	15	-	13	24	-	3
2003	11	-	173	1	-	2	-	34	22	-	3	15	7	31	5	3	-
2008	-	-	282	14	-	-	-	24	3	-	-	-	-	-	16	9	1
2012	-	-	304	5	2	3	-	16	7	3	-	-	-	70	14	3	-
2017	-	6	378	6	0	7	2	46	48	1	-	13	7	55	9	19	-
2022	-	40	359	9	-	-	-	51	18	-	-	30	-	58	9	6	-
year	Average Cover (%)																
1998	-	-	2.4	0.0	0.0	-	-	0.0	-	0.2	0.0	0.0	-	0.0	0.0	-	0.0
2003	0.0	-	0.8	0.0	-	0.0	-	0.1	0.0	-	0.0	0.0	0.0	0.1	0.0	0.0	-
2008	-	-	1.0	0.1	-	-	-	0.0	0.0	-	-	-	-	-	0.0	0.1	0.0
2012	-	-	3.7	0.1	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.3	0.0	0.0	-
2017	-	0.1	5.6	0.1	0.0	0.0	0.0	0.3	0.1	0.0	-	0.0	0.0	0.4	0.0	0.1	-
2022	-	0.2	5.9	0.1	-	-	-	0.1	0.1	-	-	0.1	-	0.4	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Streptanthus cordatus (heartleaf twistflower)	unknown annual forb ^a (unknown forb)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1998	-	-	-	-
2003	-	-	-	-
2008	3	-	-	2
2012	-	1	-	-
2017	5	-	2	0
2022	-	-	-	-
year	Average Cover (%)			
1998	-	-	-	-
2003	-	-	-	-
2008	0.0	-	-	0.0
2012	-	0.0	-	-
2017	0.0	-	0.0	0.0
2022	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)												
	year	1998	2003	2008	2012	2017	2022	1998	2003	2008	2012	2017	2022
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	-	5.1	3.6	3.7	2.2	1.7	-	-	0	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	-	-	0	0.2	-	-	-	0.0	0.0	0.1	-	-	-
Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	-	-	0.1	-	-	-	-	1.7	0.0	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	-	-	-	0.0	-	0.2	-	-	-
Juniperus osteosperma ⁱ (Utah juniper)	-	-	24.3	32.3	35.6	34.3	39.1	12.0	14.8	17.4	22.0	22.4	20.0
Opuntia (pricklypear)	-	-	0	0	-	-	-	-	0.0	0.0	-	-	-
Pinus edulis ⁱ (twoneedle pinyon)	-	-	-	-	-	-	-	-	-	0.1	-	0.0	-
Purshia stansburiana ^p (Stansbury cliffrose)	-	-	2.7	1.1	1.4	0.9	0.4	1.6	0.6	0.4	0.4	0.6	0.1
Purshia tridentata ^p (antelope bitterbrush)	-	-	0.2	0.9	1.3	0.9	1.1	0.1	0.6	0.5	0.4	0.4	0.1
Quercus gambelii ^p (Gambel oak)	-	-	2.7	2.4	2.3	3.2	7.3	2.4	1.1	1.2	1.5	2.5	1.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	173/137
2012	-	-	-	-	-	-	-	-	94/79
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	1640	20	5	77	18	15	2	16	62/95
2003	1300	-	0	43	57	14	2	28	56/81
2008	980	20	2	51	47	27	0	35	54/83
2012	1340	-	0	48	52	46	8	42	62/90
2017	920	-	2	20	78	17	4	74	57/76
2022	640	-	0	16	84	22	0	81	-/-
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	224/210
2008	-	-	-	-	-	-	-	-	172/204
2012	-	-	-	-	-	-	-	-	144/146
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	25/30
2008	20	-	0	0	100	0	0	100	- / -
2012	20	-	0	0	100	0	0	100	31/56
2017	20	-	0	100	0	0	0	0	45/38
2022	20	-	0	0	100	0	0	100	- / -
Ephedra viridis^p -- (mormon tea)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	66/181
2008	-	-	-	-	-	-	-	-	107/201
2012	-	-	-	-	-	-	-	-	95/156
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
1998	160	-	13	13	75	0	0	38	69/88
2003	20	-	0	0	100	0	0	100	57/34
2008	-	-	-	-	-	-	-	-	40/61
2012	-	-	-	-	-	-	-	-	24/19
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	260	20	8	92	0	0	0	0	15/16
2003	20	-	0	100	0	0	0	0	19/27
2008	80	-	0	75	25	0	0	25	21/31
2012	-	-	-	-	-	-	-	-	15/15
2017	-	-	-	-	-	-	-	-	26/36
2022	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1998	380	-	21	79	0	0	0	0	- / -
2003	500	-	0	100	0	0	0	0	- / -
2008	500	-	16	84	0	0	0	0	- / -
2012	500	-	20	76	4	0	0	16	- / -
2017	380	-	5	95	0	0	0	0	- / -
2022	460	-	9	87	4	0	0	4	- / -
Opuntia -- (pricklypear)									
1998	20	-	0	100	0	0	0	0	20/33
2003	20	-	0	100	0	0	0	0	19/36
2008	20	-	0	100	0	0	0	0	18/40
2012	20	-	0	100	0	0	0	100	14/33
2017	40	-	0	100	0	0	0	0	18/41
2022	-	-	-	-	-	-	-	-	-/-
Pinus edulis¹ -- (twoneedle pinyon)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	20	0	0	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
1998	40	-	50	50	0	0	0	0	148/169
2003	120	-	0	17	83	17	0	17	158/145
2008	20	-	0	0	100	100	0	0	163/151
2012	60	-	0	67	33	33	0	33	134/151
2017	40	-	0	50	50	100	0	50	171/180
2022	20	-	0	0	100	100	0	100	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1998	60	-	0	100	0	100	0	0	88/147
2003	100	-	0	100	0	0	0	0	83/107
2008	40	-	0	100	0	0	100	0	84/158
2012	40	-	0	100	0	100	0	0	82/174
2017	60	-	0	100	0	100	0	0	95/139
2022	120	-	0	0	100	0	100	67	- / -
Quercus gambelii^p -- (Gambel oak)									
1998	780	-	46	54	0	0	0	0	108/74
2003	800	-	23	73	5	0	0	0	89/65
2008	1040	-	56	29	15	14	0	2	103/86
2012	640	80	53	47	0	0	0	9	69/69
2017	880	-	0	100	0	0	0	0	84/59
2022	1140	-	93	7	0	93	5	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

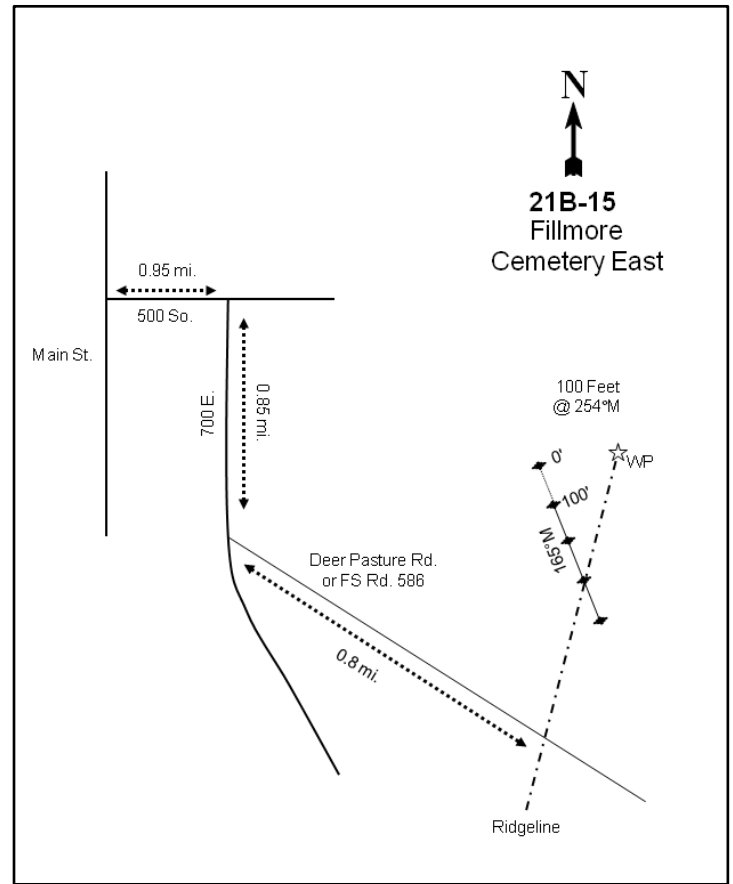
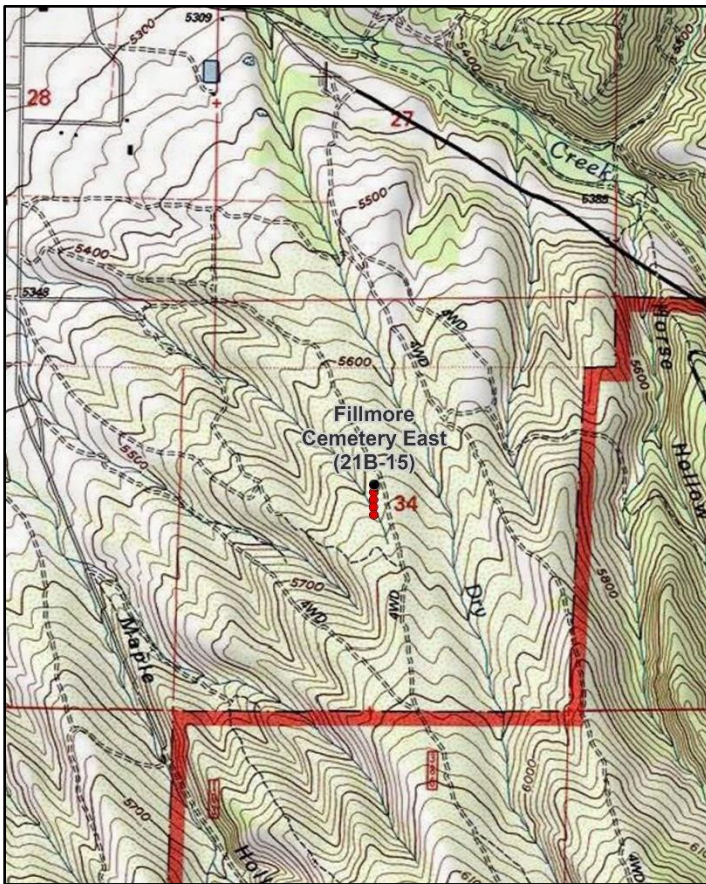
Table 21B-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	367	-	-	-	-	-	9.2
2003	354	-	5	50	35	10	16.3
2008	369	-	5	25	30	40	16.1
2012	358	-	-	15	35	50	14.8
2017	304	-	-	30	55	15	17.3
2022	410	-	-	40	45	15	23.8

Table 21B-14.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	18.1	9.1	8.7	21.7	-2.0	0.4	0.0	56.0	Fair
2003	13.6	0.0	2.8	11.3	-1.0	0.1	0.0	26.8	Very Poor
2008	9.9	3.2	8.8	12.0	-1.4	0.3	0.0	32.7	Very Poor
2012	11.0	6.7	7.0	23.1	-2.3	0.2	0.0	45.7	Poor
2017	8.7	5.9	0.3	15.1	-0.7	0.3	0.0	29.6	Very Poor
2022	11.7	6.6	15.0	14.4	-3.2	0.2	0.0	44.7	Poor

FILLMORE CEMETERY EAST - STUDY NO. 21B-15



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Fillmore NE; Township 21S, Range 4W, Section 34
NAD 83 UTM ZONE 12, 388216 East 4311293 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

119
165° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 2: 6ft

Directions to Site

From 500 South and Main in Fillmore (the bend in the road), go east for 0.95 miles past the LDS Church and the cemetery to an intersection. Turn right (south) and go 0.85 miles to F.S. Road #386. Turn left and follow this road for 0.8 miles to the ridgeline. From the ridgeline, walk north about 1/3 of a mile to a witness post (full-high rebar). The frequency baseline starts 100 feet west (254 degrees magnetic) of the cairn. The 0-foot stake is a rebar tagged #7073.

Site Information

Land Ownership	State
Land Administrator	DWR
Allotment	No data
Elevation	5,720ft (1,743m)
Aspect	Northwest
Slope	5-10%
Sample Dates	06/23/1998, 06/09/2003, 07/22/2008, 08/15/2012, 06/20/2017, 06/22/2022

Table 21B-15.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Plateau	Fillmore WMA Juniper Thinning	408	November-December 2008	156
Chaining - Chain Unknown	-	-	1973	-
Seeding - Seed Unknown	-	-	1973	-
Harrow - One-Way Dixie	Fillmore WMA Juniper Thinning	408	November 2008	156
Seeding - Broadcast Before	Fillmore WMA Juniper Thinning	408	November 2008	156

Table 21B-15.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Fillmore WMA			Broadcast	Nov 2008	315
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Douglas	0.48	0.40
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	0.48	0.42
G	Dactylis glomerata	Orchardgrass	Paiute	0.10	0.09
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.48	0.36
G	Pascopyrum smithii	Western Wheatgrass	Arriba	0.48	0.39
G	Poa secunda	Canby Bluegrass	Canbar	0.10	0.09
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	0.79	0.68
F	Achillea millefolium	Western Yarrow		0.05	0.05
F	Linum lewisii	Lewis Flax	Maple Grove	0.24	0.22
F	Medicago sativa	Alfalfa	Ladak	0.32	0.29
F	Medicago sativa	Alfalfa	Ranger	0.32	0.28
F	Medicago sativa	Alfalfa	Spredor 4	0.32	0.30
F	Onobrychis viciifolia	Sainfoin	Eski	1.90	1.75
F	Sanguisorba minor	Small Burnet	Delar	1.90	1.77
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.48	0.11
S	Purshia stansburiana	Stansbury Cliffrose		0.10	0.06

Wildlife Habitat and Vegetation History

Table 21B-15.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Gambel Oak	Phase I
1991	Mountain Big Sagebrush/Gambel Oak	Phase I
1998	Mountain Big Sagebrush/Gambel Oak	Phase I
2003	Mountain Big Sagebrush/Gambel Oak	Phase I
2008	Mountain Big Sagebrush/Gambel Oak	Phase I
2012	Gambel Oak/Mountain Big Sagebrush	Phase I
2017	Gambel Oak/Mountain Big Sagebrush	Phase I
2022	Gambel Oak/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 21B-15.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8	06/23/1998

Site Potential

1981 - 2010 Average Annual Precipitation 17 inches
 NRCS Ecological Site Mountain Loam (Oak)
 NRCS Ecological Site # R047XA432UT
 States and Transitions No state and transition model is available for this ecological site.

When the site was established in 1985, it was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) dominated plant community. Following a harrow treatment in the fall of 2008, sagebrush cover decreased significantly while oak cover increased (Photos, Table 21B-15.1, Table 21B-15.12). As for the herbaceous understory, the forbs are diverse, but cover is low (Table 21B-15.11). The graminoid component consists mainly of undesirable introduced species. More specifically, the perennial species bulbous bluegrass (*Poa bulbosa*) and annual species cheatgrass (*Bromus tectorum*) are the primary grasses: their presence detracts from the overall ecological health of the site (Table 21B-15.10). There has been some encroachment by Utah juniper (*Juniperus oostesperma*) and the site has been considered to be within Phase I of woodland succession in all sample years (Table 21B-15.4, Table 21B-15.14).

Trend Summary Tables

Table 21B-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	25.3	2.4	-	-	-	-
2003	26.7	0.5	1.2	27.2	0.5	2.7
2008	18.5	0.4	1.6	31.5	0.8	3.7
2012	13.3	0.6	0.8	20.8	1.6	3.1
2017	16.3	5.0	1.9	26.5	7.6	3.3
2022	17.6	0.7	3.6	29.7	0.7	5.0

Table 21B-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	374	159	257	38	6.8	4.5	2.5	0.4
2003	367	214	107	34	10.7	6.9	0.7	0.6
2008	384	214	174	31	10.0	5.7	0.8	0.7
2012	348	302	291	57	7.9	20.1	3.2	0.5
2017	286	329	373	73	10.8	20.2	9.7	1.5
2022	259	390	348	45	4.5	27.4	3.8	0.8

Table 21B-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	15.6	1.1	54.0	16.2	6.2	39.4
2003	16.6	0.6	43.2	9.5	5.7	44.4
2008	4.3	1.3	50.7	9.2	5.8	41.6
2012	8.0	0.0	54.8	8.9	5.4	50.4
2017	15.1	0.3	44.0	6.2	4.8	54.5
2022	20.9	0.3	51.6	10.7	5.4	48.9

Table 21B-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	49	-	1	14
2003	-	35	-	-	6
2008	-	51	3	-	21
2012	-	28	-	-	18
2017	1	24	2	-	27
2022	-	26	-	-	1
Year	Days Use Per Acre (ha)				
1998	0.7 (1.8)	79.8 (197.0)	-	0.6 (1.4)	-
2003	-	61.7 (152.3)	1.3 (3.3)	-	-
2008	-	111.3 (274.8)	0.7 (1.7)	-	-
2012	-	44.2 (109.2)	-	-	-
2017	-	22.1 (54.6)	-	-	-
2022	2.2 (5.4)	110.6 (273.1)	2.7 (6.6)	-	-

Table 21B-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Taeniatherum caput-medusae ^{ai} (medusahead)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency													
1998	-	32	183	-	313	52	32	3	-	61	5	-	-	8
2003	-	26	145	-	350	84	77	-	-	58	12	-	9	-
2008	-	28	172	-	359	80	83	3	-	85	0	-	25	-
2012	3	22	232	-	229	41	238	-	1	45	33	-	-	-
2017	-	38	118	72	202	55	278	-	-	5	47	-	-	7
2022	-	42	186	3	163	49	362	8	-	8	37	14	3	2
year	Average Cover (%)													
1998	-	1.0	3.0	-	3.8	1.4	1.2	0.0	-	0.9	0.0	-	-	0.0
2003	-	1.0	1.0	-	9.6	2.0	2.1	-	-	0.9	0.9	-	0.0	-
2008	-	1.7	2.3	-	7.6	1.1	1.2	0.0	-	1.7	0.0	-	0.1	-
2012	0.2	1.6	3.4	-	4.6	0.6	15.0	-	0.0	1.0	1.5	-	-	-
2017	-	2.1	0.8	2.5	7.3	1.0	14.7	-	-	0.0	2.4	-	-	0.2
2022	-	1.8	1.7	0.0	2.7	1.9	20.4	0.0	-	0.0	3.1	0.1	0.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides ^{ai} (pale madwort)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Asclepias (milkweed)	Astragalus argophyllus (silverleaf milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium calcareum ^a (Cainville thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)
year	Nested Frequency																
1998	-	175	3	8	3	3	-	-	56	16	9	-	1	-	14	46	3
2003	-	95	-	-	-	-	-	-	11	5	6	-	-	-	1	-	-
2008	-	162	-	-	-	2	1	4	3	8	3	1	-	-	3	-	-
2012	-	253	-	-	-	1	-	1	-	84	14	-	2	-	6	4	19
2017	4	335	-	-	0	3	-	11	5	101	25	4	-	2	-	-	19
2022	3	321	-	4	-	8	-	19	9	42	12	3	1	-	-	68	-
year	Average Cover (%)																
1998	-	1.0	0.0	0.2	0.0	0.0	-	-	0.1	0.7	0.0	-	0.0	-	0.0	0.4	0.0
2003	-	0.5	-	-	-	-	-	-	0.0	0.2	0.0	-	-	-	0.0	-	-
2008	-	0.6	-	-	-	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-	-	0.0	-	-
2012	-	1.5	-	-	-	0.0	-	0.0	-	1.5	0.0	-	0.0	-	0.0	0.0	0.0
2017	0.0	6.0	-	-	0.0	0.1	-	0.1	0.0	3.4	0.1	0.0	-	0.0	-	-	0.0
2022	0.0	1.9	-	0.0	-	0.2	-	0.0	0.0	1.7	0.0	0.0	0.0	-	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Galium boreale (northern bedstraw)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lotus utahensis (Utah bird's-foot trefoil)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^{ai} (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Silene antirrhina ^a (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1998	-	4	-	6	0	-	4	6	2	-	29	2	1	-	6
2003	-	8	-	6	6	-	-	-	1	-	3	-	3	-	10
2008	4	-	1	1	5	2	-	-	-	16	-	3	-	-	12
2012	-	29	10	9	3	-	-	1	4	14	10	4	-	3	6
2017	3	29	-	2	2	4	-	2	3	10	-	5	-	23	11
2022	5	-	-	1	2	1	-	-	1	-	-	3	-	3	2
year	Average Cover (%)														
1998	-	0.0	-	0.0	0.0	-	0.0	0.0	0.0	-	0.1	0.0	0.0	-	0.1
2003	-	0.3	-	0.0	0.2	-	-	-	0.0	-	0.0	-	0.0	-	0.1
2008	0.0	-	0.0	0.1	0.2	0.0	-	-	-	0.0	-	0.1	-	-	0.3
2012	-	0.1	0.0	0.0	0.1	-	-	0.0	0.0	0.1	0.0	0.2	-	0.0	0.0
2017	0.0	0.3	-	0.0	0.3	0.3	-	0.0	0.0	0.0	-	0.1	-	0.2	0.4
2022	0.0	-	-	0.0	0.4	0.0	-	-	0.0	-	-	0.0	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia (pricklypear)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	13.7	0.5	2.7	-	-	6.6	6.9
2008	12.9	0.8	3.7	-	-	8.5	10.1
2012	4.7	1.6	3.1	0	-	4.2	11.9
2017	7.2	7.5	3.3	0.1	-	7.8	11.5
2022	9.2	0.7	5	-	0.9	5.6	14
year	Quadrat Cover (%)						
1998	16.7	2.2	-	0.1	-	6.0	2.7
2003	17.2	0.5	1.2	-	-	5.6	3.8
2008	7.8	0.3	1.6	0.1	-	5.8	4.8
2012	3.5	0.5	0.8	0.0	-	3.1	6.7
2017	4.0	4.9	1.9	0.0	0.4	4.9	7.1
2022	7.0	0.7	3.6	0.0	0.1	5.3	5.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	2680	80	7	60	33	15	0	7	66/93
2003	2440	-	0	59	41	16	7	19	66/87
2008	2420	-	6	34	60	41	5	28	71/93
2012	3120	400	64	30	6	10	4	6	46/72
2017	2940	-	21	71	8	24	12	10	37/52
2022	2940	20	9	84	8	33	9	16	- / -
Ceanothus fendleri -- (Fendler's ceanothus)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	42/141
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	66/58
2017	-	-	-	-	-	-	-	-	51/72
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	66/113
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	- / -
2022	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	5100	60	13	88	0	0	0	0	18/23
2003	980	-	6	90	4	0	0	2	18/22
2008	1000	80	12	78	10	2	0	8	20/34
2012	1440	380	21	74	6	0	0	3	21/36
2017	5100	-	11	88	2	0	0	2	25/37
2022	800	20	3	98	0	0	0	30	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	20	0	0	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	- / -
2017	60	-	67	0	33	0	0	33	- / -
2022	40	-	50	50	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1998	40	-	0	100	0	0	0	0	18/41
2003	40	-	0	100	0	0	0	0	16/48
2008	60	-	0	100	0	0	0	33	16/58
2012	80	-	25	75	0	0	0	0	13/45
2017	100	-	0	100	0	0	0	20	13/25
2022	40	-	0	100	0	0	0	0	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	80	-	0	100	0	100	0	0	136/164
2022	60	-	0	100	0	67	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1998	360	-	17	83	0	67	17	0	53/132
2003	340	-	0	100	0	0	100	0	60/206
2008	360	-	0	100	0	67	6	6	61/166
2012	460	-	0	91	9	78	0	9	46/135
2017	320	-	6	94	0	75	19	0	50/159
2022	360	-	0	89	11	11	89	11	- / -
Quercus gambelii^P -- (Gambel oak)									
1998	1500	180	47	53	0	0	0	0	144/94
2003	2280	60	34	54	11	10	1	5	91/73
2008	3780	80	26	69	5	5	0	5	113/120
2012	2500	20	36	63	1	8	0	1	74/66
2017	3360	-	5	89	7	23	10	7	87/84
2022	3440	800	34	61	6	10	5	14	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata ^p -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	173/479

t - Tree Species; p - Preferred Browse; i - Introduced Species

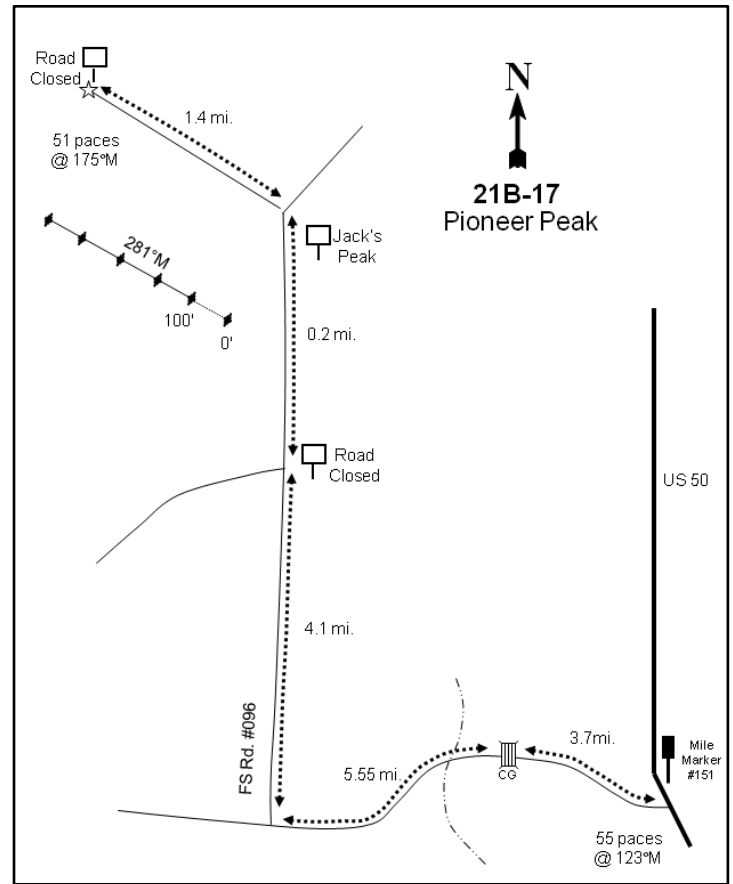
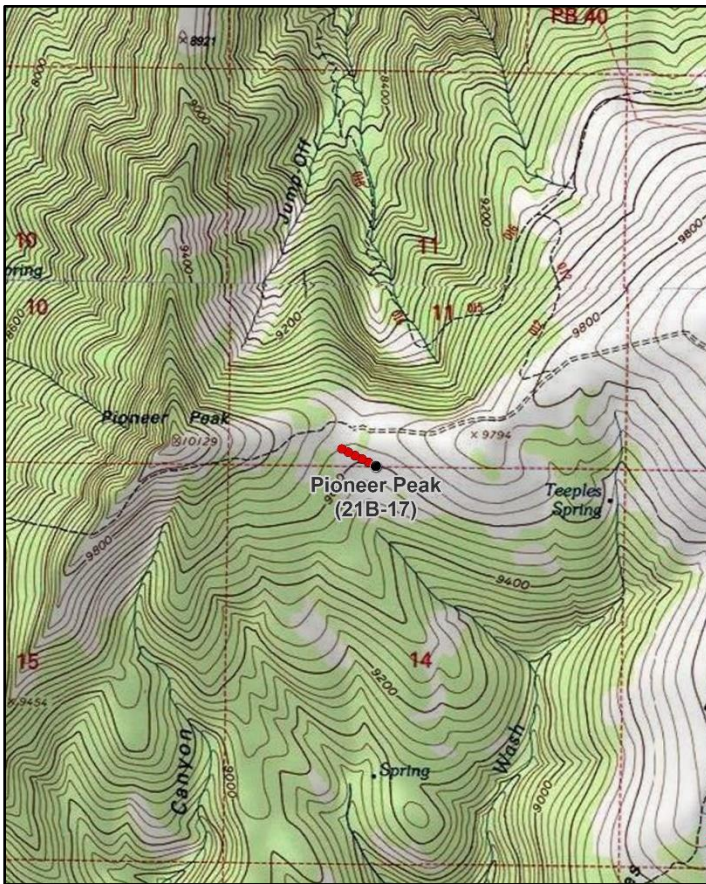
Table 21B-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	2	-	-	-	-	-	23.0
2008	5	-	-	20	-	80	17.6
2012	6	-	-	20	20	60	32.8
2017	6	-	-	40	60	-	23.6
2022	5	-	-	20	20	60	36.4

Table 21B-15.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	30.0	8.5	6.6	6.6	-5.1	0.9	0.0	47.6	Poor
2003	30.0	7.9	4.3	9.6	-8.0	1.2	0.0	45.1	Poor
2008	30.0	7.1	5.3	9.1	-7.5	1.4	0.0	45.4	Poor
2012	24.1	13.9	15.0	10.2	-5.9	0.9	0.0	58.1	Fair
2017	30.0	13.5	4.8	11.0	-8.1	3.0	0.0	54.3	Poor-Fair
2022	30.0	12.9	9.3	13.9	-3.3	1.6	-2.0	62.3	Fair

PIONEER PEAK - STUDY NO. 21B-17



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 11
NAD 83 UTM ZONE 12, 399200 East 4316684 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
281° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Rebar

Directions to Site

From Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Drive 0.2 miles to Jack's Peak. From here, turn left and drive for 1.4 miles to the end of the road and a "road closed" sign. From this sign, walk 51 paces at 175 degrees magnetic to the 500-foot stake. The 0-foot stake is 500 feet away at 101 degrees magnetic, next to a big fir tree.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Pioneer Allotment
Elevation	9,600ft (2,926m)
Aspect	South
Slope	15-20%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/05/2017, 08/08/2022

Table 21B-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History**Table 21B-17.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 21B-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment
2022	Subalpine Meadow	No Encroachment

Site Notes

No Notes

Soils**Table 21B-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.0	42.7	26.7	30.6	3.3	18.4	188.8	0.2	08/21/1997

Site Potential

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

When the site was established in 1997, it was a subalpine meadow vegetation type and has remained so through the subsequent sample years. The herbaceous understory is rich and robust with copious amounts of perennial forbs and grasses. The co-dominant grass species are mountain brome (*Bromus marginatus*), intermediate wheatgrass (*Thinopyrum intermedium*), and Letterman's needlegrass (*Achnatherum lettermanii*) (Table 21B-17.7, 21B-17.10). The dominant forbs are western larkspur (*Delphinium occidentale*), bluebells (*Mertensia sp.*), and tuber starwort (*Pseudostellaria jamesiana*) (Table 21B-17.11). Shrubs are not a major vegetation component on this site. Without a disturbance that modifies the ecological system, it is likely that this site will remain in this state in future years.

Trend Summary Tables

Table 21B-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	-	-	-	-	-	-
2003	-	-	-	-	-	-
2012	-	0.0	-	-	-	-
2017	-	-	-	-	-	-
2022	-	0.1	-	-	-	-

Table 21B-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	385	318	310	-	19.6	5.9	12.7
2003	-	358	162	305	-	17.3	2.9	16.6
2012	-	343	245	300	-	15.8	2.9	13.5
2017	-	378	155	365	-	25.7	1.7	31.1
2022	-	353	332	311	-	25.8	9.6	25.6

Table 21B-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	29.7	1.0	29.4	0.4	3.2	50.1
2003	45.4	-	23.3	0.3	3.0	34.9
2012	42.3	0.6	37.3	0.2	2.2	35.2
2017	43.4	0.0	16.2	0.1	1.8	48.5
2022	42.7	-	25.1	0.3	5.0	46.7

Table 21B-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	9	-	5
2003	6	-	1
2012	3	-	3
2017	3	1	-
2022	4	-	2
Year	Days Use Per Acre (ha)		
1997	-	-	-
2003	18.9 (46.6)	-	2.0 (5.0)
2012	22.5 (55.6)	0.7 (1.7)	19.4 (48.0)
2017	4.4 (10.8)	-	4.7 (11.6)
2022	15.3 (37.7)	7.4 (18.2)	2.0 (5.0)

Table 21B-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Achnatherum lettermanii (Letterman's needlegrass)	125	1	63	173	-	72	7	2	-	201
Achnatherum nelsonii (Columbia needlegrass)	66	104	39	135	-	5	35	3	6	169
Bromus inermis ⁱ (smooth brome)	131	3	57	178	-	-	42	-	4	127
Bromus marginatus (mountain brome)	128	-	29	272	-	8	62	8	8	89
Carex (sedge)	71	17	46	149	5	3	55	11	12	183
Dactylis glomerata ⁱ (orchardgrass)										
Elymus trachycaulus (slender wheatgrass)										
Melica bulbosa (oniongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Thinopyrum intermedium ⁱ (intermediate wheatgrass)										
year	Average Cover (%)									
1997	3.0	0.0	2.2	5.1	-	0.9	0.0	0.0	-	8.4
2003	0.8	4.0	1.7	2.9	-	0.0	1.0	0.0	0.0	6.8
2012	3.8	0.0	1.6	3.7	-	-	0.7	-	0.4	5.6
2017	3.5	-	0.9	11.5	-	0.1	2.5	0.2	0.5	6.5
2022	2.3	0.2	2.6	4.9	0.0	0.0	1.4	0.4	0.4	13.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	1	23	-	16	2	-	-	225	30	25	4	-	-	5	-	121	-
Agoseris aurantiaca (orange agoseris)	13	3	-	24	2	-	-	84	20	-	1	-	-	5	-	117	-
Agoseris glauca (pale agoseris)	11	12	-	15	12	-	-	81	35	-	16	-	-	8	2	74	-
Arabis drummondii (Drummond's rockcress)	14	18	-	12	11	-	4	141	58	9	19	6	-	12	-	3	140
Artemisia dracunculus (tarragon)	9	-	3	13	6	13	-	277	59	10	11	13	35	-	-	64	39
Chenopodium atrovirens ^a (pinyon goosefoot)																	
Claytonia lanceolata (lanceleaf springbeauty)																	
Collomia linearis ^a (tiny trumpet)																	
Delphinium × occidentale (western larkspur)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erigeron eatonii (Eaton's fleabane)																	
Galium bifolium ^a (twinleaf bedstraw)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
Geranium richardsonii (Richardson's geranium)																	
Helianthella uniflora (oneflower helianthella)																	
Heliomeris multiflora var. multiflora (showy goldeneye)																	
Hydrophyllum capitatum (ballhead waterleaf)																	
year	Average Cover (%)																
1997	0.0	0.2	-	0.1	0.0	-	-	2.3	3.7	0.2	0.0	-	-	0.4	-	1.4	-
2003	0.1	0.0	-	0.1	0.7	-	-	0.3	3.5	-	0.0	-	-	0.5	-	3.4	-
2012	0.1	0.3	-	0.1	0.6	-	-	0.3	4.0	-	0.0	-	-	0.4	0.1	0.8	-
2017	0.5	0.1	-	0.1	1.1	-	0.0	1.3	6.7	0.0	0.6	0.0	-	0.5	-	0.0	5.3
2022	0.2	-	0.0	0.7	0.4	0.1	-	5.3	6.0	0.4	0.1	0.1	0.5	-	-	2.8	2.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																
Lathyrus lanszwertii (Nevada pea)	-	46	79	18	5	-	-	184	121	13	-	156	12	2	50	8	
Lupinus argenteus (silvery lupine)	-	49	72	10	3	4	-	108	38	-	4	209	19	6	46	-	
Madia glomerata ^a (mountain tarweed)	-	63	138	16	14	1	-	118	58	-	-	199	8	2	60	-	
Mertensia (bluebells)	16	82	6	30	15	-	1	-	191	6	-	190	27	1	57	9	
Orthocarpus tolmiei ^a (Tolmie's owl's-clover)	10	61	62	50	18	19	10	169	60	-	3	166	12	0	24	-	
Penstemon (beardtongue)	Average Cover (%)																
Phlox longifolia (longleaf phlox)	1997	-	2.0	2.2	0.4	0.2	-	-	1.0	1.0	0.2	-	2.5	0.1	0.0	0.6	0.1
Polygonum douglasii ^a (Douglas' knotweed)	2003	-	3.1	1.3	0.3	0.0	0.0	-	1.3	0.1	-	0.1	3.7	0.3	0.1	0.7	-
Pseudostellaria jamesiana (tuber starwort)	2012	-	3.1	2.0	0.6	0.1	0.0	-	0.5	0.5	-	-	2.3	0.0	0.0	0.7	-
Ranunculus (buttercup)	2017	0.8	1.7	0.0	4.2	0.3	-	0.0	-	4.5	0.0	-	3.5	0.4	0.0	1.0	0.0
Senecio (ragwort)	2022	0.1	3.5	1.0	3.1	0.7	0.1	0.1	1.6	0.8	-	0.0	4.8	0.1	0.0	0.2	-
Symphitrichum ascendens (western aster)																	
Taraxacum officinale (common dandelion)																	
Tragopogon dubius ^{ai} (yellow salsify)																	
Vicia americana (American vetch)																	
Viola (violet)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line	
Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	1997	-
	2003	-
	2012	-
	2017	-
	2022	-
	year	Quadrat Cover (%)
1997	-	
2003	-	
2012	0.0	
2017	-	
2022	0.1	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

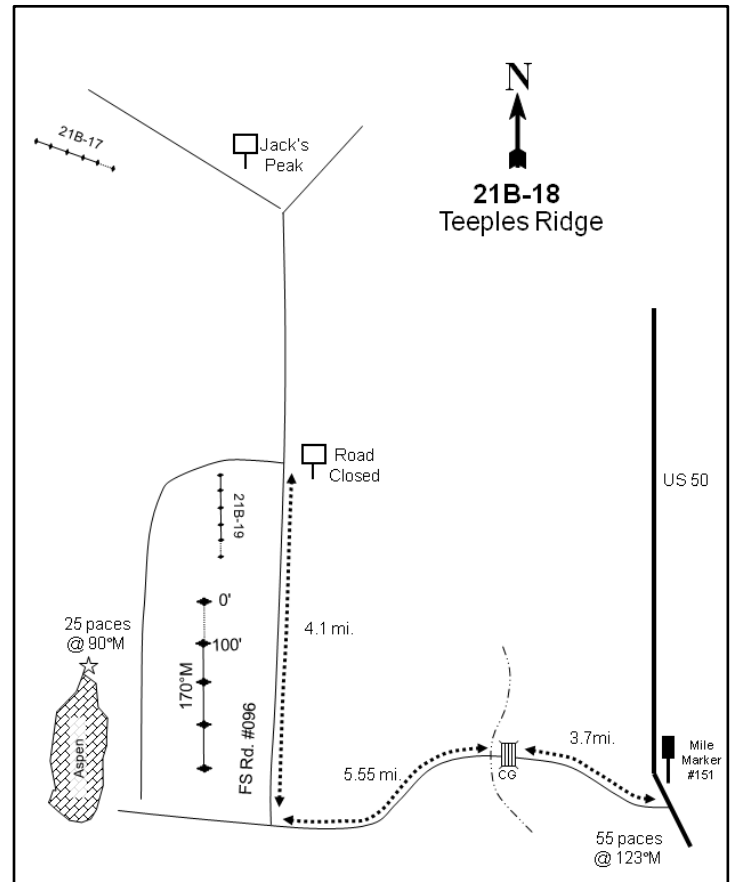
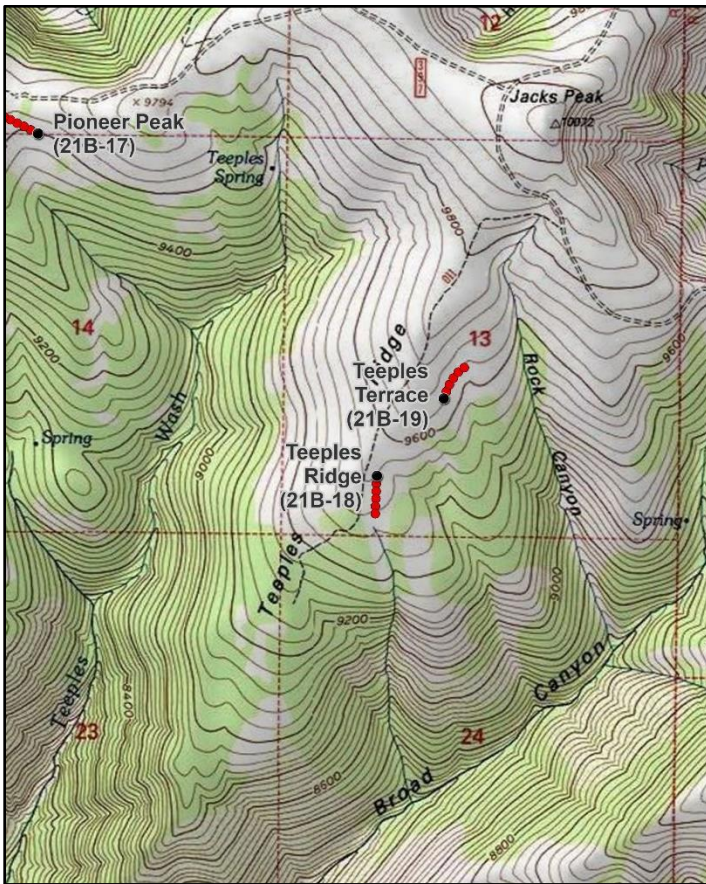
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	35/64
2022	20	-	0	100	0	0	0	0	- / -
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	15/24
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Ribes cereum^p -- (wax currant)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	123/152
2022	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	47/124
2017	-	-	-	-	-	-	-	-	79/108

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies lasiocarpa (subalpine fir)							
2022	5	-	-	-	-	100	38.0

TEEPLES RIDGE - STUDY NO. 21B-18

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 13
NAD 83 UTM ZONE 12, 400573 East 4315298 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
170° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
No Rebar

Directions to Site

From Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Travel another 0.75 miles, crossing a stream, to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the old road on the left (which is now a trail) for about 0.75 miles to the edge of an aspen clone and a clearing on the left: the study is in the clearing. From the north end of the aspen clone, walk 25 paces at 90 degrees magnetic to the 200-foot stake. The 0-foot stake is 200 feet north.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Chalk Creek North Fork A
Elevation	9,550ft (2,911m)
Aspect	Southeast
Slope	8-15%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/06/2017, 07/05/2022

Table 21B-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History**Table 21B-18.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 21B-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment
2022	Subalpine Meadow	No Encroachment

Site Notes

No Notes

Soils**Table 21B-18.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.4	32.7	28.7	38.6	3.8	18.2	252.8	0.6	08/21/1997

Site Potential

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1997, the vegetation community on this site has remained composed of a diverse mix of perennial forbs and grasses. The grasses on the site are primarily perennial introduced species -- namely smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*): these provide the majority of the cover (Table 21B-18.7, Table 21B-18.10). The primary forbs are silky lupine (*Lupinus sericeus*), western larkspur (*Delphinium occidentale*) and tuber starwort (*Pseudostellaria jamesiana*) (Table 21B-18.11). There is some mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) present on the site, and therefore there may be some potential for sagebrush to increase in future sample years (Table 21B-18.12, Table 21B-18.13).

Trend Summary Tables

Table 21B-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.0	-	-	-	-	-
2003	0.2	-	-	-	-	-
2012	0.2	-	-	0.1	-	-
2017	0.3	-	-	0.3	-	-
2022	0.5	-	-	0.3	-	-

Table 21B-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	358	171	322	-	16.4	0.8	13.2
2003	-	404	80	307	-	20.9	0.5	12.3
2012	-	438	189	280	-	34.0	1.1	8.8
2017	-	469	27	362	-	42.9	0.2	18.4
2022	-	469	81	372	-	47.7	0.7	15.2

Table 21B-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	37.9	-	31.4	0.7	0.1	34.0
2003	39.5	-	34.7	0.0	0.6	33.1
2012	31.5	-	42.9	0.2	0.3	47.3
2017	34.8	0.1	13.9	0.1	0.3	57.5
2022	35.9	-	27.0	0.1	0.3	58.1

Table 21B-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	11	2	9
2003	16	2	10
2012	7	1	13
2017	5	-	9
2022	6	3	1
Year	Days Use Per Acre (ha)		
1997	-	-	-
2003	23.2 (57.4)	1.3 (3.3)	18.1 (44.7)
2012	34.1 (84.3)	4.7 (11.6)	23.4 (57.9)
2017	4.4 (10.8)	-	20.8 (51.3)
2022	18.1 (44.8)	2.0 (5.0)	9.4 (23.2)

Table 21B-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Achnatherum lettermanii (Letterman's needlegrass)										
Achnatherum nelsonii (Columbia needlegrass)										
Bromus inermis ⁱ (smooth brome)										
Bromus marginatus (mountain brome)										
Carex norvegica (Norway sedge)										
Dactylis glomerata ⁱ (orchardgrass)										
Elymus trachycaulus (slender wheatgrass)										
Melica bulbosa (oniongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Thinopyrum intermedium ⁱ (intermediate wheatgrass)										
year	Nested Frequency									
1997	11	-	235	1	-	20	2	-	2	166
2003	18	8	277	16	-	6	-	4	8	199
2012	18	7	320	1	-	20	3	-	14	250
2017	42	3	351	32	-	29	8	4	33	185
2022	44	12	331	4	3	6	1	4	19	251
year	Average Cover (%)									
1997	0.1	-	11.6	0.0	-	0.3	0.0	-	0.0	4.4
2003	0.3	0.1	12.7	0.1	-	0.2	-	0.1	0.0	7.6
2012	0.9	0.0	18.4	0.0	-	0.9	0.0	-	0.6	13.2
2017	1.0	0.0	25.3	1.4	-	1.1	0.4	0.1	1.2	12.4
2022	2.0	0.2	28.6	0.2	0.2	0.4	0.0	0.0	0.5	15.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris aurantiaca (orange agoseris)																	
Arabis drummondii (Drummond's rockcress)																	
Artemisia dracunculus (tarragon)																	
Astragalus (milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Cirsium arizonicum ^a (Arizona thistle)																	
Collomia linearis ^a (tiny trumpet)																	
Cymopterus (springparsley)																	
Delphinium nuttalianum (two-lobed larkspur)																	
Delphinium ×occidentale (western larkspur)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erigeron eatonii (Eaton's fleabane)																	
Erigeron flagellaris (trailing fleabane)																	
Galium bifolium ^a (twinleaf bedstraw)																	
Helianthus multiflorus var. multiflorus (showy goldeneye)																	
Hydrophyllum capitatum (ballhead waterleaf)																	
year	Nested Frequency																
1997	37	56	12	4	-	-	1	52	4	-	67	8	-	-	-	30	-
2003	29	18	5	-	3	-	2	-	-	-	42	-	7	15	-	40	-
2012	54	10	-	-	3	2	6	17	-	-	49	-	18	20	21	43	-
2017	69	14	-	-	-	-	3	5	43	-	40	2	85	6	-	5	96
2022	58	40	-	-	-	-	5	25	-	3	16	3	126	6	1	13	60
year	Average Cover (%)																
1997	1.1	0.5	0.1	0.1	-	-	0.0	0.1	0.0	-	6.0	0.1	-	-	-	0.4	-
2003	0.5	0.1	0.0	-	0.0	-	0.0	-	-	-	4.1	-	0.1	0.3	-	0.5	-
2012	1.5	0.1	-	-	0.0	0.0	0.0	0.1	-	-	2.7	-	0.1	0.1	0.2	1.1	-
2017	2.7	0.0	-	-	-	-	0.0	0.0	0.3	-	2.5	0.0	1.2	0.1	-	0.1	1.4
2022	1.8	0.2	-	-	-	-	0.2	0.4	-	0.1	0.4	0.0	2.3	0.0	0.0	0.2	1.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES											
Lupinus sericeus (silky lupine)											
Mertensia oblongifolia (oblongleaf bluebells)											
Penstemon cyananthus (Wasatch beardtongue)											
Polygonum douglasii ^a (Douglas' knotweed)											
Pseudostellaria jamesiana (tuber starwort)											
Rumex salicifolius (willow dock)											
Symphytotrichum ascendens (western aster)											
Taraxacum officinale (common dandelion)											
Tragopogon dubius ^{at} (yellow salsify)											
Vicia americana (American vetch)											
Viola (violet)											
year	Nested Frequency										
1997	-	64	-	139	177	3	168	25	-	32	-
2003	-	60	-	80	17	-	253	10	-	-	-
2012	3	33	2	165	16	-	192	10	-	9	-
2017	24	58	-	9	239	-	114	33	11	10	-
2022	25	61	9	54	246	-	102	43	4	4	3
year	Average Cover (%)										
1997	-	0.8	-	0.6	1.0	0.2	2.8	0.2	-	0.1	-
2003	-	1.2	-	0.5	0.1	-	5.1	0.4	-	-	-
2012	0.0	0.6	0.0	0.7	0.0	-	2.3	0.1	-	0.0	-
2017	2.2	1.7	-	0.1	4.8	-	1.0	0.5	0.0	0.1	-
2022	1.0	2.4	0.2	0.1	3.0	-	1.1	0.8	0.0	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES		
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)		
Symphoricarpos oreophilus ^p (mountain snowberry)		
year	Line Intercept	
1997	-	-
2003	-	-
2012	0.1	-
2017	0.3	-
2022	0.3	-
year	Quadrat Cover (%)	
1997	0.0	-
2003	0.2	-
2012	0.2	-
2017	0.3	0.0
2022	0.5	-

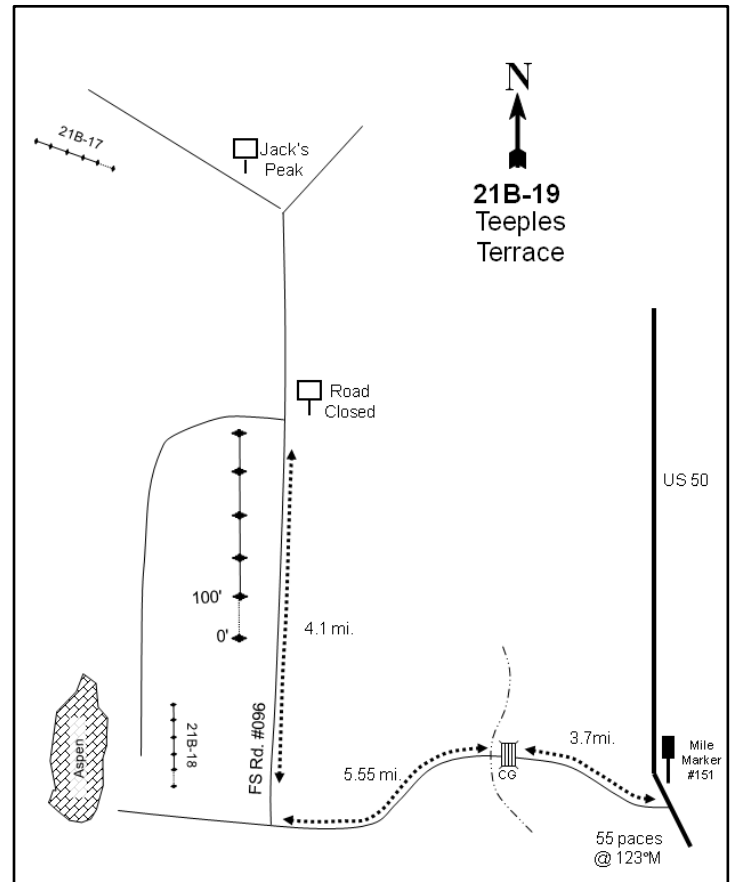
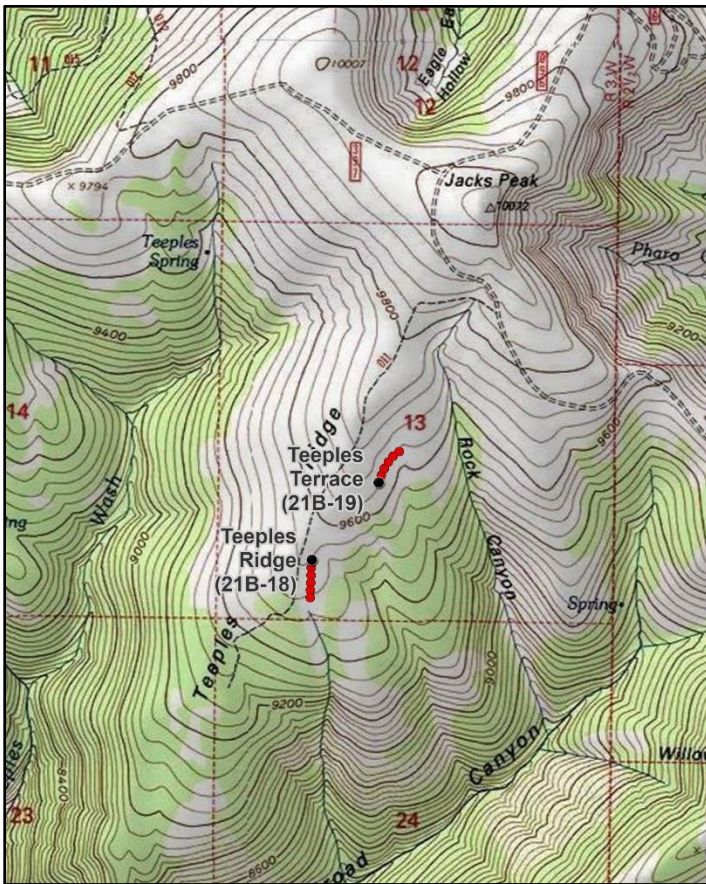
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1997	100	-	60	40	0	0	0	0	25/22
2003	120	-	17	83	0	0	0	0	32/35
2012	40	40	0	50	50	0	0	100	39/50
2017	380	-	74	26	0	5	0	0	33/35
2022	320	-	31	69	0	0	0	25	- / -
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	22/18
2003	-	-	-	-	-	-	-	-	19/32
2012	-	-	-	-	-	-	-	-	24/31
2017	-	-	-	-	-	-	-	-	-/-
2022	20	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	13/7

t - Tree Species; p - Preferred Browse; i - Introduced Species

TEEPLES TERRACE - STUDY NO. 21B-19

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 13
NAD 83 UTM ZONE 12, 400844 East 4315611 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
10° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Proceed for another 0.75 miles, crossing a stream, to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the closed road about 2/3 mile to a cluster of *Ribes sp.* Walk down eight terraces to a witness post; the 0-foot stake is just north of the witness post. The baseline runs along the terrace.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Chalk Creek North Fork A
Elevation	9,660ft (2,944m)
Aspect	Southeast
Slope	15-30%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/06/2017, 07/05/2022

Table 21B-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History**Table 21B-19.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 21B-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment
2022	Subalpine Meadow	No Encroachment

Site Notes

In 2022, it was noted that all stakes had greater than a 100-foot distance between them, meaning that the lines could not completely connect in that sample year.

Soils**Table 21B-19.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	5.0	48.0	26.7	25.3	2.5	52.0	227.2	0.2	08/21/1997

Site Potential

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 1997, it was a subalpine meadow vegetative community and remains so as of the most recent sampling in 2022. The herbaceous understory is robust and diverse. Perennial forbs provide significant cover, with silky lupine (*Lupinus sericeus*), tuber starwort (*Pseudostellaria jamesiana*), and American vetch (*Vicia americana*) as the most dominant species (Table 21B-19.11). The grass community has good cover of perennial species, with the native and introduced species Letterman's needlegrass (*Letterman's needlegrass*), smooth brome (*Bromus inermis*), and intermediate wheatgrass (*Thinopyrum intermedium*) being the most dominant grasses (Table 21B-19.11). Shrubs do not contribute high amounts of cover. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides most of the browse cover, so it is possible that sagebrush cover will continue to increase in the future unless a major disturbance occurs (Table 21B-19.12).

Trend Summary Tables**Table 21B-19.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.0	-	-	-	-	-
2003	0.0	-	-	-	-	-
2012	1.2	0.0	-	1.7	-	-
2017	2.0	0.0	-	3.1	-	-
2022	4.5	-	-	5.1	-	-

Table 21B-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	375	187	266	-	20.8	1.8	14.6
2003	-	420	64	296	-	26.0	0.4	15.1
2012	-	444	231	329	-	31.8	1.5	16.0
2017	-	431	102	338	-	29.5	0.7	20.8
2022	-	447	226	378	-	31.7	1.5	21.7

Table 21B-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	44.8	3.3	14.2	0.5	2.3	38.2
2003	43.1	-	22.1	0.5	4.5	39.3
2012	36.0	0.0	35.7	1.6	7.0	50.0
2017	44.4	-	13.6	0.9	6.5	43.9
2022	38.2	-	29.1	0.6	6.3	50.8

Table 21B-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	7	1	4	-
2003	18	1	6	1
2012	3	3	8	-
2017	1	-	1	-
2022	4	1	1	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2003	22.5 (55.6)	0.7 (1.7)	8.1 (19.9)	-
2012	7.2 (17.9)	1.3 (3.3)	28.1 (69.5)	-
2017	3.6 (9.0)	-	4.0 (9.9)	-
2022	12.3 (30.5)	0.7 (1.7)	3.4 (8.3)	-

Table 21B-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Achnatherum lettermanii (Letterman's needlegrass)	87	292	55	3	9	-	14	-	20
Bromus inermis ⁱ (smooth brome)	115	390	9	-	28	-	47	-	7
Bromus marginatus (mountain brome)	275	332	47	6	18	-	17	2	129
Carex norvegica (Norway sedge)	198	270	64	5	57	-	64	-	64
Dactylis glomerata ⁱ (orchardgrass)	235	286	84	-	5	2	21	-	132
Elymus trachycaulus (slender wheatgrass)	Average Cover (%)								
Poa pratensis ⁱ (Kentucky bluegrass)	1.7	15.0	2.7	0.0	0.2	-	0.6	-	0.5
Poa secunda (Sandberg bluegrass)	2.2	21.6	0.1	-	0.6	-	1.3	-	0.2
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	9.1	16.5	0.7	0.1	0.2	-	0.4	0.0	4.8
	197	203	2012	2017	2022				
	6.0	13.6	3.7	0.0	1.6	-	1.8	-	2.7
	5.6	15.3	2.4	-	0.2	0.0	0.4	-	7.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	62	32	-	7	1	-	-	-	108	-	-	17	7	5	-	15	-
Agoseris aurantiaca (orange agoseris)	107	43	4	17	-	-	-	-	7	-	-	-	26	4	-	-	5
Androsace septentrionalis ^a (pygmyflower rockjasmine)	51	17	-	37	7	-	0	-	5	-	-	1	20	40	14	4	10
Arabis drummondii (Drummond's rockcress)	30	39	-	35	4	-	-	32	97	37	-	-	71	2	-	-	-
Artemisia dracunculus (tarragon)	42	47	-	42	9	3	2	7	163	9	3	-	88	-	-	6	2
Chenopodium atrovirens ^a (pinyon goosefoot)	Average Cover (%)																
Cirsium arizonicum ^a (Arizona thistle)	1.3	0.3	-	0.0	0.0	-	-	-	0.6	-	-	0.1	0.0	0.1	-	0.1	-
Claytonia (springbeauty)	2.1	0.3	0.0	0.1	-	-	-	-	0.0	-	-	-	0.3	0.0	-	-	0.0
Collomia linearis ^a (tiny trumpet)	0.5	0.3	-	0.3	0.3	-	0.0	-	0.0	-	-	0.0	0.2	0.2	0.2	0.0	0.2
Delphinium nuttallianum (two-lobed larkspur)	197	203	2012	2017	2022												
Delphinium ×occidentale (western larkspur)	0.7	0.4	-	0.2	0.2	-	-	0.1	0.7	0.3	-	-	1.1	0.1	-	-	-
Epilobium brachycarpum ^a (tall annual willowherb)	0.9	0.3	-	0.2	0.7	0.0	0.0	0.0	1.1	1.1	0.0	0.0	1.8	-	-	0.0	0.0
Erigeron eatonii (Eaton's fleabane)																	
Erigeron flagellaris (trailing fleabane)																	
Galium bifolium ^a (twinleaf bedstraw)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
Helianthella uniflora (oneflower helianthella)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
<i>Helionis multiflora</i> var. <i>multiflora</i> (showy goldeneye)																		
<i>Hydrophyllum capitatum</i> (ballhead waterleaf)																		
<i>Lathyrus lanszwertii</i> (Nevada pea)																		
<i>Lupinus sericeus</i> (silky lupine)																		
<i>Microsteris gracilis</i> ^a (slender phlox)																		
<i>Orthocarpus tolmiei</i> ^a (Toimie's owl's-clover)																		
<i>Penstemon cyananthus</i> (Wasatch beardtongue)																		
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)																		
<i>Potentilla gracilis</i> (slender cinquefoil)																		
<i>Potentilla hippiana</i> (woolly cinquefoil)																		
<i>Pseudostellaria jamesiana</i> (tuber starwort)																		
<i>Ranunculus</i> (buttercup)																		
<i>Rumex salicifolius</i> (willow dock)																		
<i>Symphotrichum ascendens</i> (western aster)																		
<i>Taraxacum officinale</i> (common dandelion)																		
<i>Tragopogon dubius</i> ^a (yellow salsify)																		
<i>Vicia americana</i> (American vetch)																		
year	Nested Frequency																	
1997	3	-	-	94	3	-	1	127	-	-	44	3	60	53	112	-	20	
2003	6	-	-	95	-	3	-	52	-	2	28	-	18	79	156	3	13	
2012	3	-	-	189	2	15	2	204	-	7	71	-	-	177	39	-	45	
2017	25	38	12	204	-	-	-	6	-	4	98	-	-	64	54	-	35	
2022	6	23	-	271	2	-	-	121	0	3	137	-	-	110	55	1	43	
year	Average Cover (%)																	
1997	0.0	-	-	5.4	0.0	-	0.0	1.0	-	-	0.3	0.1	3.6	0.7	2.6	-	0.1	
2003	0.0	-	-	5.5	-	0.0	-	0.3	-	0.0	0.1	-	0.9	1.0	4.5	0.0	0.2	
2012	0.0	-	-	10.7	0.0	0.4	0.0	0.8	-	0.1	0.7	-	-	2.0	0.3	-	0.3	
2017	0.8	0.6	0.4	11.1	-	-	-	0.0	-	0.0	2.1	-	-	0.7	0.7	-	1.1	
2022	0.0	0.5	-	12.7	0.0	-	-	0.3	0.0	0.0	1.4	-	-	1.6	0.7	0.0	0.7	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
<i>Viola</i> (violet)																		
year	Nested																	
1997	-																	
2003	-																	
2012	-																	
2017	23																	
2022	20																	
year	Average Cover (%)																	
1997	-																	
2003	-																	
2012	-																	
2017	0.1																	
2022	0.1																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover		
	year	1997	2003
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>lanceolatus</i> (yellow rabbitbrush)	1.7	-	-
<i>Symphoricarpos oreophilus</i> ^p (mountain snowberry)	3.1	-	-
	2022	5.1	-
SHRUB SPECIES	Quadrat Cover (%)		
	year	1997	2003
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	0.0	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>lanceolatus</i> (yellow rabbitbrush)	0.0	-	0.0
<i>Symphoricarpos oreophilus</i> ^p (mountain snowberry)	1.2	0.0	-
	2017	2.0	0.0
	2022	4.5	-

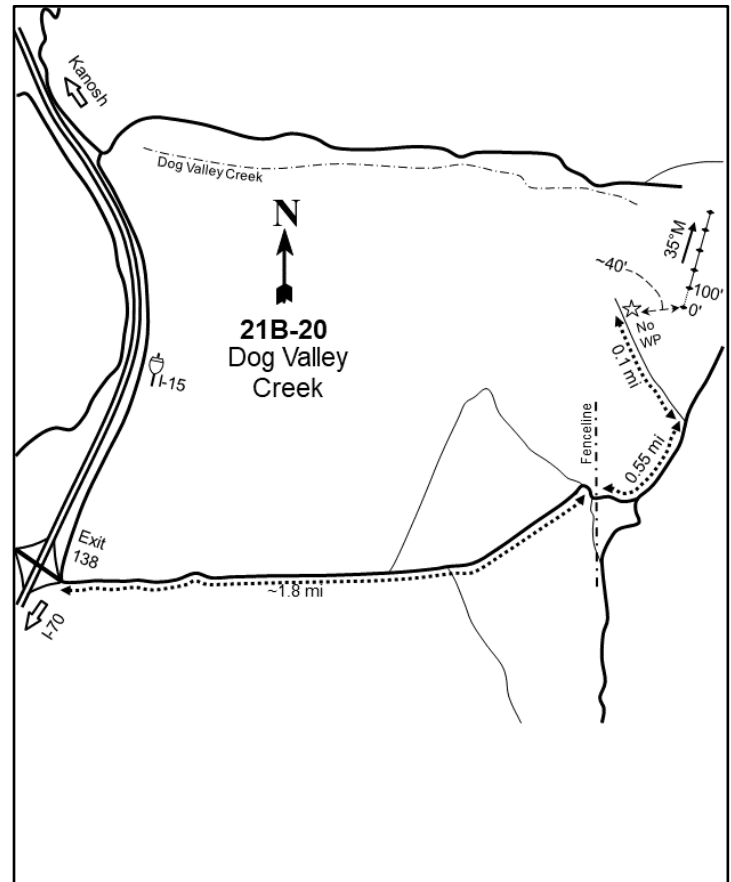
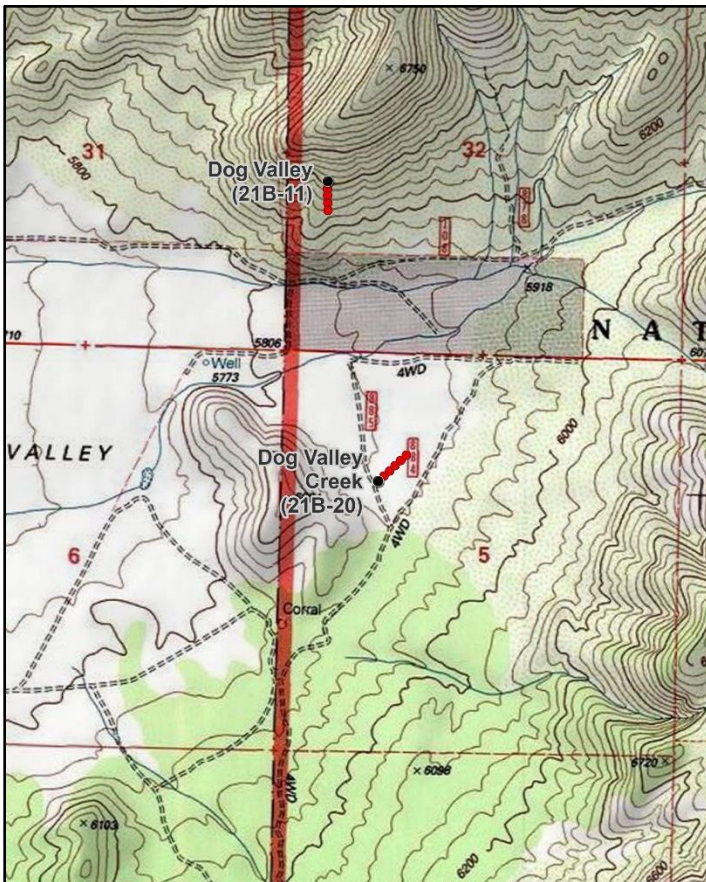
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>^p -- (mountain big sagebrush)									
1997	40	-	50	0	50	0	0	0	44/96
2003	40	-	50	50	0	0	0	0	43/33
2012	380	1640	16	84	0	0	0	0	51/76
2017	1180	-	54	42	3	0	0	0	44/65
2022	820	-	5	90	5	12	0	10	- / -
<i>Chrysothamnus viscidiflorus</i> ssp. <i>lanceolatus</i> -- (yellow rabbitbrush)									
1997	40	-	0	100	0	0	0	0	22/37
2003	-	-	-	-	-	-	-	-	25/43
2012	40	-	0	100	0	0	0	0	43/52
2017	20	-	100	0	0	0	0	0	26/48
2022	20	-	0	100	0	0	0	0	- / -
<i>Sambucus racemosa</i>^p -- (red elderberry)									
1997	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	70/128
2022	-	-	-	-	-	-	-	-	- / -
<i>Symphoricarpos oreophilus</i>^p -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	- / -
2003	20	-	100	0	0	0	0	0	- / -
2012	20	-	0	100	0	0	100	0	44/101
2017	20	-	0	100	0	0	0	0	53/104
2022	20	-	0	100	0	100	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

DOG VALLEY CREEK - STUDY NO. 21B-20

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Dog Valley Peak SE; Township 25S, Range 6W, Section 05
NAD 83 UTM ZONE 12, 364501 East 4280964 North

Transect Information

Browse Tag # (0' Stake)	555
Transect Bearing	35° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

Traveling north on I-15, take exit 138 off of I-15. Follow County Road 4603 to a fork at 1.6 miles, then follow the main road right for 0.2 miles to a fenceline. At the fenceline, turn left and follow the road for 0.15 miles to a small gap in the trees. Turn left again and continue for 0.4 miles to a faint trail: the site is on the right (east) side of this trail.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Grass Creek Allotment
Elevation	5,879ft (1,792m)
Aspect	Northwest
Slope	2%
Sample Dates	06/21/2017, 05/26/2022

Table 21B-20.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Dog Valley Peak	-	July 1996	217
Fire - Wildfire	Dog Valley	-	July-August 2006	28664

Wildlife Habitat and Vegetation History**Table 21B-20.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 21B-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mountain Big Sagebrush/Annual Grass	No Encroachment
2022	Mountain Big Sagebrush/Bulbous Bluegrass	No Encroachment

Site Notes

No Notes

Soils**Table 21B-20.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.4	34.2	34.7	31.1	2.7	28.0	262.0	0.4	06/21/2017

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2017, this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with broom snakeweed (*Gutierrezia sarothrae*) also present to a lesser extent (Table 21B-20.12, Table 21B-20.13). The introduced annual grass species cheatgrass (*Bromus tectorum*) contributed significant cover in 2017 and was a co-dominant vegetation component in that sample year. The perennial introduced grass species bulbous bluegrass (*Poa bulbosa*) and the native species western wheatgrass (*Pascopyrum smithii*) have also been present in significant amounts in the herbaceous understory. However, bulbous bluegrass increased significantly in both cover and frequency (while that of cheatgrass decreased) and became the dominant herbaceous component in 2022 (Table 21B-20.10). Native forb species are not diverse and are mostly depleted, but the introduced annual forb species desert madwort (*Alyssum desertorum*) is very common (Table 21B-20.11). There is Utah juniper (*Juniperus osteosperma*) present in the area, but all of the trees on the site itself have burned in recent fires. However, there is potential for future infill leading from nearby seed sources (Photos). Annual grasses could be a threat to the system if they increase again in the future as they have the potential to lead to increased wildfire regimes and the associated changes in plant communities associated with frequent wildfire.

Trend Summary Tables

Table 21B-20.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	12.7	3.6	-	17.1	2.2	-
2022	19.2	2.1	-	23.5	1.4	-

Table 21B-20.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	429	374	399	86	25.9	24.7	11.7	1.3
2022	67	430	291	140	0.2	31.4	5.1	1.5

Table 21B-20.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	6.2	0.1	41.8	9.7	0.3	67.5
2022	23.5	0.5	35.8	13.5	1.0	52.9

Table 21B-20.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2017	14	4	1	7
2022	6	4	1	4
Year	Days Use Per Acre (ha)			
2017	63.2 (156.0)	0.7 (1.7)	1.3 (3.3)	-
2022	17.4 (43.0)	5.3 (13.2)	3.4 (8.3)	-

Table 21B-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia myuros ^{ai} (annual fescue)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency										
2017	31	429	6	214	211	16	111	4	3	-	14
2022	4	65	3	160	418	-	78	11	6	2	-
year	Average Cover (%)										
2017	1.2	25.8	0.1	7.8	10.0	0.5	4.9	0.1	0.0	-	0.1
2022	0.0	0.2	0.2	2.3	27.3	-	1.3	0.2	0.1	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Cirsium undulatum ^a (wavy/leaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Convolvulus arvensis ⁿⁱ (field bindweed)	Cryptantha (cryptantha)	Draba ^a (draba)	Erigeron divergens ^a (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ⁿⁱ (redstem stork's bill)	Holosteum umbellatum ⁿⁱ (jagged chickweed)	Lithophragma tenellum (slender woodland-star)
year	Nested Frequency																
2017	1	385	-	9	14	8	-	71	6	1	8	2	35	-	16	60	-
2022	18	60	4	53	33	-	3	3	3	-	118	-	28	4	6	237	3
year	Average Cover (%)																
2017	0.0	10.3	-	0.0	0.0	0.1	-	0.4	0.1	0.0	0.0	0.1	0.4	-	0.1	0.3	-
2022	0.2	0.2	0.0	0.2	0.1	-	0.0	0.0	0.0	-	1.1	-	0.3	0.0	0.3	3.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Lotus utahensis (Utah bird's-foot trefoil)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
2017	-	14	3	9	20	17	46	3
2022	7	1	-	38	-	22	-	9
year	Average Cover (%)							
2017	-	0.5	0.0	0.1	0.1	0.1	0.3	0.1
2022	0.0	0.1	-	0.3	-	0.1	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept	
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	17.1
Gutierrezia sarothrae (broom snakeweed)	23.5	1.4
year	Quadrat Cover (%)	
	2017	3.6
2022	2.1	

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

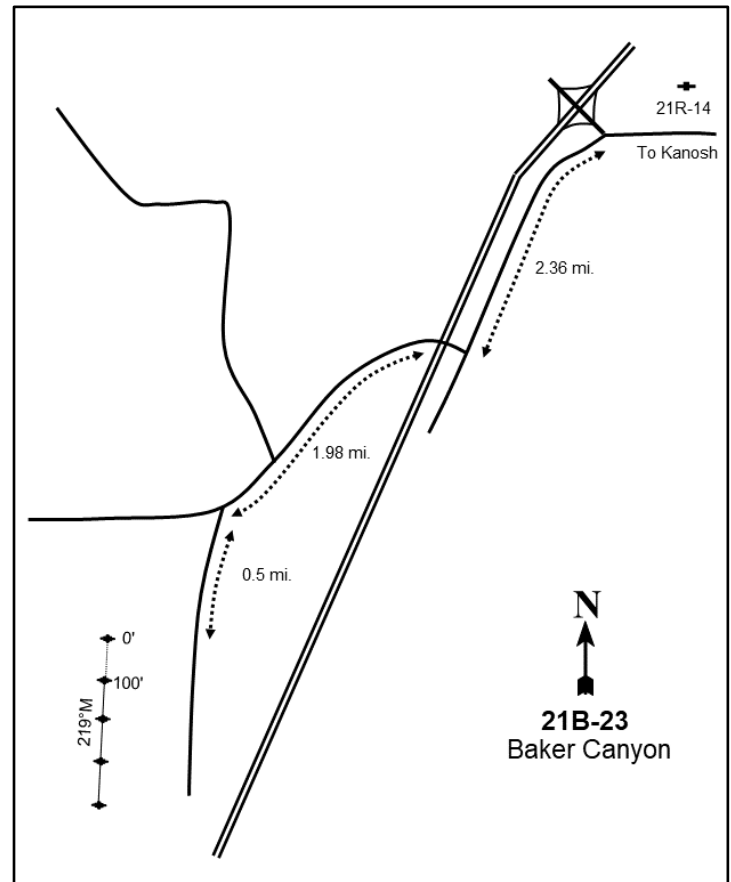
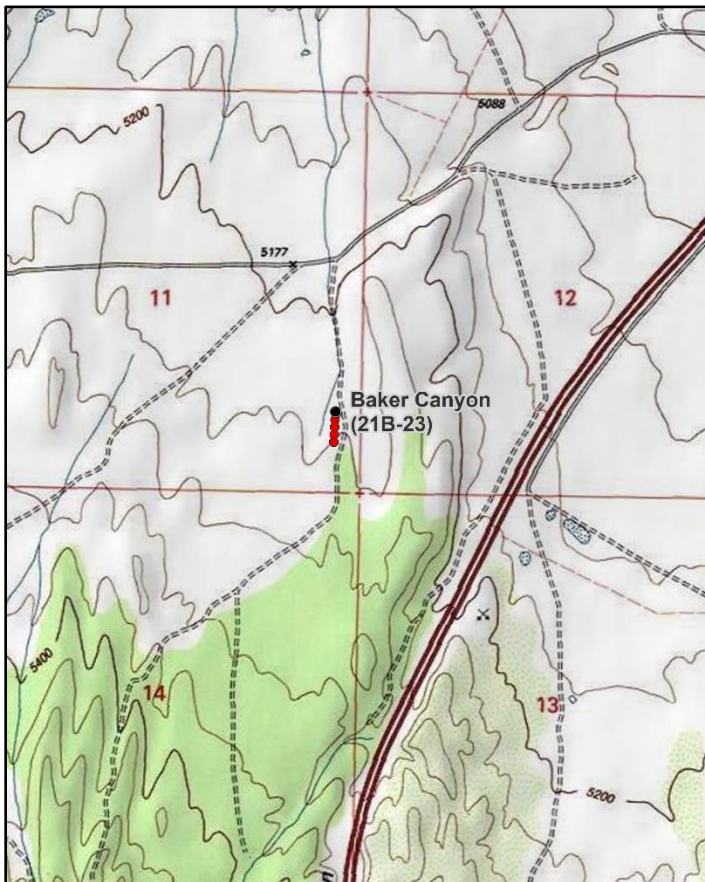
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	10640	-	81	18	0	0	0	0	53/90
2022	5220	160	28	72	0	27	3	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	7940	440	45	55	0	0	0	0	18/25
2022	2280	120	4	78	18	0	0	19	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Quercus gambelii^p -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	86/77

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-20.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	21.4	14.9	15.0	29.4	-19.4	2.5	-2.0	61.7	Fair
2022	29.4	14.9	13.8	8.1	-0.2	3.1	-2.0	67.0	Fair-Good

BAKER CANYON - STUDY NO. 21B-23

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Dog Valley Peak NW; Township 24S, Range 7W, Section 11
NAD 83 UTM ZONE 12, 360922 East 4288321 North

Transect Information

Browse Tag # (0' Stake)	7071
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Proceed south from Kanosh on the main road and turn left just before the I-15 interchange. Travel on the frontage road for 1.8 miles (paralleling the freeway on the east side) to an overpass. Proceed over the interstate and continue 0.5 miles west to a fork. Take the left fork and travel for about 1.05 miles. Just beyond the point of a small hill, turn left onto a two-track road. Go 0.35 miles to the first point where the road squeezes between two junipers. From the south side of the large juniper to the right, walk 100 feet due west to the start of the frequency baseline. The 0-foot baseline stake is a rebar, tagged #7071.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	TWIN PEAKS
Elevation	5,220ft (1,591m)
Aspect	Northwest
Slope	3%
Sample Dates	06/16/1998, 06/12/2003, 07/23/2008, 08/14/2012, 06/22/2017, 05/26/2022

Table 21B-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Plow	Horse Hollow Seeding	-	1967	2200
Seeding - Rangeland Drill	Horse Hollow Seeding	-	1967	2200
Fire - Prescribed	-	-	Prior to 1991	-

Table 21B-23.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Horse Hollow			Drill	Nov 1967	2200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Psathyrostachys juncea	Russian Wildrye		6.00	0.00

Wildlife Habitat and Vegetation History**Table 21B-23.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing

Table 21B-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Wyoming Big Sagebrush/Perennial Grass	Phase I
1991	Wyoming Big Sagebrush/Perennial Grass	Phase I
1998	Wyoming Big Sagebrush/Perennial Grass	Phase I
2003	Wyoming Big Sagebrush/Perennial Grass	Phase I
2008	Wyoming Big Sagebrush/Perennial Grass	Phase I
2012	Wyoming Big Sagebrush/Perennial Grass	Phase I
2017	Wyoming Big Sagebrush/Annual Grass	Phase I
2022	Wyoming Big Sagebrush/Annual-Perennial Grass	Phase I

Site Notes

No Notes

Soils**Table 21B-23.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	48.0	27.4	24.6	1.0	16.8	140.8	0.6	06/16/1998

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

From the time this site was established in 1985 to the most recent sampling in 2022, it has been dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Prior to 2017, the herbaceous component mainly consisted of perennial grasses. In 2017, however, the understory transitioned to an annual grass dominated state (21B-23.10). Perennial grass cover increased again as of the 2022 sampling, and it co-dominated along with annual grasses in that sample year (21B-23.7). The forb component of the site is primarily comprised of introduced annual species, and cover of these undesirable forbs is just over 7% as of 2022 (21B-23.11). Utah juniper (*Juniperus osteosperma*) has been present on the site, with cover and density exhibiting an overall increase over the study period (Table 21B-23.12, Table 21B-23.14). Although the site has remained in Phase I of woodland succession since study establishment (Table 21B-23.4), it appears that it may near the transition to Phase II if encroachment continues.

Trend Summary Tables

Table 21B-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	5.4	1.0	2.9	-	-	0.2
2003	7.4	1.2	3.1	5.1	0.5	6.4
2008	4.8	1.2	0.1	4.1	0.9	6.9
2012	6.3	1.5	2.9	6.9	0.7	8.3
2017	6.9	1.7	1.4	5.7	1.1	15.8
2022	9.7	0.9	3.3	8.2	1.8	10.0

Table 21B-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	276	213	379	158	6.5	10.2	5.5	5.2
2003	110	233	98	79	1.4	13.2	2.5	2.7
2008	234	242	284	95	2.5	11.6	3.7	2.2
2012	250	282	317	133	5.5	12.2	2.3	2.2
2017	306	242	416	128	16.2	6.5	11.7	2.5
2022	346	233	414	110	9.7	13.1	7.2	2.5

Table 21B-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	40.5	1.5	28.4	23.4	4.1	33.1
2003	19.7	1.4	23.2	34.2	3.0	29.8
2008	9.2	3.0	34.3	30.9	2.2	27.9
2012	20.9	3.8	39.8	18.0	1.4	36.3
2017	24.8	1.0	28.9	20.3	1.4	46.6
2022	30.7	0.5	31.5	23.9	3.4	35.7

Table 21B-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1998	4	12	7
2003	-	9	32
2008	-	15	86
2012	4	-	32
2017	12	12	42
2022	5	5	24
Year	Days Use Per Acre (ha)		
1998	7.2 (17.9)	19.4 (48.0)	-
2003	12.3 (30.5)	0.7 (1.7)	-
2008	12.3 (30.5)	9.4 (23.2)	-
2012	0.7 (1.8)	2.0 (5.0)	-
2017	30.5 (75.3)	0.7 (1.7)	-
2022	27.6 (68.1)	1.3 (3.3)	-

Table 21B-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1998	9	-	-	276	25	-	-	-	1	68	1	148
2003	16	-	-	110	24	-	-	-	-	117	-	151
2008	6	-	-	234	1	-	-	-	2	75	-	205
2012	4	-	-	250	4	-	-	-	-	210	-	158
2017	24	4	35	306	5	1	5	4	28	117	-	127
2022	10	18	14	346	18	2	4	-	-	196	-	63
year	Average Cover (%)											
1998	0.4	-	-	6.5	0.5	-	-	-	0.1	1.7	0.0	7.4
2003	0.4	-	-	1.4	0.7	-	-	-	-	2.2	-	9.9
2008	0.0	-	-	2.5	0.0	-	-	-	0.0	0.8	-	10.7
2012	0.0	-	-	5.5	0.2	-	-	-	-	4.4	-	7.5
2017	0.2	0.0	0.3	16.2	0.3	0.0	0.0	0.0	0.4	2.5	-	2.6
2022	0.7	0.6	0.8	9.7	0.8	0.1	0.0	-	-	7.5	-	2.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 21B-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus calycosus (Torrey's milkvetch)	Astragalus cibrarius (browse milkvetch)	Astragalus piutensis (Sevier milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Comandra umbellata (bastard toadflax)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (sty gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
1998	364	-	68	-	3	-	150	5	-	4	-	69	-	1	-	15	72
2003	21	-	12	-	-	-	-	7	-	-	-	78	2	-	-	-	32
2008	241	6	23	-	-	-	136	5	-	3	-	107	-	-	-	-	22
2012	294	1	49	-	-	-	141	11	-	-	-	85	-	-	-	2	52
2017	403	3	35	-	2	-	61	9	1	11	-	168	-	-	1	6	44
2022	406	-	25	2	1	7	55	2	8	12	3	21	-	-	-	-	28
year	Average Cover (%)																
1998	3.3	-	0.9	-	0.0	-	1.0	0.0	-	0.0	-	1.2	-	0.0	-	0.2	2.6
2003	0.1	-	0.1	-	-	-	-	0.2	-	-	-	2.4	0.0	-	-	-	1.1
2008	0.8	0.0	0.3	-	-	-	0.7	0.1	-	0.0	-	2.1	-	-	-	-	0.4
2012	1.4	0.0	0.5	-	-	-	0.4	0.1	-	-	-	0.5	-	-	-	0.0	1.0
2017	5.4	0.0	0.3	-	0.1	-	0.5	0.0	0.0	0.2	-	5.7	-	-	0.0	0.0	1.0
2022	6.8	-	0.7	0.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.1	-	-	-	-	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES			
	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency		
1998	-	37	-
2003	4	31	-
2008	19	29	-
2012	1	34	-
2017	6	41	7
2022	14	36	-
year	Average Cover (%)		
1998	-	1.4	-
2003	0.0	1.3	-
2008	0.4	0.9	-
2012	0.0	0.6	-
2017	0.0	1.0	0.0
2022	0.1	0.8	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 21B-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis ^p (Nevada jointfir)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	3.2	0.5	1	0.9	-	6.4	-
2008	2.7	0.1	1	0.4	-	6.9	0.8
2012	4.3	0.7	1.3	1.3	-	8.3	-
2017	3.7	0.9	0.4	1.6	0.1	15.8	0.1
2022	5.1	1.8	1.3	1.8	-	10	-
year	Quadrat Cover (%)						
1998	3.1	1.0	1.2	1.0	-	2.9	-
2003	4.8	1.2	1.9	0.7	-	3.1	-
2008	3.6	1.2	1.2	0.0	-	0.1	0.0
2012	3.8	1.5	1.7	0.8	-	2.9	-
2017	5.1	1.1	1.0	0.7	0.4	1.4	0.2
2022	5.7	0.9	1.3	2.7	-	3.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 21B-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
1998	780	-	5	80	15	51	3	3	53/74
2003	560	-	0	71	29	7	0	21	58/87
2008	580	20	3	55	41	31	31	28	72/99
2012	500	-	0	68	32	12	20	76	54/86
2017	600	760	7	77	17	7	0	17	58/90
2022	580	-	7	76	17	35	0	10	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1998	260	-	0	100	0	0	0	0	25/33
2003	360	-	0	89	11	0	0	0	28/53
2008	420	20	5	81	14	5	0	10	28/42
2012	520	-	15	85	0	4	0	85	28/54
2017	520	-	15	85	0	35	23	0	27/59
2022	460	-	0	100	0	17	0	0	- / -
Ephedra nevadensis^P -- (Nevada jointfir)									
1998	100	-	40	60	0	20	20	0	60/115
2003	320	-	69	25	6	6	13	6	60/105
2008	480	-	50	33	17	25	17	4	60/116
2012	220	-	0	100	0	73	9	46	60/119
2017	500	-	48	44	8	64	24	8	49/107
2022	620	-	26	61	13	0	7	13	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1998	20	-	0	100	0	0	0	0	110/203
2003	40	-	100	0	0	0	0	0	76/124
2008	20	-	0	100	0	0	0	0	74/104
2012	60	-	0	67	33	33	0	33	63/96
2017	280	-	14	64	21	0	0	14	53/78
2022	360	-	28	67	6	6	28	6	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	-	-	-	-	-	-	-	-	35/48
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	17/12
2017	140	-	0	100	0	0	0	29	24/38
2022	20	-	0	100	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	40	-	50	50	0	0	0	0	- / -
2003	40	-	50	50	0	0	0	0	- / -
2008	60	20	33	67	0	0	0	0	- / -
2012	180	20	0	100	0	0	0	89	- / -
2017	80	40	75	25	0	0	0	0	- / -
2022	100	40	40	60	0	20	0	0	- / -
Opuntia -- (pricklypear)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	29/63
2008	-	-	-	-	-	-	-	-	5/21
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	6/9
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	40	-	0	100	0	0	0	0	65/86
2012	-	-	-	-	-	-	-	-	-/-
2017	160	-	25	75	0	0	0	0	32/32

t - Tree Species; p - Preferred Browse; i - Introduced Species

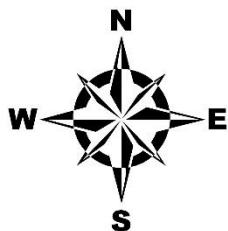
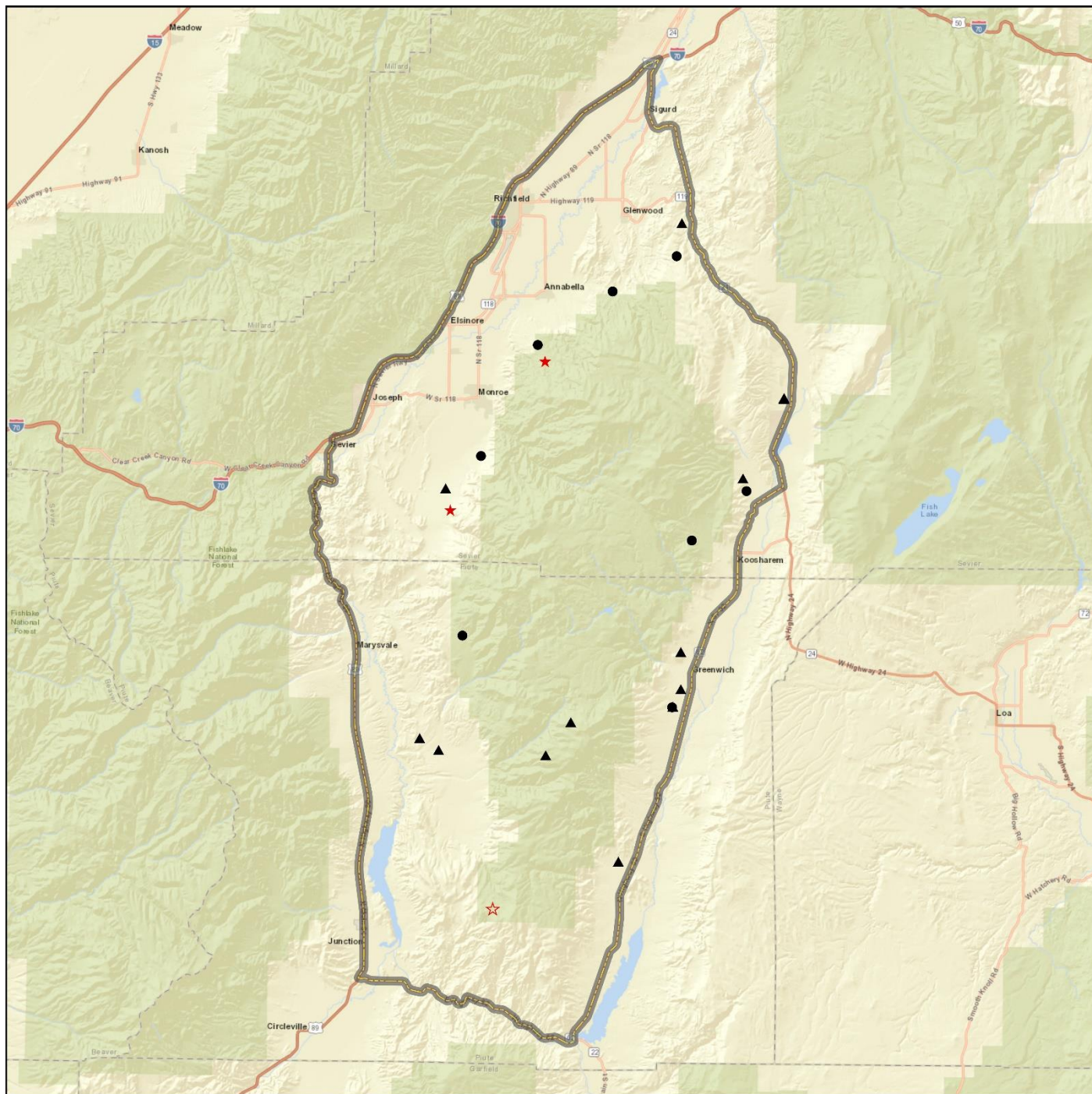
Table 21B-23.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2003	40	9	45	27	18	-	8.0
2008	44	8	38	38	8	8	10.5
2012	47	13	40	33	13	-	6.3
2017	55	12	47	24	-	18	9.6
2022	52	-	38	19	19	25	14.5

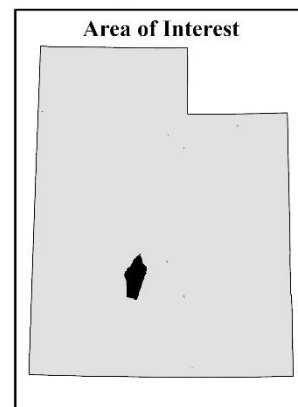
Table 21B-23.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	6.7	12.2	6.0	20.4	-4.9	10.0	0.0	50.5	Poor-Fair
2003	6.4	9.2	15.0	26.3	-1.0	5.4	0.0	61.3	Fair
2008	5.1	0.0	0.0	23.3	-1.9	4.4	0.0	31.0	Very Poor
2012	8.6	7.1	0.0	24.3	-4.1	4.4	0.0	40.4	Poor
2017	7.1	9.8	5.9	12.9	-12.2	4.9	0.0	28.4	Very Poor
2022	10.3	10.8	7.2	26.1	-7.3	5.0	0.0	52.1	Fair

WILDLIFE MANAGEMENT UNIT 23 - MONROE

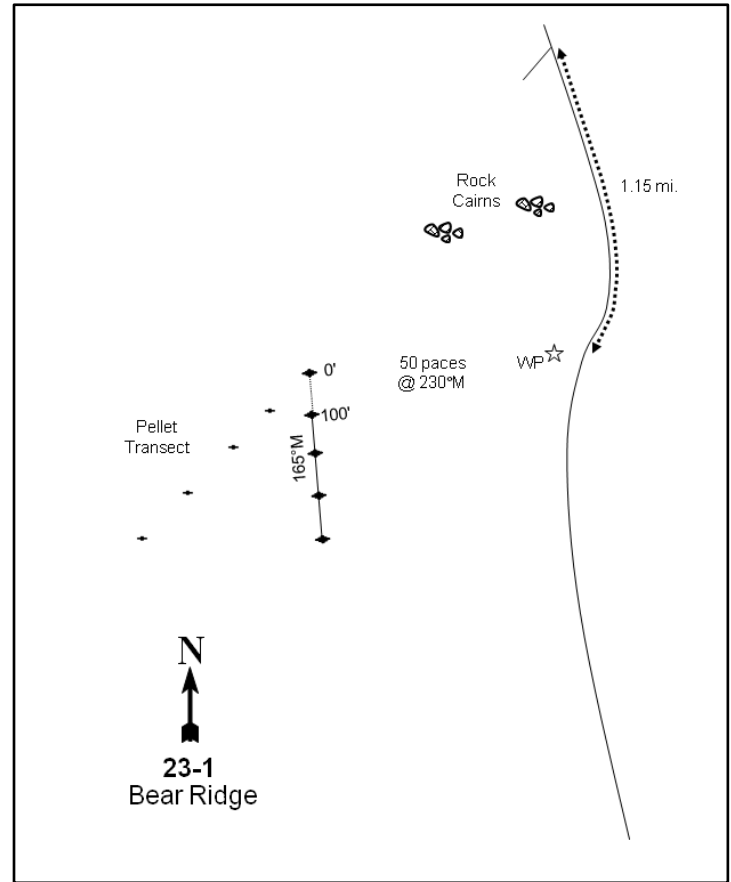
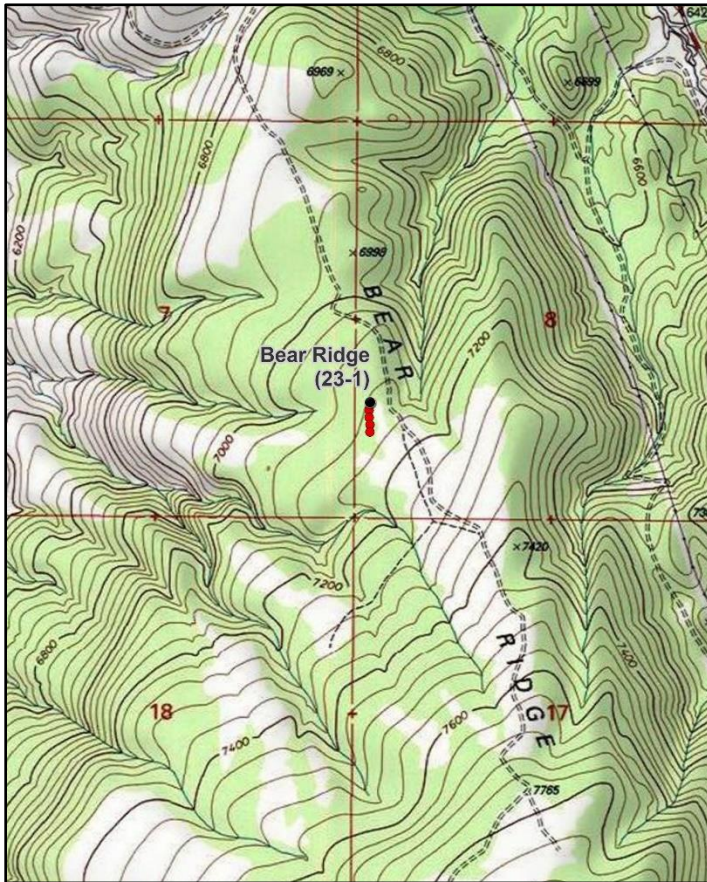


Study Locations Project, Status	Unit Boundary
● RT, Active	Unit - 23
★ RT, Suspended	
▲ WRI, Active	
★ WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

BEAR RIDGE - STUDY NO. 23-1

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Water Creek Canyon N; Township 24S, Range 1W, Section 08
NAD 83 UTM ZONE 12, 418271 East 4287692 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

7038
165° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt 1: 1ft, Belt 2: 7ft, Belt 5: No Rebar

Directions to Site

From Richfield, travel east on Highway 119 to the junction of U-24. One hundred yards before the intersection of Highway 119 and U-24, turn south onto a dirt road. Follow this road for 1.5 miles to a hairpin turn and keep right. Go 0.55 miles to a fork, bear left, and continue for 1.15 miles more to a witness post on the right (west) side of the road. Walk 50 paces at 230 degrees magnetic to the 0-foot baseline stake. The trend study stakes are rebar 2-1/2 feet tall, and the 0-foot stake is marked by browse tag #7038.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NORTH COVE MOUNTAIN
Elevation	7,140ft (2,176m)
Aspect	Southwest
Slope	10%
Sample Dates	07/20/1998, 08/22/2003, 08/19/2008, 08/06/2012, 06/15/2017, 07/28/2022

Table 23-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop (No Scatter)	North Cove Maintenance and Guzzlers	3150	October 2016	1500
Chaining - Two-Way Ely	North Cove Vegetation Treatment	1880	October-November 2010	3000
Seeding - Aerial Before	North Cove Vegetation Treatment	1880	October-November 2010	1500

Table 23-01.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
North Cove Vegetation Treatment			Aerial	Oct 2010	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Festuca ovina	Sheep Fescue	Covar	0.50	0.40
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.50	1.47
G	Poa fendleriana	Muttongrass		0.20	0.18
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.50	0.45
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.00	1.62
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.00	0.91
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	1.00	0.92
F	Helianthus annuus	Annual Sunflower	Sunflower	1.00	0.97
F	Linum perenne	Blue Flax	Appar	1.00	0.89
F	Medicago sativa	Alfalfa	Ranger	1.00	0.94
F	Melilotus officinalis	Yellow Sweetclover		1.00	0.88
F	Penstemon palmeri	Palmer Penstemon	Elko NV	0.00	0.00
F	Penstemon palmeri	Palmer Penstemon	Iron UT	0.19	0.18
F	Penstemon palmeri	Palmer Penstemon	Pine NV	0.30	0.28
F	Sanguisorba minor	Small Burnet	Delar	4.00	3.80

Wildlife Habitat and Vegetation History**Table 23-01.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 23-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1991	Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1998	Sagebrush/Pinyon-Juniper	Phase II
2003	Sagebrush/Pinyon-Juniper	Phase II
2008	Pinyon-Juniper/Sagebrush	Phase II transitioning to Phase III
2012	Perennial Grass	Phase I
2017	Perennial Grass/Antelope Bitterbrush	Phase I
2022	Perennial Grass/Antelope Bitterbrush	Phase I

Site Notes

No Notes

Soils**Table 23-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.4	40.0	33.4	26.6	3.3	9.0	124.8	0.7	07/20/1998

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R047XB456UT
States and Transitions	No state and transition model is available for this ecological site.

This site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*A. nova*) plant community with twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees co-dominant from study establishment in 1985 through 2008. The cover of pinyon and juniper continued to increase through the sample years and the study site progressed through phases of woodland succession: the study was considered to be in Phase II transitioning to Phase III in 2008 (Photos, Table 23-01.4, Table 23-01.12, Table 23-01.13, Table 23-01.14). The herbaceous understory was somewhat abundant between 1985 and 2008 (Table 23-01.7), but was not considered a dominant vegetation component of the site. However, a chaining and seeding treatment in 2010 (Table 23-01.1) removed much of the pinyon-juniper and amplified diversity and abundance in the understory. As a result, the site transitioned to one dominated by perennial grasses -- primarily the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) -- in 2012; the introduced and seeded species sheep fescue (*Festuca ovina*) has increased steadily each year since treatment (Table 23-01.10). Cover of browse species also increased following the treatment, and antelope bitterbrush (*Purshia tridentata*) became a co-dominant vegetation component in 2017 (Table 23-01.12, Table 23-01.13). Forbs have remained rare throughout the study years, although they have increased in diversity following treatment (Table 23-01.11).

Trend Summary Tables

Table 23-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	7.9	0.3	11.4	-	-	-
2003	7.4	-	18.0	6.4	-	32.3
2008	4.2	0.0	7.9	7.7	-	31.8
2012	2.7	0.0	0.4	5.6	-	0.7
2017	9.3	0.1	0.2	11.1	0.3	-
2022	8.4	0.6	-	11.2	0.4	0.3

Table 23-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	49	276	4	53	0.4	10.9	0.0	0.8
2003	15	229	-	24	0.0	7.0	-	0.4
2008	25	248	-	42	0.1	6.7	-	0.5
2012	25	258	47	154	0.1	9.8	0.4	3.8
2017	61	319	25	130	0.8	27.4	0.1	3.1
2022	32	312	15	29	0.3	23.4	0.1	0.2

Table 23-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	21.2	0.9	42.3	26.1	11.1	29.9
2003	13.0	3.4	37.3	19.6	13.1	32.3
2008	12.4	2.7	43.8	29.8	10.0	21.0
2012	32.5	0.5	44.9	8.2	7.3	18.9
2017	28.8	-	49.2	6.7	5.9	38.4
2022	22.5	0.0	37.0	13.9	9.1	31.4

Table 23-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	-	-	35	4	24
2003	-	-	20	-	32
2008	-	-	20	1	64
2012	-	-	4	1	5
2017	-	-	20	13	36
2022	1	-	18	43	5
Year	Days Use Per Acre (ha)				
1998	-	-	50.9 (125.8)	7.4 (18.2)	-
2003	0.7 (1.8)	-	54.3 (134.1)	1.3 (3.3)	-
2008	0.7 (1.8)	8.7 (21.5)*	33.5 (82.8)	1.3 (3.3)	-
2012	-	-	21.5 (53.0)	4.0 (9.9)	-
2017	-	-	16.1 (39.7)	6.7 (16.6)	-
2022	8.0 (19.7)	-	36.2 (89.4)	87.1 (215.2)	-

*Pellets per acre (ha)

Table 23-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Festuca ovina ⁱ (sheep fescue)	Leymus cinereus (basin wildrye)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
1998	13	49	-	7	-	-	54	103	-	207	-
2003	5	15	-	2	-	-	28	88	-	177	-
2008	-	25	-	2	-	-	9	122	-	194	-
2012	6	25	-	4	28	12	7	70	5	182	50
2017	12	61	2	5	89	19	7	48	5	240	45
2022	10	32	-	1	149	10	-	62	19	197	21
year	Average Cover (%)										
1998	0.2	0.4	-	0.0	-	-	1.0	2.0	-	7.7	-
2003	0.0	0.0	-	0.0	-	-	0.5	0.9	-	5.6	-
2008	-	0.1	-	0.0	-	-	0.1	0.7	-	6.0	-
2012	0.2	0.1	-	0.0	0.1	0.3	0.2	0.9	0.1	6.3	1.7
2017	0.5	0.8	0.0	0.1	5.9	2.3	0.7	0.6	0.6	15.7	1.2
2022	0.3	0.3	-	0.0	8.7	1.1	-	1.7	0.3	10.9	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus cicer ⁱ (chickpea milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
1998	1	-	1	-	6	-	-	-	1	4	3	8	5	9	-	-	-
2003	-	-	1	-	6	-	-	-	-	-	-	-	-	6	-	-	-
2008	-	-	4	-	9	-	-	-	-	-	-	-	1	7	-	-	-
2012	7	-	4	-	4	-	-	-	3	-	-	-	4	19	5	36	10
2017	24	6	2	1	5	2	0	-	6	1	-	11	4	3	6	2	8
2022	7	8	2	3	2	-	-	4	-	-	-	1	-	7	-	-	-
year	Average Cover (%)																
1998	0.0	-	0.0	-	0.1	-	-	-	0.0	0.0	0.0	0.1	0.0	0.2	-	-	-
2003	-	-	0.0	-	0.1	-	-	-	-	-	-	-	-	0.1	-	-	-
2008	-	-	0.0	-	0.1	-	-	-	-	-	-	-	0.0	0.2	-	-	-
2012	0.1	-	0.0	-	0.0	-	-	-	0.0	-	-	-	0.0	0.4	0.0	0.3	0.1
2017	0.2	0.0	0.0	0.0	0.1	0.0	0.0	-	0.0	0.0	-	0.4	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.1	0.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum perenne ⁱ (blue flax)	Lithospermum incisum (narrowleaf stone seed)	Lomatium (desertparsley)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Penstemon palmeri (Palmer's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Tragopogon dubius ^{at} (yellow salsify)
year	Nested Frequency									
1998	-	-	1	-	-	-	4	17	-	-
2003	-	-	-	-	-	-	7	7	-	-
2008	-	-	-	-	-	-	7	20	-	-
2012	80	0	-	0	1	23	8	5	38	-
2017	41	-	3	-	-	13	15	2	25	4
2022	1	-	-	-	-	-	3	5	-	3
year	Average Cover (%)									
1998	-	-	0.0	-	-	-	0.2	0.2	-	-
2003	-	-	-	-	-	-	0.2	0.0	-	-
2008	-	-	-	-	-	-	0.0	0.1	-	-
2012	2.3	0.0	-	0.0	0.0	0.3	0.1	0.0	0.5	-
2017	0.7	-	0.0	-	-	0.9	0.2	0.0	0.6	0.0
2022	0.0	-	-	-	-	-	0.0	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Pinus edulis ⁱ (twoneedle pinyon)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)										
1998	-	-	-	-	-	-	-	-	-	-	-
2003	1.9	0.6	-	-	-	-	23.3	-	-	9	3.9
2008	2.2	0.3	-	-	-	-	21.4	-	-	10.4	5.2
2012	0.9	0.3	-	-	-	-	0.5	-	-	0.2	4.4
2017	2.1	0.6	-	0.3	0.1	-	-	-	-	-	8.3
2022	3.4	0.8	-	0.4	-	-	0.3	-	-	-	7
year	Quadrat Cover (%)										
1998	2.2	2.5	0.1	-	-	-	5.5	-	0.1	6.0	3.2
2003	2.4	0.8	-	-	-	-	9.2	-	-	8.8	4.3
2008	1.4	0.1	-	-	-	-	3.1	0.0	0.0	4.8	2.7
2012	1.1	0.2	-	-	-	-	0.4	-	0.0	0.0	1.4
2017	2.8	0.7	-	0.0	0.1	0.0	0.2	-	-	-	5.6
2022	3.1	0.9	-	0.0	-	0.2	0.0	-	0.4	-	4.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	54/59
2017	-	-	-	-	-	-	-	-	39/67
2022	-	-	-	-	-	-	-	-	-/-
Artemisia nova^P -- (black sagebrush)									
1998	1300	-	6	60	34	49	0	9	40/58
2003	1140	-	2	46	53	9	0	18	37/61
2008	740	-	0	51	49	8	19	30	36/56
2012	680	-	29	65	6	12	3	3	25/44
2017	1260	-	0	100	0	19	0	10	27/46
2022	1120	-	5	91	4	2	5	7	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	1100	-	9	24	67	56	2	40	38/56
2003	840	-	14	17	69	29	0	41	37/54
2008	520	-	0	0	100	23	54	81	32/49
2012	340	-	29	65	6	18	0	0	32/51
2017	580	900	41	59	0	17	14	0	38/60
2022	800	-	25	70	5	23	3	23	-/-
Cercocarpus ledifolius^P -- (curl-leaf mountain mahogany)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	23/42
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
1998	20	-	0	100	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	28/35
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	20	-	0	100	0	0	0	0	25/30
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum^P -- (slender buckwheat)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	21/57
2017	320	-	0	100	0	13	0	0	15/10
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa -- (rubber rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	66/74
2022	20	-	0	100	0	0	0	0	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	40	-	0	100	0	0	0	0	24/24
2003	-	-	-	-	-	-	-	-	16/13
2008	-	-	-	-	-	-	-	-	17/26
2012	-	-	-	-	-	-	-	-	21/30
2017	80	-	0	100	0	0	0	0	32/45
2022	120	-	0	100	0	0	0	0	-/-
Juniperus osteosperma^t -- (Utah juniper)									
1998	80	40	50	50	0	0	0	0	-/-
2003	100	-	60	40	0	0	0	0	-/-
2008	140	-	43	57	0	0	14	14	-/-
2012	80	20	75	25	0	0	0	0	-/-
2017	60	-	100	0	0	0	0	0	-/-
2022	120	20	83	17	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
1998	60	20	67	33	0	0	0	0	20/30
2003	40	-	0	100	0	0	0	0	14/36
2008	60	-	0	100	0	0	0	0	16/68
2012	40	-	0	100	0	0	0	0	12/25
2017	40	-	0	100	0	0	0	0	11/19
2022	40	-	0	100	0	0	0	0	-/-
Pinus edulis^t -- (twoneedle pinyon)									
1998	80	20	0	100	0	0	0	0	-/-
2003	120	20	33	67	0	0	0	0	-/-
2008	160	40	38	63	0	0	0	0	-/-
2012	60	-	67	33	0	0	0	33	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1998	760	40	5	87	8	37	0	5	56/110
2003	420	-	5	71	24	43	48	0	67/151
2008	420	-	0	76	24	24	76	57	63/129
2012	580	20	17	83	0	62	14	0	44/83
2017	1040	-	4	96	0	14	56	0	50/87
2022	800	-	0	90	10	25	40	20	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

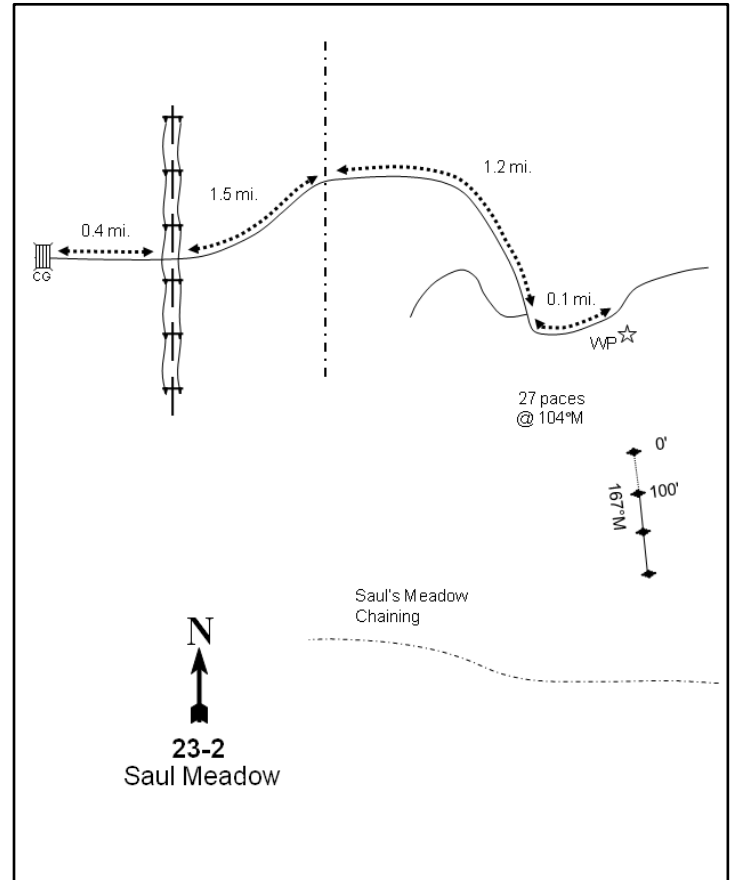
Table 23-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	213	-	-	-	-	-	22.4
2003	197	-	15	20	20	45	17.8
2008	165	10	5	25	30	30	30.9
2012	86	30	50	20	-	-	12.3
2017	36	53	47	-	-	-	3.0
2022	71	42	58	-	-	-	2.2
Pinus edulis (twoneedle pinyon)							
1998	144	-	-	-	-	-	12.1
2003	119	5	15	35	25	20	13.6
2008	124	6	11	39	22	22	18.4
2012	41	50	36	14	-	-	3.0
2017	11	50	50	-	-	-	1.8
2022	16	57	43	-	-	-	2.3

Table 23-01.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	10.7	4.8	3.4	21.8	-0.3	1.7	0.0	42.1	Poor
2003	9.0	4.0	2.4	14.1	0.0	0.7	0.0	30.2	Very Poor
2008	10.9	4.8	0.0	13.4	-0.1	0.9	0.0	30.1	Very Poor
2012	8.1	14.6	9.9	19.6	-0.1	7.5	0.0	59.7	Fair
2017	16.0	15.0	2.5	30.0	-0.6	6.3	0.0	69.1	Fair-Good
2022	15.8	12.7	1.7	30.0	-0.2	0.4	0.0	60.4	Fair

SAUL MEADOW - STUDY NO. 23-2

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Water Creek Canyon N; Township 24S, Range 2W, Section 15
NAD 83 UTM ZONE 12, 413149 East 4284873 North

Transect Information

Browse Tag # (0' Stake)	517
Transect Bearing	167° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft & 95ft), Line 3 (59ft)
Belt Marker Placement	Standard

Directions to Site

Starting from the Annabella Cemetery, drive northeast for 0.1 miles to a cattle guard. Bear left and continue 0.4 miles, crossing under a powerline. Proceed for 1.5 miles to the BLM boundary sign, then 1.2 miles more to a fork in the road. Continue straight for 0.1 miles on the main road to a green and yellow fencepost on the right (south) side of the road. The rebar marking the 0-foot end of the frequency baseline is 27 paces at 104 degrees magnetic from the green and yellow fencepost, which marks the start of a pellet transect.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALLS MEADOW
Elevation	6,110ft (1,862m)
Aspect	Northeast
Slope	3-6%
Sample Dates	07/27/1998, 07/14/2003, 08/19/2008, 08/06/2012, 06/15/2017, 06/01/2022

Table 23-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast Before	Maple Creek Seeding	-	May 1965	540
Hand Crew - Lop and Scatter	Sauls Meadow Thinning	-	April 2003	331
Chaining - Two-Way Unknown	Maple Creek Seeding	-	May 1965	540
Seeding - Aerial Before	Maple Creek Seeding	-	May 1965	540

Table 23-02.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Maple Creek Seeding			Aerial	May 1965	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		7.04	0.00

Mix Name			Application Type	Application Date	Acres
Maple Creek Seeding			Broadcast	May 1965	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet		0.50	0.00
S	Atriplex canescens	Fourwing Saltbush		0.50	0.00
S	Cercocarpus ledifolius	Curlleaf Mountain Mahogany		0.13	0.00
S	Cercocarpus montanus	True Mountain Mahogany		0.13	0.00
S	Ephedra viridis	Greenleaf Ephedra		0.13	0.00
S	Krascheninnikovia lanata	Winterfat		0.13	0.00
S	Purshia tridentata	Bitterbrush		0.50	0.00

Wildlife Habitat and Vegetation History**Table 23-02.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 23-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Annual Grass	Phase I
2003	Mountain Big Sagebrush	Phase I
2008	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Annual Grass-Forb	Phase I

Site Notes

No Notes

Soils**Table 23-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.6	62.0	19.4	18.6	1.2	8.6	115.2	0.5	07/27/1998

Site Potential

1981 - 2010 Average Annual Precipitation 10 inches

NRCS Ecological Site Upland Loam (Bonneville Big Sagebrush)

NRCS Ecological Site # R028AY310UT

States and Transitions

1985-2008 - Seeded Range State: Community Phase 5.2

2012-2022 - Yellow rabbitbrush/Invasive Annuals State: Community Phase Undefined

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species on this site since the study was established in 1985, although density and recruitment of young has exhibited an overall decrease over the study period. Utah juniper (*Juniperus osteosperma*) trees have been scattered throughout the site in each study year, but woodland succession has never exceeded Phase I: this is likely due (in part) to a lop and scatter treatment that took place between 1998 and 2003 (Table 23-02.1, Table 23-02.4, Table 23-02.12, Table 23-02.13, Table 23-02.14). The herbaceous understory is depauperate in species diversity. The introduced annual grass cheatgrass (*Bromus tectorum*) has been the most abundant herbaceous species in many sample years and was a co-dominant site component in 1998, 2012, 2017, and 2022; the abundance of cheatgrass increases fuel loads on this study site (Table 23-02.10). Forbs have remained rare in most sample years. However, cover of the introduced annual forb species desert madwort (*Alyssum desertorum*) increased significantly in 2022, and it became a co-dominant herbaceous species along with cheatgrass in that sample year (Table 23-02.7, Table 23-02.7.11) (USDA-ARS Jornada Experimental Range, 2022). Without a disturbance event, this site will likely remain in this ecological state in future sample years.

Trend Summary Tables**Table 23-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	12.7	-	2.0	-	-	-
2003	14.7	-	-	12.0	0.1	-
2008	8.6	0.0	-	12.0	0.1	-
2012	11.7	-	-	16.6	-	-
2017	13.4	0.0	-	13.4	-	-
2022	13.6	-	-	14.5	-	-

Table 23-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	298	159	5	2	11.6	7.4	0.0	0.0
2003	257	161	42	-	5.9	7.2	0.7	-
2008	341	149	86	-	5.6	8.0	0.2	-
2012	352	189	247	-	10.3	8.4	0.6	-
2017	455	117	388	-	31.9	3.0	3.9	-
2022	415	97	422	2	16.3	3.0	11.5	0.0

Table 23-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	21.8	1.9	45.3	7.9	4.0	31.3
2003	34.3	1.6	36.5	8.4	4.6	27.2
2008	21.6	0.5	56.5	12.2	3.1	22.8
2012	28.3	1.4	35.0	12.1	4.0	33.3
2017	25.8	0.2	55.1	6.6	2.8	48.8
2022	31.9	0.6	39.0	6.8	2.7	42.7

Table 23-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	50	10	55
2003	2	36	3	68
2008	1	47	11	80
2012	1	20	22	51
2017	-	28	-	50
2022	1	20	3	21
Year	Days Use Per Acre (ha)			
1998	3.6 (9.0)	99.2 (245.0)	18.1 (44.7)	-
2003	1.5 (3.6)	59.0 (145.7)	10.0 (24.8)	-
2008	-	85.1 (210.2)	15.4 (38.1)	-
2012	-	47.6 (117.5)	39.6 (97.7)	-
2017	1.5 (3.6)	23.4 (57.9)	5.3 (13.2)	-
2022	3.6 (9.0)	69.0 (170.5)	2.7 (6.6)	-

Table 23-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	<i>Achnatherum hymenoides</i> (Indian ricegrass)	<i>Agropyron cristatum</i> ⁱ (crested wheatgrass)	<i>Bromus tectorum</i> ^{ai} (cheatgrass)	<i>Elymus elymoides</i> (squirreltail)	<i>Vulpia octoflora</i> ^a (sixweeks fescue)
year	Nested Frequency				
1998	-	148	298	11	-
2003	-	152	257	12	7
2008	-	136	341	13	-
2012	-	180	352	11	-
2017	-	103	455	17	-
2022	3	86	415	10	-
year	Average Cover (%)				
1998	-	7.0	11.6	0.5	-
2003	-	6.9	5.9	0.3	0.0
2008	-	7.5	5.6	0.5	-
2012	-	8.2	10.3	0.2	-
2017	-	2.6	31.9	0.5	-
2022	0.1	2.8	16.3	0.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chamaesyce (sandmat)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)
year	Nested Frequency										
1998	2	-	2	-	-	-	-	3	-	-	-
2003	5	14	-	-	-	-	-	3	-	21	-
2008	75	9	-	-	-	-	-	2	-	2	-
2012	247	15	-	-	-	3	-	-	-	14	-
2017	388	5	-	-	-	-	13	-	-	-	-
2022	421	12	-	1	1	-	12	4	3	1	1
year	Average Cover (%)										
1998	0.0	-	0.0	-	-	-	-	0.0	-	-	-
2003	0.0	0.1	-	-	-	-	-	0.0	-	0.6	-
2008	0.2	0.0	-	-	-	-	-	0.0	-	0.0	-
2012	0.6	0.0	-	-	-	0.0	-	-	-	0.0	-
2017	3.6	0.0	-	-	-	-	0.3	-	-	-	-
2022	11.3	0.0	-	0.0	0.0	-	0.2	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1998	-	-	-	-
2003	12	-	-	0.1
2008	12	-	-	0.1
2012	16.6	-	-	-
2017	13.4	-	-	0
2022	14.5	-	-	-
year	Quadrat Cover (%)			
1998	12.7	-	2.0	-
2003	14.7	-	-	0.0
2008	8.4	0.1	-	0.0
2012	11.7	-	-	-
2017	13.4	-	-	0.0
2022	13.6	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	2840	40	9	47	44	45	4	15	61/80
2003	3060	40	31	41	28	12	1	13	61/80
2008	2740	-	10	54	37	19	46	26	58/82
2012	2620	-	4	78	18	24	48	14	64/86
2017	2420	-	2	73	26	36	39	20	63/89
2022	2160	20	7	69	24	38	19	24	- / -
Atriplex canescens^p -- (fourwing saltbush)									
1998	-	-	-	-	-	-	-	-	- / -
2003	40	-	0	100	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	40	-	0	100	0	0	0	0	14/21
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	46/67
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
1998	60	-	0	100	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
1998	80	-	0	75	25	0	0	25	11/15
2003	40	-	0	100	0	0	0	0	14/36
2008	60	-	0	67	33	0	0	33	15/50
2012	40	-	0	100	0	0	0	0	13/31
2017	80	-	0	100	0	0	0	0	13/32
2022	80	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

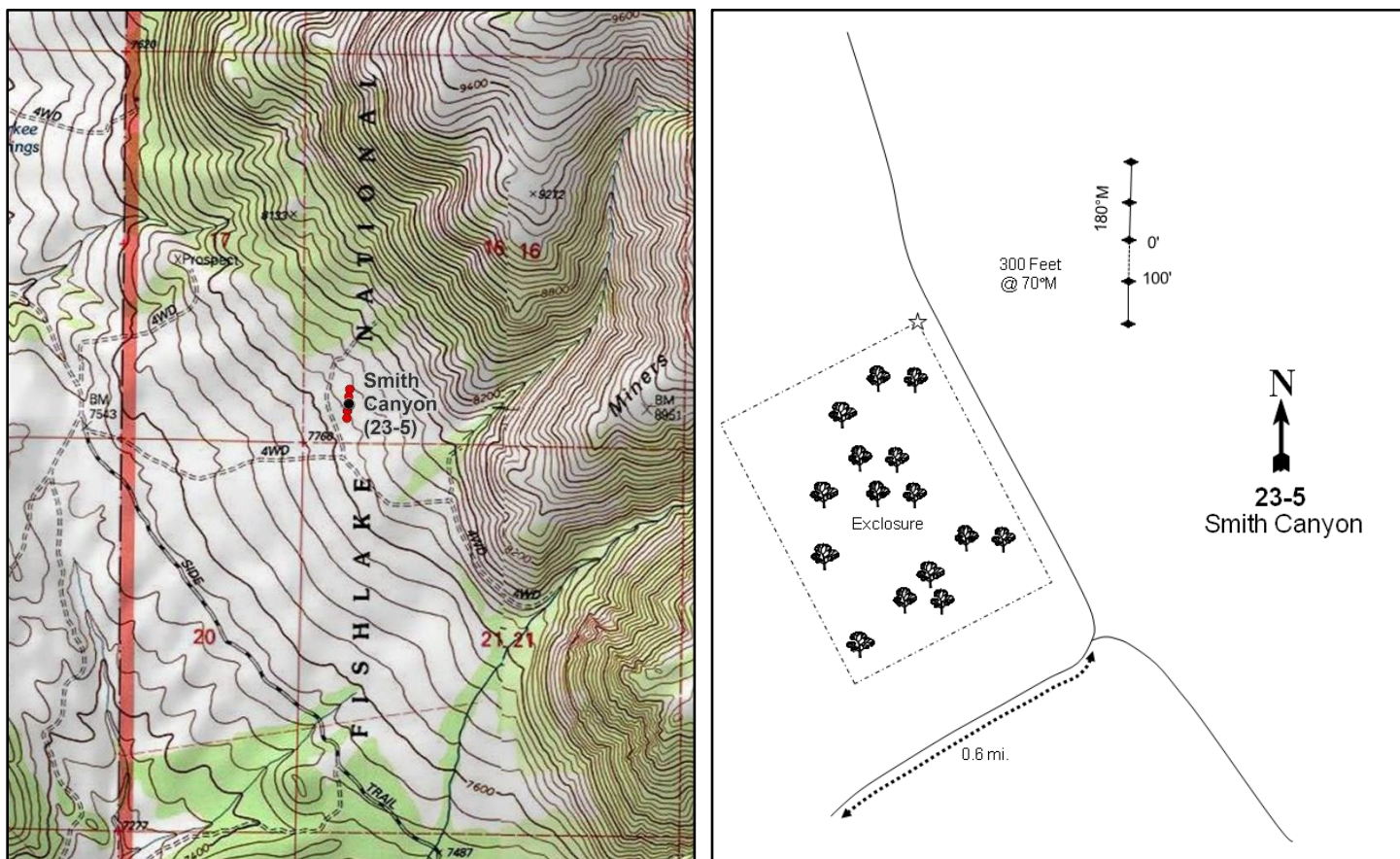
Table 23-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	12	-	-	-	-	-	11.6
2008	4	-	100	-	-	-	5.7
2017	5	-	33	67	-	-	7.3
2022	4	-	-	100	-	-	9.3

Table 23-02.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	15.9	1.7	4.3	14.9	-8.7	0.0	0.0	28.1	Very Poor
2003	15.0	6.6	15.0	14.3	-4.4	0.0	0.0	46.5	Poor
2008	15.0	4.1	4.8	16.0	-4.2	0.0	0.0	35.6	Very Poor-Poor
2012	20.8	9.5	1.9	16.9	-7.7	0.0	0.0	41.3	Poor
2017	16.8	7.3	0.9	6.1	-20.0	0.0	0.0	11.0	Very Poor
2022	18.1	7.8	3.7	6.0	-12.2	0.1	0.0	23.5	Very Poor

SMITH CANYON - STUDY NO. 23-5

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Marysville NE; Township 27S, Range 2W, Section 16
NAD 83 UTM ZONE 12, 401130 East 4257287 North

Transect Information

Browse Tag # (0' Stake)	7043
Transect Bearing	180° magnetic (Lines 3-4: 360° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 5ft

Directions to Site

From the intersection of Main Street (SR-89) and Center Street in Marysville, turn east and proceed for 0.7 miles, crossing a bridge. At a three-way split in the road, stay left and continue for 1.9 miles. Keep right and drive for 0.8 miles. Stay right at the split, then immediately continue to the right again. Proceed for another 0.8 miles and make a left turn: continue for 2.75 miles up this road to a "T" intersection. Turn right and go 1.0 miles to a cattle guard. Make a hard left turn here and drive 0.1 miles, then turn right and continue for 0.6 miles to an enclosure. Turn north (left) and go along the east side of a cattle enclosure. From the northeast corner of the enclosure, walk 300 feet at 70 degrees (in line with the north side fence) to the start of the baseline. The 0-foot end is marked by a fencepost with browse tag #7043 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Marysvale Peak Allotment
Elevation	7,850ft (2,393m)
Aspect	Southwest
Slope	5-10%
Sample Dates	07/13/1998, 07/21/2003, 08/15/2008, 08/07/2012, 06/12/2017, 06/01/2022

Table 23-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Fire - Wildfire	Blackbird Mine WFU	-	June 2006	1464
Seeding - Aerial Unknown	Monroe Mountain Burn Stabilization	598	July 2006	1468

Wildlife Habitat and Vegetation History**Table 23-05.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 23-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Annual Grass	Phase I
2008	Annual Grass	No Encroachment
2012	Mountain Big Sagebrush/Annual Grass	No Encroachment
2017	Mountain Big Sagebrush/Annual Grass	No Encroachment
2022	Mountain Big Sagebrush	No Encroachment

Site Notes

Wildlife use the area in the winter, but tracks and sightings indicate that use is common year-round. A dixie harrow pipe was found near the site during the 2022 reading.

Soils**Table 23-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4	07/13/1998

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

From 1985 through the 2003 sample year, this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a minor component of other shrub species. Twoneedle pinyon (*Pinus edulis*) trees, although rare, were present during this time period, placing the site in Phase I of woodland succession (Photos, Table 23-05.4, Table 23-05.12, Table 23-05.13). A wildfire in 2006 removed the trees and nearly all of the browse (Table 23-05.1). The introduced annual grass species cheatgrass (*Bromus tectorum*) was a co-dominant site component prior to the burn, and was the dominant vegetation in the 2008 sample year. Sagebrush began to recover following rehabilitation efforts, and was co-dominant with cheatgrass in both 2012 and 2017. Although sagebrush is still abundant as of the most recent sampling, density decreased significantly between 2017 and 2022 (Table 23-05.12, Table 23-05.13). Cheatgrass decreased in 2022, leaving sagebrush as the sole dominant vegetation component. Although diverse, herbaceous species other than cheatgrass have generally remained rare throughout the duration of the study (Table 23-05.7, Table 23-05.10, Table 23-05.11). Although cover of cheatgrass is low as of 2022, the resiliency of the site could be at risk and the fire regime potentially increased should cheatgrass increase again in the future.

Trend Summary Tables

Table 23-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	31.0	-	-	-	-	-
2003	28.7	-	-	34.5	-	-
2008	0.8	-	-	1.1	-	-
2012	11.5	-	-	15.8	-	-
2017	37.1	-	-	37.2	-	-
2022	42.9	0.0	-	50.8	-	-

Table 23-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	372	252	16	94	10.5	5.0	0.0	2.5
2003	420	136	270	62	17.4	1.5	3.4	1.2
2008	370	40	159	63	18.0	1.2	3.8	5.1
2012	458	45	250	64	30.5	0.7	4.3	0.8
2017	417	59	127	90	27.0	1.2	0.6	1.9
2022	256	32	39	74	4.8	0.6	0.1	0.9

Table 23-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	13.6	0.1	53.9	12.9	2.7	40.5
2003	10.3	0.0	46.0	16.3	2.2	49.6
2008	7.8	-	29.7	36.6	4.0	35.6
2012	5.1	0.0	39.5	18.0	1.0	49.6
2017	18.0	-	56.6	12.7	1.4	59.5
2022	24.1	0.0	37.8	21.3	3.7	47.3

Table 23-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1998	3	34	-	24	-
2003	-	28	-	3	-
2008	3	25	4	16	-
2012	5	12	3	1	-
2017	4	10	-	47	-
2022	3	15	1	6	-
Year	Days Use Per Acre (ha)				
1998	13.8 (34.1)	105.9 (261.5)	0.7 (1.7)	-	1.3 (3.3)
2003	2.9 (7.2)	139.4 (344.3)	6.7 (16.6)	-	-
2008	12.3 (30.5)	24.8 (61.2)	8.7 (21.5)	-	-
2012	18.1 (44.8)	23.4 (57.9)	8.1 (19.9)	-	-
2017	-	10.7 (26.5)	4.7 (11.6)	-	-
2022	7.2 (17.9)	8.1 (19.9)	1.3 (3.3)	-	-

Table 23-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
<i>Bromus tectorum</i> ^{ai} (cheatgrass)	372	29	5	4	30	7	223
<i>Elymus elymoides</i> (squirreltail)	420	38	1	-	34	8	82
<i>Hesperostipa comata</i> (needle and thread)	370	6	-	-	5	-	31
<i>Pleuraphis jamesii</i> (James' galleta)	458	1	-	-	6	-	39
<i>Poa fendleriana</i> (muttongrass)	417	29	-	-	3	-	27
<i>Poa secunda</i> (Sandberg bluegrass)	256	-	-	-	-	-	32
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)							
year	Average Cover (%)						
1998	10.5	0.2	0.2	0.1	0.3	0.0	4.2
2003	17.4	0.4	0.0	-	0.3	0.2	0.6
2008	18.0	0.2	-	-	0.1	-	0.9
2012	30.5	0.0	-	-	0.0	-	0.6
2017	27.0	0.7	-	-	0.0	-	0.5
2022	4.8	-	-	-	-	-	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Agoseris glauca</i> (pale agoseris)	0	3	3	3	-	9	-	-	2	1	-	5	-	2	1	-	-
<i>Alyssum desertorum</i> ^{ai} (desert madwort)	7	11	-	2	-	11	-	-	-	-	-	-	-	96	5	-	-
<i>Arabis</i> (rockcress)	-	43	-	4	-	1	-	-	0	5	-	-	-	57	-	-	-
<i>Astragalus</i> (milkvetch)	-	193	-	3	-	12	-	-	1	-	-	-	-	7	-	-	1
<i>Astragalus cibaricus</i> (browse milkvetch)	13	100	-	-	7	11	6	1	1	12	-	-	2	2	-	4	-
<i>Astragalus convallarius</i> (lesser rushy milkvetch)	6	17	-	-	7	6	3	1	-	17	1	-	-	-	-	1	-
<i>Astragalus lentiginosus</i> (freckled milkvetch)																	
<i>Astragalus purshii</i> (woollypod milkvetch)																	
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)																	
<i>Calochortus nuttallii</i> (sego lily)																	
<i>Ceratocephala testiculata</i> ^{ai} (curvseed butterwort)																	
<i>Chaenactis douglasii</i> (Douglas' dusty maiden)																	
<i>Cirsium</i> (thistle)																	
<i>Collinsia parviflora</i> ^a (maiden blue eyed Mary)																	
<i>Comandra umbellata</i> (bastard toadflax)																	
<i>Crepis acuminata</i> (tapertip hawkbeard)																	
<i>Cryptantha humilis</i> (roundspike cryptantha)																	
year	Average Cover (%)																
1998	0.0	0.0	0.0	0.0	-	0.2	-	-	0.0	0.0	-	0.0	-	0.0	0.0	-	-
2003	0.0	0.1	-	0.0	-	0.2	-	-	-	-	-	-	-	0.7	0.0	-	-
2008	-	0.4	-	0.0	-	0.0	-	-	0.0	0.0	-	-	-	0.1	-	-	-
2012	-	4.1	-	0.0	-	0.1	-	-	0.0	-	-	-	-	0.0	-	-	0.0
2017	0.1	0.4	-	-	0.2	0.4	0.0	0.0	0.2	0.0	-	-	0.0	0.0	-	0.1	-
2022	0.0	0.0	-	-	0.1	0.0	0.0	0.0	-	0.0	0.0	-	-	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata ^a (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lotus utahensis (Utah bird's-foot trefoil)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency																
1998	-	-	22	4	-	-	-	-	-	-	17	19	11	22	-	-	1
2003	-	-	9	13	-	-	-	-	-	-	1	9	202	3	-	-	2
2008	7	-	45	-	3	-	-	74	0	4	0	8	-	-	-	14	1
2012	17	1	46	2	3	-	1	46	-	4	-	0	-	2	1	19	-
2017	-	-	35	-	3	-	-	25	5	4	2	-	14	11	4	5	-
2022	-	-	30	-	17	2	-	5	-	1	-	-	11	8	-	-	-
year	Average Cover (%)																
1998	-	-	0.3	0.0	-	-	-	-	-	-	0.3	1.5	0.0	0.1	-	-	0.0
2003	-	-	0.1	0.1	-	-	-	-	-	-	0.0	0.8	2.6	0.0	-	-	0.0
2008	0.3	-	1.9	-	0.0	-	-	1.1	0.0	0.3	0.0	2.8	-	-	-	1.9	0.0
2012	0.0	0.0	0.5	0.0	0.0	-	0.0	0.1	-	0.0	-	0.0	-	0.0	0.0	0.1	-
2017	-	-	0.6	-	0.0	-	-	0.1	0.0	0.2	0.0	-	0.0	0.0	0.0	0.0	-
2022	-	-	0.5	-	0.0	0.0	-	0.0	-	0.1	-	-	0.0	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested	
1998	-	-
2003	-	-
2008	-	-
2012	1	-
2017	-	-
2022	1	3
year	Average Cover (%)	
1998	-	-
2003	-	-
2008	-	-
2012	0.0	-
2017	-	-
2022	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	28.9	-	-	-	5.5	0.1
2008	1	-	0.1	-	0	-
2012	14.8	-	0.4	-	0.6	-
2017	36.4	-	0.4	-	0.4	-
2022	49.7	-	0.6	-	0.5	-
year	Quadrat Cover (%)					
1998	24.4	-	-	-	6.6	-
2003	25.0	-	-	-	3.7	0.0
2008	0.8	-	0.0	-	0.0	0.0
2012	11.4	-	0.0	0.0	0.1	-
2017	36.4	-	0.1	-	0.4	0.1
2022	42.7	0.0	0.0	-	0.2	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1998	-	-	-	-	-	-	-	-	60/44
2003	-	-	-	-	-	-	-	-	22/23
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	18/33
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1998	3860	-	4	79	18	46	7	6	83/112
2003	3400	-	1	58	41	27	5	7	78/99
2008	1100	-	33	67	0	0	0	0	33/38
2012	17240	5260	91	9	0	0	0	0	49/82
2017	16360	-	27	73	0	6	0	0	54/86
2022	12280	20	37	59	4	11	0	6	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	40	-	0	100	0	0	50	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	41/60
2012	-	-	-	-	-	-	-	-	34/67
2017	20	-	0	100	0	0	0	0	24/14
2022	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Eriogonum microthecum^P -- (slender buckwheat)									
1998	60	-	67	33	0	0	33	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	100	20	60	40	0	60	20	0	10/30
2017	-	-	-	-	-	-	-	-	60/54
2022	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
1998	20	-	0	0	100	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	20	-	0	100	0	0	0	0	38/53
2012	60	-	33	67	0	0	0	0	48/69
2017	100	-	0	100	0	0	0	0	80/82
2022	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
1998	-	-	-	-	-	-	-	-	12/29
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	12/29
2017	-	-	-	-	-	-	-	-	8/60
2022	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
1998	20	-	100	0	0	0	0	0	- / -
2003	20	-	0	100	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
1998	1220	-	15	77	8	26	67	0	55/103
2003	1040	-	0	42	58	15	79	37	47/96
2008	120	-	17	83	0	33	17	0	24/63
2012	120	-	0	100	0	0	100	0	25/76
2017	120	-	0	100	0	0	50	0	30/89
2022	80	-	0	100	0	25	50	0	- / -
Quercus gambelii^P -- (Gambel oak)									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	71/66
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -
Sclerocactus -- (fishhook cactus)									
1998	80	-	0	25	75	0	75	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

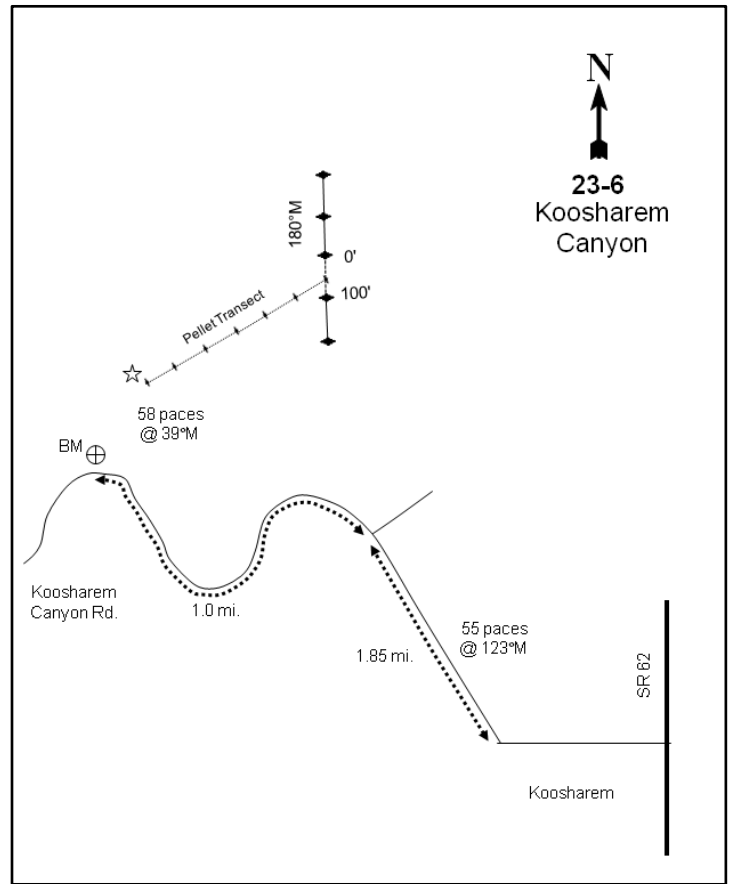
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1998	20	-	0	100	0	0	0	0	32/71
2003	60	-	0	67	33	0	0	33	21/40
2008	20	-	0	100	0	0	0	0	34/64
2012	20	-	0	100	0	100	0	0	32/76
2017	40	-	0	100	0	0	0	50	26/72
2022	20	-	0	100	0	0	100	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	0	100	0	0	0	0	27/33
2008	20	-	0	100	0	0	0	0	34/42
2012	20	-	0	100	0	0	100	0	20/77
2017	20	-	0	0	100	0	0	100	30/72

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-05.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	30.0	10.3	3.0	10.0	-7.9	5.1	0.0	50.5	Poor
2003	30.0	1.9	0.3	3.0	-13.0	2.4	0.0	24.6	Very Poor
2008	1.4	0.0	0.0	2.4	-13.5	10.0	0.0	0.3	Very Poor
2012	19.9	15.0	15.0	1.4	-20.0	1.5	0.0	32.9	Very Poor
2017	30.0	15.0	13.4	2.4	-20.0	3.8	0.0	44.6	Poor
2022	30.0	13.5	15.0	1.3	-3.6	1.8	0.0	58.1	Fair

KOOSHAREM CANYON - STUDY NO. 23-6



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Koosharem SE; Township 26S, Range 1W, Section 20
NAD 83 UTM ZONE 12, 419491 East 4264909 North

Transect Information

Browse Tag # (0' Stake)	7042
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection next to the Koosharem LDS Ward Building, go west for 0.35 miles on Koosharem Mountain Road. Bear right and travel 0.05 miles to a fork. Take the left fork, pass over a small bridge, and proceed for 1.85 miles to another fork. Turn left and go just over 1.0 miles to a hairpin turn that curves to the left. Stop at the apex of the curve: there is a benchmark here on the north side of the road. Take a bearing of 39 degrees and walk 58 feet from the benchmark to find a short yellow rebar that marks a pellet group transect. From the first stake, the pellet group transect runs northeast (62-67 degrees) with stakes at intervals of about 50-60 feet. Count down 7 stakes, then walk due north 50 feet to the baseline starting point. The 0-foot end of the baseline is marked by a steel rebar with browse tag #7042 attached. The baseline runs due south, crossing the pellet group transect.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Koosharem Allotment
Elevation	7,650ft (2,332m)
Aspect	North
Slope	25-30%
Sample Dates	08/03/1998, 08/08/2003, 08/14/2008, 08/08/2012, 06/13/2017, 06/21/2022

Table 23-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Pine Canyon to Koosharem Creek Wildlife Habitat Improvement Project - Phase 2	3868	Between June 2017 and February 2019	1409

Wildlife Habitat and Vegetation History

Table 23-06.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 23-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I
2008	Mixed Mountain Brush	Phase I transitioning to Phase II
2012	Mixed Mountain Brush	Phase I transitioning to Phase II
2017	Mixed Mountain Brush	Phase I transitioning to Phase II
2022	Mixed Mountain Brush	Phase I

Site Notes

Wildlife use appears to be year-round.

Soils

Table 23-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.5	40.0	25.4	34.6	4.2	26.8	243.2	0.6	08/02/1998

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Mixed mountain brush, including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and alderleaf mountain mahogany (*Cercocarpus montanus*), has dominated this site since study establishment in 1985; the overall shrub component has remained very diverse throughout the study period (Photos, Table 23-06.12, Table 23-06.13). Native perennial grasses have been the most abundant herbaceous component in all years. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in small amounts in 2003, 2017, and 2022. Although forbs were diverse in 2022, they have never been abundant (Table 23-06.7, Table 23-06.10, Table 23-06.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees are present on this study site, and it was considered to be within Phase I transitioning to Phase II of woodland succession from 2008 to 2017. A lop and scatter treatment occurred between 2017 and 2019, however, removing some of the trees (Table 23-06.1). The site remains in Phase I of woodland succession as of 2022 (Photos, Table 23-06.4, Table 23-06.14); the extant tree component indicates that there may be potential for infilling in future sample years.

Trend Summary Tables

Table 23-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	28.1	0.3	0.2	-	-	-
2003	28.9	0.8	1.1	26.0	0.6	3.0
2008	23.6	1.4	1.6	36.0	2.1	3.9
2012	29.3	3.0	2.0	35.7	2.8	4.2
2017	26.8	2.0	2.4	28.5	1.2	6.7
2022	25.2	1.0	0.1	32.4	0.3	-

Table 23-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	-	304	18	37	-	12.5	0.1	0.3
2003	1	252	13	18	0.0	6.9	0.0	0.1
2008	-	293	3	56	-	8.8	0.0	0.6
2012	-	305	9	17	-	9.8	0.1	0.1
2017	23	280	100	94	0.2	13.3	0.8	1.3
2022	9	303	61	63	0.0	12.5	0.7	0.4

Table 23-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	23.5	0.0	46.9	14.5	9.5	37.1
2003	19.6	0.2	42.9	7.2	12.1	36.9
2008	21.8	0.0	39.4	6.9	11.8	40.7
2012	16.4	0.1	53.3	5.9	9.3	41.8
2017	34.9	0.0	43.9	3.1	9.7	37.0
2022	27.4	0.0	44.4	5.7	9.5	35.1

Table 23-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	44	8	47
2003	-	42	-	34
2008	-	71	11	77
2012	-	33	1	11
2017	-	37	4	38
2022	-	44	3	19
Year	Days Use Per Acre (ha)			
1998	5.1 (12.6)	63.0 (155.6)	30.8 (76.1)	-
2003	0.7 (1.8)	113.2 (279.7)	2.0 (5.0)	-
2008	3.6 (9.0)	162.8 (402.2)	12.8 (31.5)	-
2012	0.7 (1.8)	63.7 (157.3)	7.4 (18.2)	-
2017	-	231.2 (571.1)	0.7 (1.7)	-
2022	1.5 (3.6)	84.5 (208.6)	7.4 (18.2)	-

Table 23-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1998	20	-	-	2	-	127	-	61	-	5	156	-	35
2003	16	8	-	-	1	65	-	34	-	5	153	-	23
2008	10	15	-	-	-	131	-	55	-	23	166	-	26
2012	17	28	-	2	-	132	-	53	-	21	120	-	28
2017	48	-	2	1	23	116	-	42	3	3	139	5	53
2022	25	5	-	1	9	55	108	63	-	2	125	6	32
year	Average Cover (%)												
1998	0.7	-	-	0.0	-	2.0	-	1.0	-	0.0	8.0	-	0.8
2003	0.2	0.2	-	-	0.0	1.4	-	0.3	-	0.0	3.9	-	0.8
2008	0.8	0.2	-	-	-	2.0	-	0.8	-	0.0	4.2	-	0.9
2012	0.6	1.2	-	0.0	-	1.4	-	0.8	-	0.1	4.8	-	0.8
2017	1.9	-	0.0	0.0	0.2	2.2	-	0.4	0.3	0.0	5.7	0.1	2.7
2022	1.4	0.2	-	0.0	0.0	0.8	1.6	1.4	-	0.0	5.2	0.1	1.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis ^{ai} (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dusty-aiden)	Collinsia parviflora ^a (maiden blue-eyed Mary)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata ^a (western tansymustard)	Dracocephalum parviflorum (American dragonhead)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)
year	Nested Frequency																
1998	15	-	3	-	5	-	-	-	1	2	-	-	4	3	-	-	-
2003	-	6	-	-	-	-	-	-	-	3	-	-	-	-	-	-	11
2008	2	-	11	6	-	7	-	-	-	1	-	-	3	2	-	-	-
2012	7	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
2017	6	1	2	-	-	7	1	-	8	4	-	3	3	10	51	4	44
2022	14	1	4	4	-	3	-	1	-	10	1	-	7	-	14	1	35
year	Average Cover (%)																
1998	0.1	-	0.0	-	0.0	-	-	-	0.0	0.0	-	-	0.0	0.0	-	-	-
2003	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0
2008	0.0	-	0.0	0.1	-	0.0	-	-	-	0.0	-	-	0.1	0.0	-	-	-
2012	0.1	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-
2017	0.0	0.0	0.0	-	-	0.0	0.0	-	0.1	0.0	-	0.0	0.1	0.3	0.2	0.0	0.5
2022	0.1	0.0	0.0	0.0	-	0.0	-	0.0	-	0.1	0.0	-	0.0	-	0.0	0.0	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Orogenia linearifolia (Great Basin Indian potato)	Packera multiflora (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarpos ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{at} (yellow salsify)	Trifolium (clover)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1998	-	-	-	-	8	7	-	1	-	5	-	-	1	-	2	-
2003	-	-	-	5	-	4	-	-	-	-	-	-	-	-	3	-
2008	2	-	-	-	10	16	-	1	-	1	-	-	-	-	11	-
2012	3	-	-	1	-	6	-	5	-	2	-	-	2	-	-	-
2017	4	1	4	3	13	31	3	1	1	4	4	-	-	-	27	1
2022	2	-	1	-	23	11	-	-	-	4	-	3	-	8	-	-
year	Average Cover (%)															
1998	-	-	-	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	-	0.0	-
2003	-	-	-	0.1	-	0.0	-	-	-	-	-	-	-	-	0.0	-
2008	0.0	-	-	-	0.2	0.1	-	0.0	-	0.0	-	-	-	-	0.1	-
2012	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.0	-	-	-
2017	0.0	0.0	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-	-	-	0.2	0.1
2022	0.0	-	0.0	-	0.3	0.0	-	-	-	0.0	-	0.0	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis ^t (twoneedle pinyon)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Sclerocactus (fishhook cactus)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)													
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	0.1	12.4	8.1	-	0.3	0.3	1.7	0.3	-	1.3	1.1	2.8	-	1.2
2008	0.1	16.3	12.8	-	0.8	0.3	2.4	1.3	-	1.5	1.2	2.6	-	2.7
2012	0.7	16.2	11.3	-	1	1.1	2.5	1.8	-	1.7	0.9	2.8	-	2.7
2017	0.2	14.4	9.3	0	-	-	3.9	1.2	-	2.8	0.7	1.8	-	2.1
2022	0.2	15.8	9.1	-	-	0.1	-	0.3	-	-	0.3	2	-	4.9
year	Quadrat Cover (%)													
1998	0.4	16.9	6.7	0.3	0.0	0.4	0.0	0.2	0.0	0.2	0.2	1.5	-	1.8
2003	0.2	15.6	8.1	0.0	0.2	0.3	0.8	0.6	0.0	0.3	0.3	2.7	-	1.7
2008	0.0	13.0	5.9	0.0	0.0	0.4	0.7	1.4	0.0	1.0	0.2	1.4	0.0	2.7
2012	0.2	14.0	8.8	0.0	0.4	0.9	1.4	2.6	-	0.7	1.4	1.7	-	2.2
2017	0.0	13.2	8.6	0.2	0.4	0.2	1.0	1.6	-	1.4	0.7	1.4	-	2.5
2022	0.0	14.1	6.6	-	0.2	0.1	-	0.8	0.0	0.1	0.3	1.3	-	2.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
1998	240	-	33	67	0	25	0	0	64/54
2003	140	-	0	71	29	14	71	29	67/47
2008	40	-	100	0	0	0	0	0	37/41
2012	120	-	33	50	17	33	50	17	64/54
2017	120	-	33	67	0	17	67	33	43/46
2022	360	-	22	61	17	6	39	39	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
1998	3420	60	9	64	26	33	6	3	74/80
2003	4400	-	3	64	33	32	11	7	62/69
2008	4440	60	9	38	54	28	5	49	57/80
2012	4180	320	5	71	24	35	21	20	65/86
2017	3780	140	5	74	21	38	44	20	65/73
2022	4400	20	12	65	23	22	3	29	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
1998	1380	-	13	78	9	49	23	3	91/101
2003	1520	-	4	88	8	18	72	8	83/89
2008	1980	-	22	50	28	39	27	10	76/92
2012	1640	40	11	83	6	35	45	22	82/93
2017	1680	-	2	94	4	19	63	2	62/71
2022	1500	-	3	97	0	35	44	4	- / -
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
1998	160	-	0	100	0	63	0	0	8/25
2003	260	-	0	100	0	39	54	0	16/23
2008	400	-	20	75	5	20	15	5	11/19
2012	160	-	13	88	0	0	63	0	10/19
2017	200	-	20	80	0	0	80	0	7/10
2022	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	140	-	0	86	14	0	0	14	40/34
2003	60	-	0	33	67	0	0	33	35/26
2008	200	-	10	50	40	10	10	10	33/43
2012	260	-	8	85	8	8	0	15	35/36
2017	120	-	0	100	0	0	0	0	35/32
2022	100	-	40	40	20	0	0	20	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
1998	780	-	21	80	0	3	0	0	22/25
2003	860	-	2	91	7	0	2	5	15/14
2008	1060	-	15	81	4	23	0	0	18/20
2012	680	20	9	91	0	9	3	15	18/27
2017	320	-	6	94	0	6	0	0	13/15
2022	60	-	33	67	0	0	0	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
1998	60	20	33	67	0	0	0	0	- / -
2003	100	-	40	60	0	0	0	0	- / -
2008	100	-	60	40	0	0	0	0	- / -
2012	160	20	63	38	0	0	0	13	- / -
2017	120	-	50	50	0	0	0	0	- / -
2022	80	-	75	25	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
1998	60	-	0	100	0	0	0	0	11/17
2003	-	-	-	-	-	-	-	-	-/-
2008	20	-	0	100	0	0	0	0	6/9
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1998	620	20	16	84	0	0	0	13	17/34
2003	940	-	2	98	0	0	0	0	10/24
2008	740	-	3	92	5	0	0	14	15/39
2012	1260	20	2	98	0	5	0	21	15/34
2017	2080	-	0	99	1	4	0	1	12/24
2022	480	-	4	50	46	0	0	58	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
1998	40	-	50	50	0	0	0	0	-/-
2003	20	-	0	100	0	0	0	0	6/8
2008	40	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	5/7
2017	-	-	-	-	-	-	-	-	4/7
2022	20	-	0	100	0	0	0	0	-/-
Pinus edulis^t -- (twoneedle pinyon)									
1998	60	-	33	67	0	0	0	0	-/-
2003	60	-	67	33	0	0	0	0	-/-
2008	40	20	50	50	0	0	0	0	-/-
2012	60	20	33	67	0	0	0	0	-/-
2017	60	-	33	67	0	0	0	0	-/-
2022	40	20	100	0	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1998	180	-	22	78	0	33	22	0	59/88
2003	200	-	0	100	0	30	70	0	47/99
2008	200	-	20	20	60	20	70	40	43/87
2012	180	60	0	89	11	11	89	33	38/70
2017	280	-	0	100	0	7	93	0	36/62
2022	60	-	0	100	0	0	33	0	-/-
Quercus gambelii^p -- (Gambel oak)									
1998	960	80	56	38	6	52	8	0	83/61
2003	940	-	45	53	2	30	28	0	119/80
2008	1840	-	17	63	20	47	16	9	126/111
2012	600	-	20	77	3	13	57	27	94/80
2017	600	-	0	97	3	47	33	3	70/58
2022	800	20	0	85	15	55	15	43	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1998	1540	20	38	61	1	17	0	1	33/53
2003	2240	-	7	91	2	0	2	2	27/39
2008	2320	360	23	50	27	22	1	4	25/43
2012	2220	20	16	83	1	20	3	7	25/34
2017	2560	-	6	94	0	6	6	0	22/31
2022	2980	-	8	92	0	22	6	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

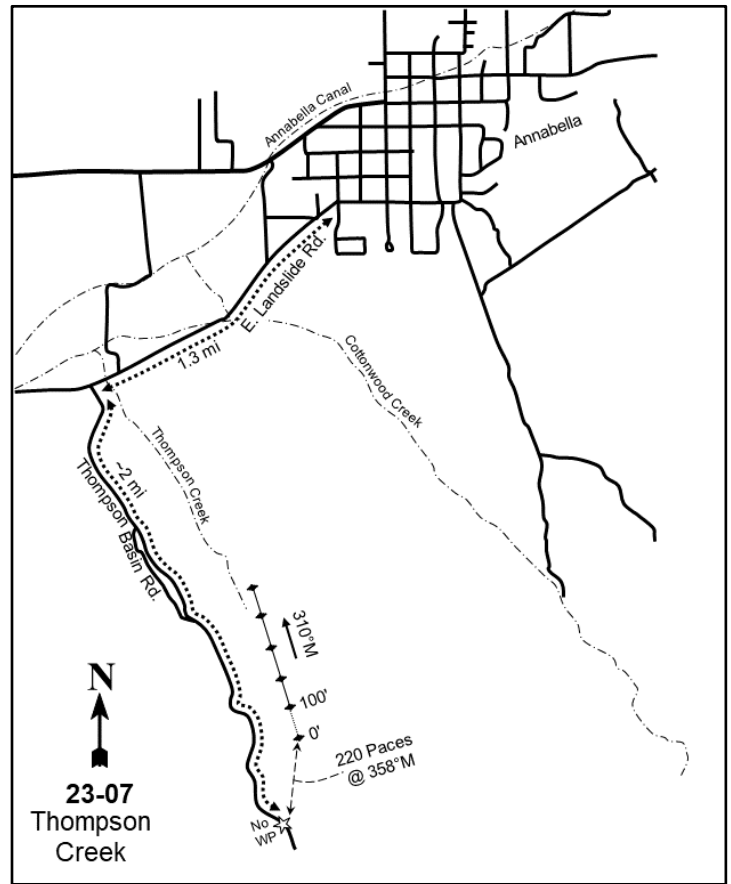
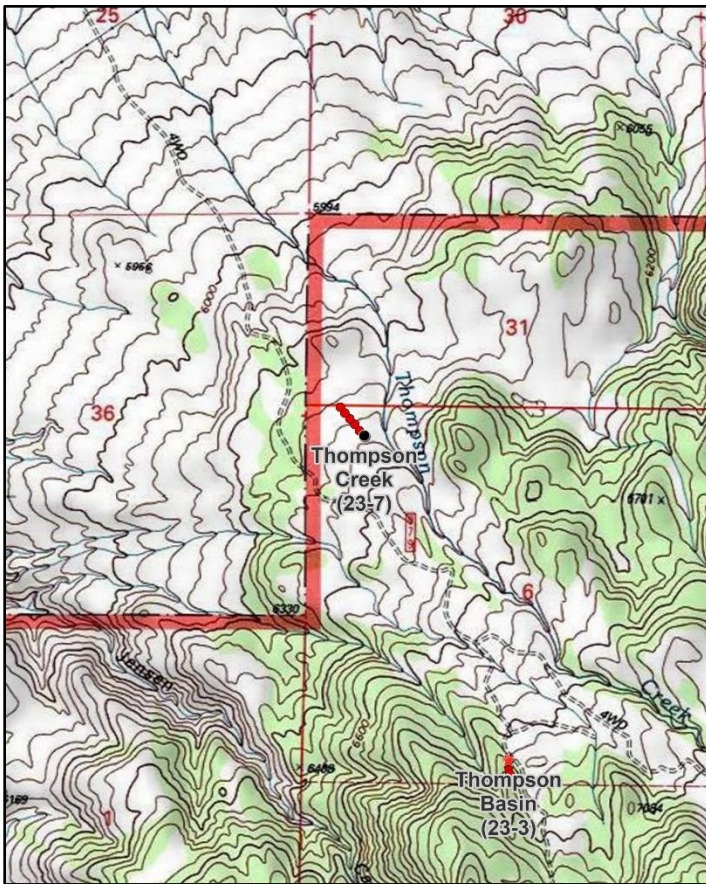
Table 23-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1998	36	-	-	-	-	-	6.0
2003	32	8	8	62	-	23	14.2
2008	39	-	29	29	24	18	12.8
2012	63	12	35	18	29	6	10.4
2017	57	-	33	11	33	22	16.6
2022	38	40	60	-	-	-	2.0
Pinus edulis (twoneedle pinyon)							
1998	31	-	-	-	-	-	6.7
2003	51	8	25	25	25	17	7.6
2008	37	13	13	40	13	20	8.5
2012	64	23	8	15	54	-	6.8
2017	34	-	7	36	14	43	12.5
2022	43	70	20	-	-	10	5.8

Table 23-06.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	30.0	9.5	7.5	25.1	0.0	0.5	0.0	72.7	Good
2003	30.0	9.4	4.0	13.7	0.0	0.2	0.0	57.4	Fair
2008	30.0	3.1	7.9	17.7	0.0	1.2	0.0	59.9	Fair
2012	30.0	10.9	4.8	19.6	0.0	0.2	0.0	65.4	Fair
2017	30.0	11.4	2.0	26.6	-0.2	2.7	0.0	72.5	Good
2022	30.0	11.3	4.1	25.1	0.0	0.8	0.0	71.3	Fair-Good

THOMPSON CREEK - STUDY NO. 23-7



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Annabella SW; Township 25S, Range 2W, Section 06
NAD 83 UTM ZONE 12, 407159 East 4280581 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

514
310° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the town of Annabella, continue for 1.3 miles on East Landslide (may be named Omni Point) Road. Turn left (south) onto Thompson Basin Road and continue for 2.0 miles, passing Thompson Creek, then park. The study site is on the right-hand (north) side of the road, and the 0-foot stake is approximately 220 paces away at 358 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	West
Slope	8-12%
Sample Dates	06/12/2017, 06/02/2022

Table 23-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	216	2005	1115
Chaining - Chain Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History**Table 23-07.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 23-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mountain Big Sagebrush/Annual Grass	Phase I
2022	Mountain Big Sagebrush/Annual Grass	Phase I

Site Notes

A white spike shed was found on site in 2017. In 2022, a domestic sheep was found dead near the site.

Soils**Table 23-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.1	60.2	20.7	19.1	2.9	8.3	427.0	0.5	06/12/2017

Site Potential

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	2017-2022 - Yellow rabbitbrush/Invasive Annuals State: Community Phase Undefined

This site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since the outset of the study in 2017 while a few other shrub species have been present (Table 23-07.12, Table 23-07.13). Utah juniper (*Juniperus osteosperma*) trees were observed in small amounts throughout the sample period, and the study is considered to be within Phase I of woodland succession as of 2022 (Photos, Table 23-07.4, Table 23-07.14). A majority of the herbaceous cover has been provided by the introduced annual species cheatgrass (*Bromus tectorum*), which was a co-dominant site vegetation component in both 2017 and 2022. Although a number of other grass species are present, they are rare in comparison as of 2022. Forbs have remained depauperate in both species composition and quantity. The exception to this, however, was redstem stork's bill (*Erodium cicutarium*), which provided 8% cover in 2022 (Table 23-07.7, Table 23-07.10, Table 23-07.11) (USDA-ARS Jornada Experimental Range, 2022).

Trend Summary Tables

Table 23-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	10.5	1.9	-	13.5	0.9	-
2022	8.5	0.8	-	12.7	0.5	-

Table 23-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	457	289	70	1	41.0	14.9	1.9	0.1
2022	453	147	154	20	32.1	2.9	8.5	0.1

Table 23-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	2.2	-	60.2	8.3	14.2	65.0
2022	8.4	0.0	46.8	10.9	17.5	45.1

Table 23-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2017	3	18	22	23
2022	-	31	7	9
Year	Days Use Per Acre (ha)			
	2017	-	16.8 (41.4)	21.5 (53.0)
2022	0.7 (1.8)	40.2 (99.3)	14.1 (34.8)	-

Table 23-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
2017	9	9	6	457	25	61	1	3	57	199
2022	3	18	13	453	21	13	-	-	5	103
year	Average Cover (%)									
2017	0.0	0.1	0.2	41.0	0.9	2.4	0.0	0.0	1.5	9.9
2022	0.0	0.4	0.1	32.1	0.6	0.1	-	-	0.0	1.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata ^a (western tansymustard)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia inconspicua ^a (shy gilia)	Hymenopappus (hymenopappus)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Mentzelia albicaulis ^{ai} (whitestem blazingstar)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency													
2017	-	-	-	-	-	64	-	1	2	-	-	-	6	-
2022	1	1	11	2	1	118	1	-	-	36	1	17	4	3
year	Average Cover (%)													
2017	-	-	-	-	-	1.8	-	0.1	0.0	-	-	-	0.0	-
2022	0.0	0.0	0.1	0.0	0.0	8.0	0.0	-	-	0.4	0.0	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)		Opuntia polyacantha (plains pricklypear)	
	year	Line Intercept		
2017	13.5	0.9		
2022	12.7	0.5		
year	Quadrat Cover (%)			
2017	10.5	1.9		
2022	8.5	0.8		

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	1740	200	1	75	24	31	23	16	55/91
2022	1460	-	6	74	21	15	7	26	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2017	-	-	-	-	-	-	-	-	96/155
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
2017	1380	-	0	99	1	0	0	1	12/27
2022	580	-	0	90	10	0	0	24	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

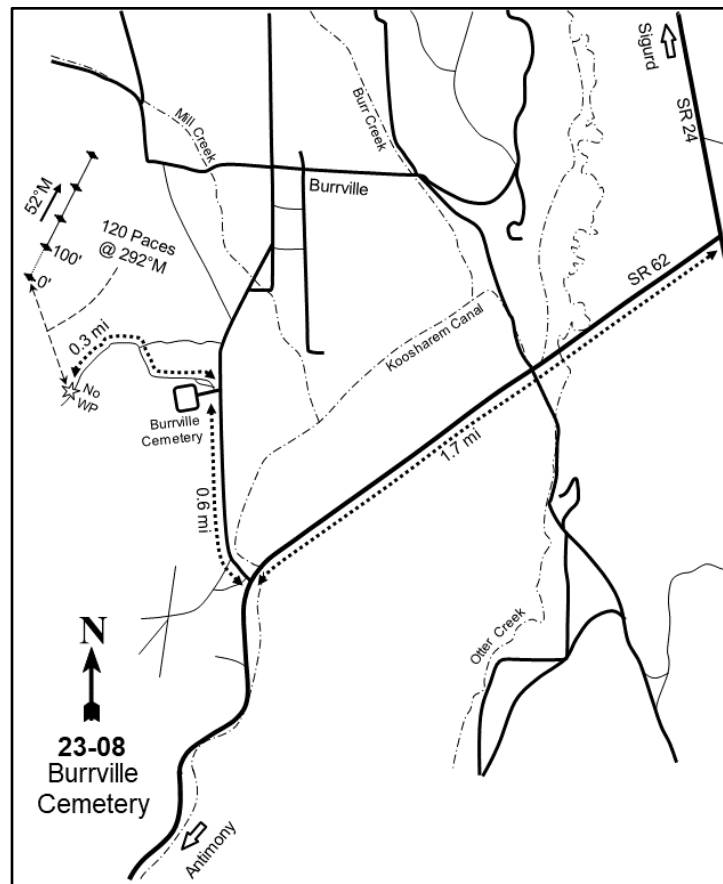
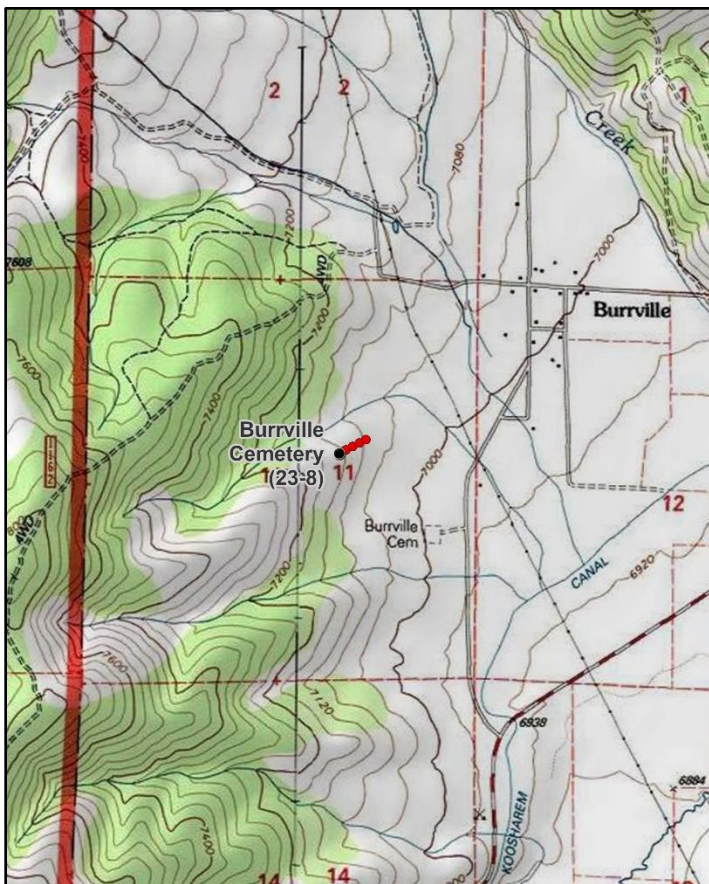
Table 23-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	8	-	67	33	-	-	14.7

Table 23-07.15 - Deer Desirable Components Index: Upland Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	16.9	7.8	0.6	29.9	-20.0	0.3	0.0	35.4	Very Poor-Poor
2022	15.9	8.9	2.8	5.8	-20.0	0.2	0.0	13.4	Very Poor

BURRVILLE CEMETERY - STUDY NO. 23-8



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Burrville NW; Township 26S, Range 1W, Section 11
NAD 83 UTM ZONE 12, 423868 East 4268863 North

Transect Information

Browse Tag # (0' Stake)	575
Transect Bearing	52° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Traveling south on Highway 24, turn right (west) onto Highway 62 and continue for 1.7 miles. Turn right onto East 300 South and proceed for 0.6 miles to a road on the left (west) leading to Burrville Cemetery. Turn right onto a dirt road before reaching the cemetery, continue for 0.3 miles, and park. The study site is 120 paces away from the right (north) side of the road at a bearing of 292 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BURRVILLE
Elevation	7,056ft (2,151m)
Aspect	Northeast
Slope	12%
Sample Dates	06/13/2017, 06/21/2022

Table 23-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Dixie	-	-	Between 2006 and 2009	-
Seeding - Seed Unknown	-	-	Between 2006 and 2009	-
Hand Crew - Lop and Scatter	Burrville Collaboration Ecosystem Restoration Project	5232	July 2020-June 2022	538

Wildlife Habitat and Vegetation History

Table 23-08.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 23-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Perennial Grass/Mountain Big Sagebrush	Phase I
2022	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 23-08.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.9	38.2	36.7	25.1	1.6	3.4	139.0	0.4	06/13/2017

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R034XY308UT
States and Transitions	No state and transition model is available for this ecological site.

This site was established in 2017 and has remained co-dominated by perennial grasses -- mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) -- and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since that time. The percentage of sagebrush plants that were considered to have poor vigor, however, increased 45% between 2017 and 2022. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed in both sample years, but with low cover (Table 23-08.10, Table 23-08.12, Table 23-08.13). Forbs on this site have been somewhat diverse, but a majority of the cover was provided by the introduced annual species desert madwort (*Alyssum desertorum*) in 2022 (Table 23-08.7, Table 23-08.11). Utah juniper (*Juniperus osteosperma*) trees have been present with low density, placing this site in Phase I of woodland succession in both sample years (Table 23-08.4, Table 23-08.14). A lop and scatter treatment (Table 23-08.1) occurred between 2020 and 2022. The extant tree component indicates that infilling could possibly occur over time, but is likely not an immediate concern.

Trend Summary Tables

Table 23-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	6.7	0.0	-	8.1	0.2	-
2022	7.8	0.1	0.0	9.8	0.1	0.1

Table 23-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	281	297	289	33	4.2	20.5	2.7	0.4
2022	110	216	298	24	1.0	20.1	5.0	0.1

Table 23-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	28.3	-	34.7	21.5	5.2	32.5
2022	18.5	-	29.3	37.3	9.7	34.0

Table 23-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2017	8	5	54
2022	8	3	15
Year	Days Use Per Acre (ha)		
2017	10.0 (24.8)	22.1 (54.6)	-
2022	18.1 (44.7)	9.4 (23.2)	-

Table 23-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency											
2017	48	64	281	20	6	62	8	-	30	3	179	64
2022	53	30	110	5	6	11	23	6	25	11	133	-
year	Average Cover (%)											
2017	2.6	2.9	4.2	0.2	0.4	1.6	0.1	-	0.3	0.1	11.6	0.6
2022	2.8	1.5	1.0	0.0	0.2	0.3	2.2	0.0	0.1	0.5	12.6	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Astragalus lentiginosus (freckled milkvetch)	Astragalus piutensis (Sevier milkvetch)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)
year	Nested Frequency																
2017	250	4	7	40	8	-	5	2	2	3	53	1	1	-	1	3	-
2022	261	-	-	114	3	2	7	1	-	-	85	-	1	6	-	8	3
year	Average Cover (%)																
2017	2.4	0.0	0.1	0.1	0.2	-	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-	0.0	0.0	-
2022	4.0	-	-	0.2	0.0	0.0	0.0	0.0	-	-	0.7	-	0.0	0.0	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Trifolium gymnocarpon (hollyleaf clover)
year	Nested
2017	9
2022	-
year	Average Cover (%)
2017	0.0
2022	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
2017	8	0.1	-	0.2
2022	9.7	0.1	0.1	0.1
year	Quadrat Cover (%)			
2017	5.9	0.8	-	0.0
2022	6.9	0.9	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	3360	-	10	88	2	45	35	2	34/46
2022	2620	20	13	66	21	16	1	47	- / -
Bassia prostrata^{pi} -- (forage kochia)									
2017	600	-	7	93	0	7	3	0	10/16
2022	480	-	4	96	0	0	0	0	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	- / -
2022	20	-	100	0	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2017	280	-	14	86	0	0	0	0	11/23
2022	460	-	0	96	4	4	0	9	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

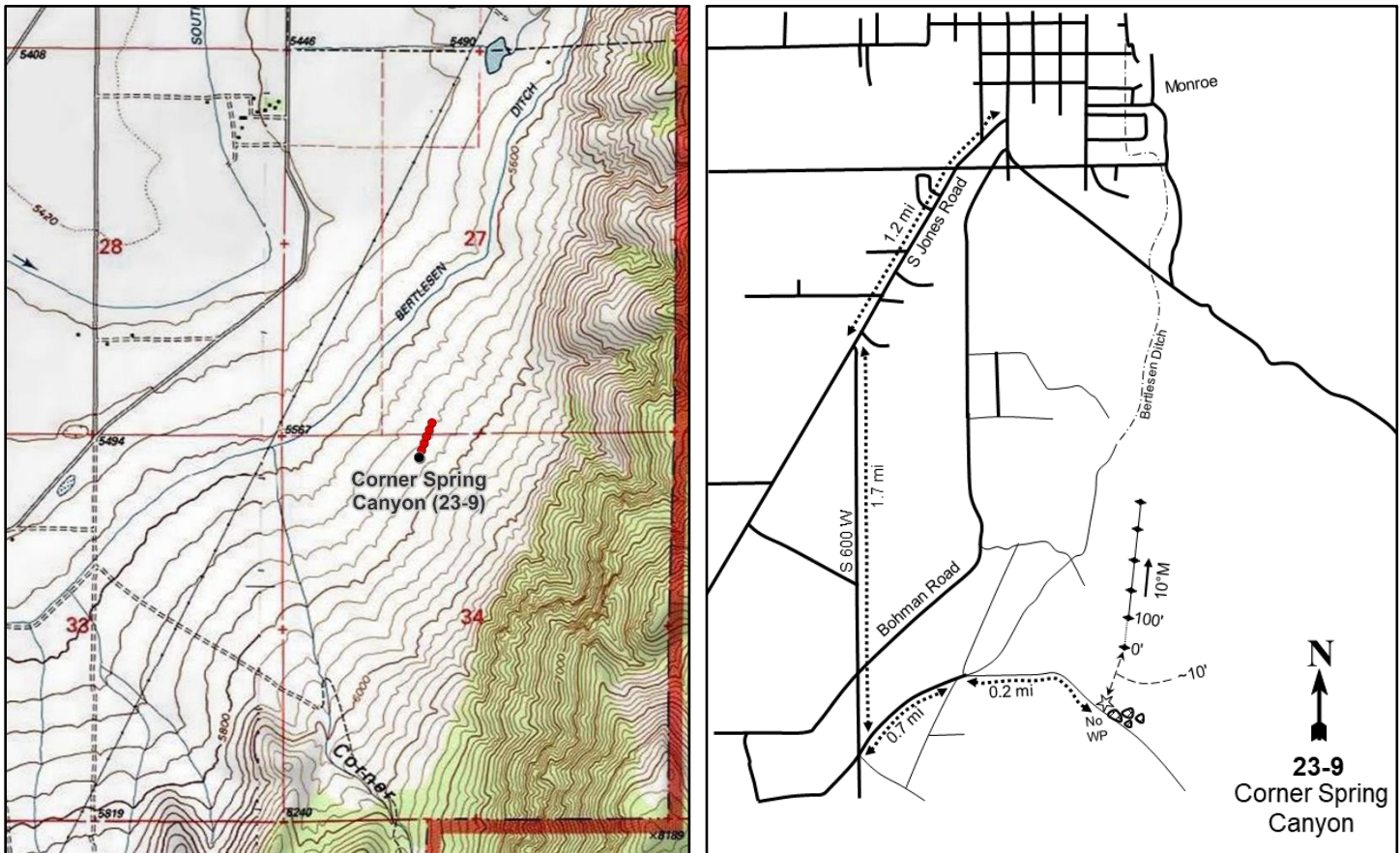
Table 23-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	13	-	100	-	-	-	6.6
2022	12	60	40	-	-	-	2.4

Table 23-08.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	10.2	14.5	5.0	30.0	-3.2	0.7	0.0	57.2	Fair
2022	12.3	8.6	6.5	30.0	-0.7	0.2	0.0	56.9	Fair

CORNER SPRING CANYON - STUDY NO. 23-9

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Monroe Peak NW; Township 25S, Range 3W, Section 34
NAD 83 UTM ZONE 12, 402615 East 4271680 North

Transect Information

Browse Tag # (0' Stake)	574
Transect Bearing	10° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the town of Monroe, travel southeast on Jones Road for 1.2 miles to S 600 W, then turn left. Travel on this road for 1.7 miles, crossing Bertlesen ditch. Turn left onto the service road for the ditch and go for 0.7 miles, crossing through a gate: after the 0.7 miles, turn right at a fenceline. Drive for 0.2 miles and the site will be on the left-hand (north) side of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HUNT
Elevation	5,728ft (1,746m)
Aspect	West
Slope	5-10%
Sample Dates	06/15/2017, 06/02/2022

Wildlife Habitat and Vegetation History**Table 23-09.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
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Table 23-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Annual Grass	Phase I
2022	Annual Grass-Forb	Phase I

Site Notes

No Notes

Soils**Table 23-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.4	60.2	24.7	15.1	1.3	7.7	203.0	0.4	06/15/2017

Site Potential

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	2017-Present - Annual State: Community Phase 4.2

The main browse species on this site is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which has provided little cover since study establishment in 2017. In addition, a majority of the sagebrush plants on this site are decadent, and density decreased between 2017 and 2022 (Table 23-09.12, Table 23-09.13). The site has remained dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*). Cover of cheatgrass has decreased over time, but still remains high at over 22% as of 2022: this study may therefore be subject to consequences of a high fuel load if a wildfire should occur. Perennial grasses and forbs have remained low in quantity and species diversity. The cover and frequency of the introduced annual forb species redstem stork's bill (*Erodium cicutarium*) increased in 2022 while annual forbs were a co-dominant vegetation component along with cheatgrass in that year (Table 23-09.7, Table 23-09.10, Table 23-09.11). Utah juniper (*Juniperus osteosperma*) trees have also been observed with low density. Although the site has remained in Phase I of woodland succession throughout the study period, it may have the potential for further encroachment in the future (Table 23-09.4, Table 23-09.14).

Trend Summary Tables**Table 23-09.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2017	2.2	0.1	-	2.4	0.1	-
2022	1.9	0.2	-	1.6	0.7	-

Table 23-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2017	482	63	83	-	68.8	1.0	1.5	-
2022	446	51	385	3	22.1	0.4	24.2	0.2

Table 23-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	1.9	0.0	44.7	5.1	15.4	74.0
2022	7.1	0.0	53.0	4.0	17.0	44.7

Table 23-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2017	28	1	20
2022	37	2	4
Days Use Per Acre (ha)			
2017	81.7 (201.9)	-	-
2022	89.1 (220.2)	16.1 (39.7)	-

Table 23-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency				
2017	2	482	20	-	42
2022	5	446	40	1	6
year	Average Cover (%)				
2017	0.0	68.8	0.2	-	0.8
2022	0.0	22.1	0.4	0.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Astragalus lentiginosus (freckled milkvetch)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Erodium cicutarium ^{ai} (redstem stork's bill)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumblemustard)
year	Nested Frequency						
2017	4	-	-	73	-	-	7
2022	36	0	10	379	3	3	9
year	Average Cover (%)						
2017	0.0	-	-	1.3	-	-	0.1
2022	0.3	0.1	0.0	23.5	0.0	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover		
2017	2.4	-	0.1
2022	1.6	-	0.7
year	Quadrat Cover (%)		
2017	2.2	-	0.1
2022	1.9	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2017	580	-	3	31	66	7	72	55	46/74
2022	180	-	0	33	67	0	67	44	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
2017	-	-	-	-	-	-	-	-	57/103
2022	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
2017	60	-	0	100	0	0	0	33	16/45
2022	260	-	0	92	8	0	0	8	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

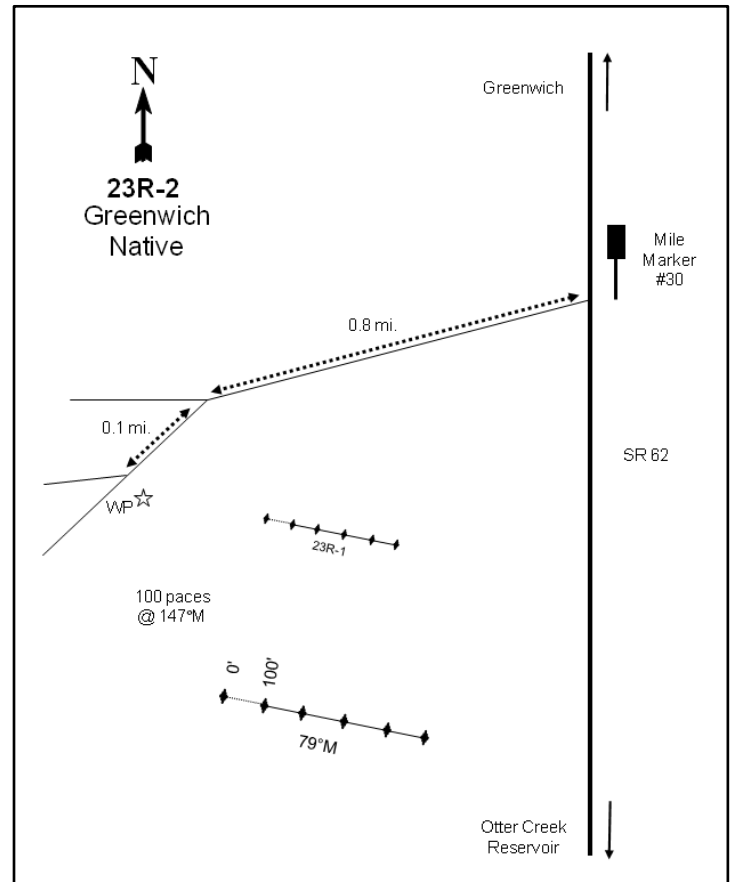
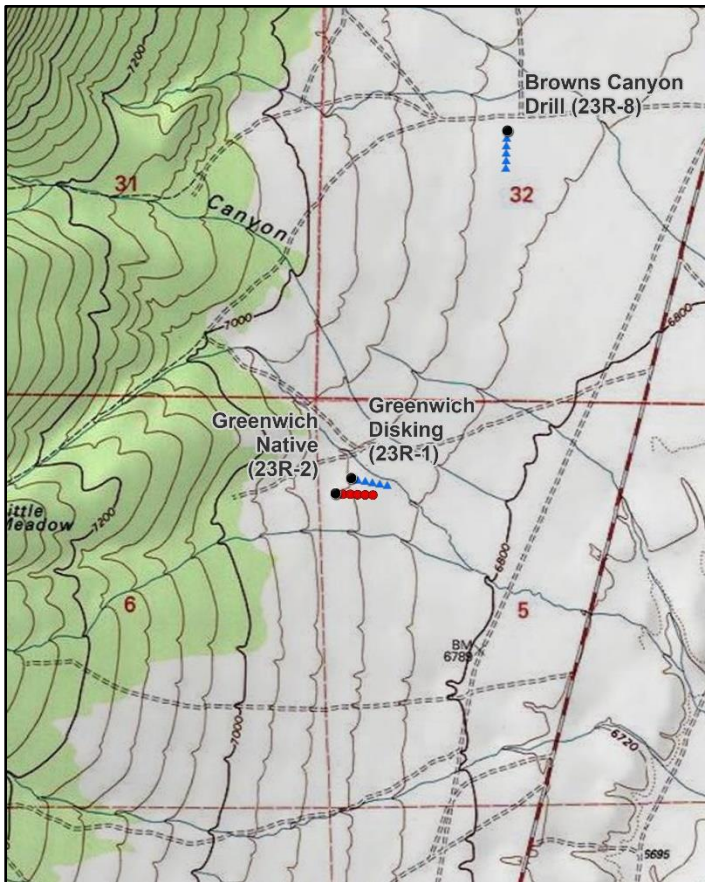
Table 23-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	4	-	50	50	-	-	8.5
2022	8	-	100	-	-	-	12.0

Table 23-09.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	3.0	0.0	0.0	2.1	-20.0	0.0	0.0	-14.9	Very Poor
2022	2.0	0.0	0.0	0.9	-16.6	0.3	0.0	-13.4	Very Poor

GREENWICH NATIVE - STUDY NO. 23R-2

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Greenwich SW; Township 28S, Range 1W, Section 05
NAD 83 UTM ZONE 12, 417908 East 4251535 North

Transect Information

Browse Tag # (0' Stake)	102
Transect Bearing	79° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	No Rebar

Directions to Site

Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west: take this road for 0.8 miles to a fork. Stay right and continue for 0.1 mile to a witness post on the left (south) side of the road. From the witness post, walk 100 paces at 147 degrees magnetic to the 0-foot stake, which is marked with browse tag #102. The study is marked with green, steel fenceposts approximately 12-18 inches in height.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NORTH NARROWS
Elevation	6,870ft (2,094m)
Aspect	Northeast
Slope	6-7%
Sample Dates	08/13/1997, 08/21/2003, 08/10/2004, 06/19/2008, 08/07/2012, 06/12/2017, 06/21/2022

Table 23R-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Two-Way Dixie	Narrows Project	PDB	November 2004	3600
Seeding - Broadcast Before	Narrows Project	PDB	November 2004	3600
Seeding - Aerial Unknown	Narrows Project	PDB	December 2004	1650

Table 23R-02.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Narrows Project			Broadcast	Nov 2004	3600
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass		0.21	0.00
G	Achnatherum hymenoides	Indian Ricegrass		0.50	0.00
G	Agropyron cristatum	Crested Wheatgrass		1.00	0.00
G	Festuca ovina	Sheep Fescue		0.83	0.00
G	Festuca ovina	Sheep Fescue		0.08	0.00
G	Festuca ovina	Sheep Fescue		0.08	0.00
G	Leymus cinereus	Great Basin Wildrye		0.50	0.00
G	Poa secunda	Sandberg Bluegrass		0.17	0.00
G	Poa secunda	Sandberg Bluegrass		0.83	0.00
G	Psathyrostachys juncea	Russian Wildrye		0.17	0.00
G	Psathyrostachys juncea	Russian Wildrye		0.83	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass		2.00	0.00
F	Achillea millefolium	Western Yarrow		0.07	0.06
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.15	0.13
F	Helianthus annuus	Annual Sunflower		0.04	0.03
F	Lactuca serriola	Prickly Lettuce	Sanpete UT	0.01	0.01
F	Linum perenne	Blue Flax		0.43	0.00
F	Linum perenne	Blue Flax		0.56	0.00
F	Medicago sativa	Alfalfa	Ladak +	1.50	1.42
F	Melilotus officinalis	Yellow Sweetclover		1.00	0.00
F	Onobrychis viciifolia	Sainfoin		1.50	1.37
F	Sanguisorba minor	Small Burnet		2.00	0.00
S	Atriplex canescens	Fourwing Saltbush		0.28	0.00
S	Atriplex canescens	Fourwing Saltbush		0.50	0.00
S	Atriplex canescens	Fourwing Saltbush		0.22	0.00

Mix Name			Application Type	Application Date	Acres
Narrows Project Browse			Aerial	Dec 2004	1650
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.33	0.09
S	Bassia prostrata	Forage Kochia	Immigrant	0.67	0.00

Wildlife Habitat and Vegetation History**Table 23R-02.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 23R-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Wyoming Big Sagebrush	No Encroachment
2003	Wyoming Big Sagebrush	No Encroachment
2004	Wyoming Big Sagebrush	No Encroachment
2008	Wyoming Big Sagebrush	No Encroachment
2012	Wyoming Big Sagebrush	No Encroachment
2017	Wyoming Big Sagebrush	No Encroachment
2022	Wyoming Big Sagebrush	No Encroachment

Site Notes

This study was established as a reference site to the Greenwich Disking trend study (23R-1) in 1997.

Soils**Table 23R-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.3	55.3	26.2	18.5	1.2	17.7	147.2	0.4	08/13/1997

Site Potential

1981 - 2010 Average Annual Precipitation 9 inches
 NRCS Ecological Site Semidesert Loam (Wyoming Big Sagebrush)
 NRCS Ecological Site # R047XB222UT
 States and Transitions No state and transition model is available for this ecological site.

This study site has remained in a stable state while in a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) plant community type since establishment in 1997, and other shrubs are rare. Sagebrush density has increased over the study period, but plants that were considered to have poor vigor increased from 20% to 45% between 2017 and 2022 (Table 23R-02.12, Table 23R-02.13). The herbaceous understory, while somewhat diverse, has never been abundant; the introduced perennial grass species Russian wildrye (*Psathrostachys juncea*) and annual forbs western tansymustard (*Descurainia pinnata*) and flatspine stickseed (*Lappula occidentalis*) provided the most cover in 2022. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed for the first time with low abundance in 2017, but was absent in 2022 (Table 23R-02.7, Table 23R-02.10, Table 23R-02.11). Finally, pinyon (*Pinus* sp.) and Utah juniper (*Juniperus osteosperma*) trees have been visible near the transect in site photos in all sample years, but encroachment is not actively occurring.

Trend Summary Tables

Table 23R-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	17.9	0.0	-	-	-	-
2003	20.9	-	-	16.6	-	-
2004	19.7	-	-	21.4	0.1	-
2008	14.3	0.0	-	11.9	-	-
2012	17.5	-	-	21.0	-	-
2017	16.4	-	-	16.8	0.1	-
2022	20.4	-	-	23.3	-	-

Table 23R-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	44	-	2	-	0.6	-	0.0
2003	-	20	1	-	-	0.1	0.0	-
2004	-	10	14	0	-	0.0	0.1	0.0
2008	-	86	25	42	-	1.6	0.1	3.3
2012	-	85	71	9	-	2.5	0.3	0.0
2017	2	102	146	20	0.0	2.7	2.0	0.4
2022	-	95	72	16	-	2.7	0.6	0.0

Table 23R-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	21.4	9.6	19.6	31.3	19.0	19.0
2003	21.7	7.3	22.1	18.0	19.8	21.1
2004	26.9	2.5	27.5	30.8	9.3	19.7
2008	30.0	2.5	39.2	14.9	10.7	18.9
2012	27.0	1.4	39.7	16.7	6.0	19.6
2017	42.4	1.5	33.2	16.6	10.4	19.9
2022	35.7	2.4	28.5	25.0	11.4	23.1

Table 23R-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	3	-	1
2003	-	-	-	64
2004	-	1	-	42
2008	-	-	1	87
2012	1	3	-	22
2017	4	5	1	68
2022	2	14	-	13
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2003	-	-	1.3 (3.3)	-
2004	-	0.7 (1.7)	4.7 (11.6)	-
2008	0.7 (1.8)	-	3.4 (8.3)	-
2012	4.4 (10.8)	0.7 (1.7)	4.7 (11.6)	-
2017	3.6 (9.0)	1.3 (3.3)	3.4 (8.3)	-
2022	8.7 (21.5)	24.8 (61.2)	3.4 (8.3)	-

Table 23R-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)
year	Nested Frequency								
1997	-	-	17	-	27	-	-	-	-
2003	-	-	9	-	11	-	-	-	-
2004	-	-	10	-	-	-	-	-	-
2008	1	-	3	-	38	24	-	-	41
2012	7	23	2	-	29	15	-	7	20
2017	-	7	2	2	46	17	-	11	45
2022	13	-	9	-	28	-	2	4	50
year	Average Cover (%)								
1997	-	-	0.3	-	0.3	-	-	-	-
2003	-	-	0.1	-	0.1	-	-	-	-
2004	-	-	0.0	-	-	-	-	-	-
2008	0.0	-	0.0	-	0.5	0.1	-	-	0.9
2012	0.0	0.7	0.0	-	0.3	0.6	-	0.1	0.8
2017	-	0.0	0.0	0.0	0.6	0.1	-	0.1	1.8
2022	0.1	-	0.2	-	0.7	-	0.0	0.0	1.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 23R-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus lentiginosus (freckled milkvetch)	Cryptantha (cryptantha)	Cryptantha ^a (annual cryptantha)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Oenothera caespitosa (tufted evening primrose)	Orobancha fasciculata (clustered broomrape)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Solanum triflorum ^a (cutleaf nightshade)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)
year	Nested Frequency																
1997	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
2004	-	0	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	1	-	-	-	-	6	41	-	-	1	19	-	-	-
2012	2	2	-	50	2	-	-	-	17	2	-	3	-	3	6	2	-
2017	7	7	-	130	-	-	10	2	46	-	4	-	-	-	2	-	-
2022	1	-	11	54	-	7	-	3	12	-	3	-	-	-	-	-	4
year	Average Cover (%)																
1997	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-
2004	-	0.0	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	0.0	-	-	-	-	0.0	3.3	-	-	0.0	0.0	-	-	-
2012	0.0	0.0	-	0.2	0.0	-	-	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-
2017	0.3	0.2	-	1.6	-	-	0.0	0.0	0.3	-	0.0	-	-	-	0.0	-	-
2022	0.0	-	0.1	0.3	-	0.0	-	0.0	0.2	-	0.0	-	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	unknown perennial forb (unknown forb)
year	Nested
1997	-
2003	-
2004	0
2008	-
2012	-
2017	-
2022	-
year	Average Cover (%)
1997	-
2003	-
2004	0.0
2008	-
2012	-
2017	-
2022	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 23R-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept	
1997	-	-
2003	16.6	-
2004	21.4	0.1
2008	11.9	-
2012	21	-
2017	16.8	0.1
2022	23.3	-
year	Quadrat Cover (%)	
1997	17.9	0.0
2003	20.9	-
2004	19.7	0.0
2008	14.3	0.0
2012	17.5	-
2017	16.4	0.0
2022	20.4	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 23R-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

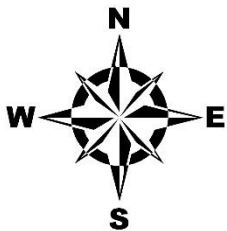
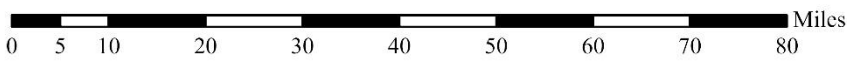
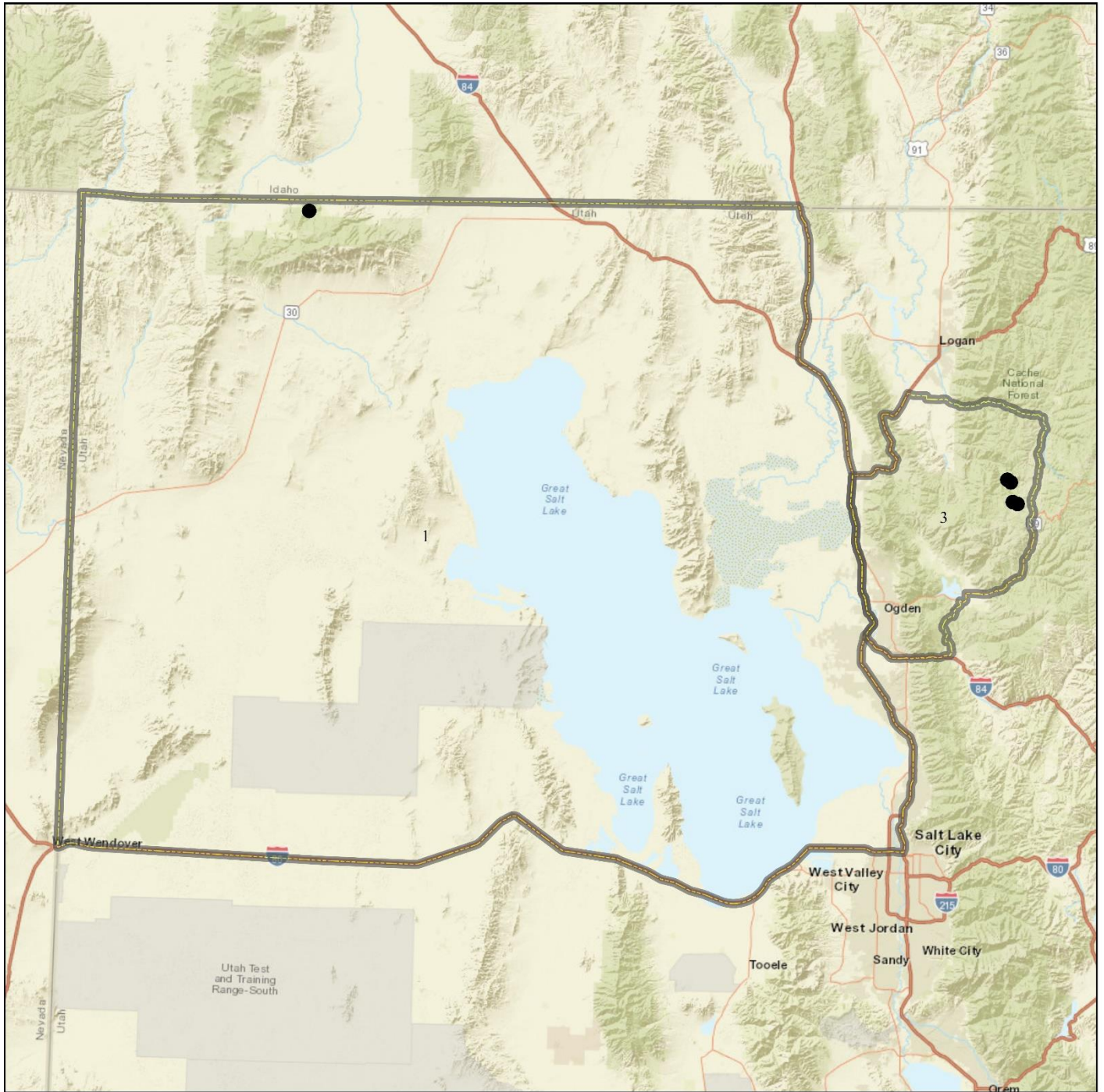
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
1997	3800	160	6	76	18	45	1	8	67/102
2003	4220	-	4	14	82	11	1	40	61/78
2004	4280	5500	4	40	56	2	1	29	62/86
2008	6160	4940	31	40	30	17	17	16	50/67
2012	5400	2400	24	55	21	23	29	34	61/88
2017	5200	160	14	67	19	17	12	20	55/73
2022	5220	20	15	58	26	13	0	45	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	20/17
2004	-	-	-	-	-	-	-	-	25/16
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2022	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	20	-	0	100	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	13/33
2004	20	-	0	100	0	0	0	0	13/39
2008	20	20	0	0	100	0	0	100	12/32
2012	20	-	0	100	0	0	0	0	10/34
2017	60	-	0	100	0	0	0	0	11/19
2022	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

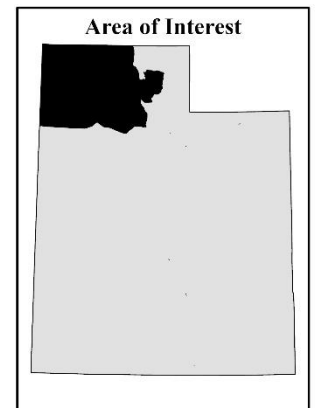
Table 23R-02.15 - Deer Desirable Components Index: Semidesert Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	22.4	9.5	2.9	1.2	0.0	0.1	0.0	36.0	Fair
2003	20.8	-9.6	1.9	0.3	0.0	0.0	0.0	13.3	Poor
2004	26.8	-2.0	1.9	0.1	0.0	0.0	0.0	26.8	Poor-Fair
2008	14.9	6.2	15.0	3.2	0.0	6.5	0.0	45.7	Fair-Good
2012	26.3	8.8	12.2	5.0	0.0	0.1	0.0	52.3	Good
2017	21.0	9.2	6.9	5.4	0.0	0.8	0.0	43.3	Fair-Good
2022	29.1	7.1	7.7	5.4	0.0	0.1	0.0	49.3	Good

NORTHERN REGION – OFF YEAR SITES

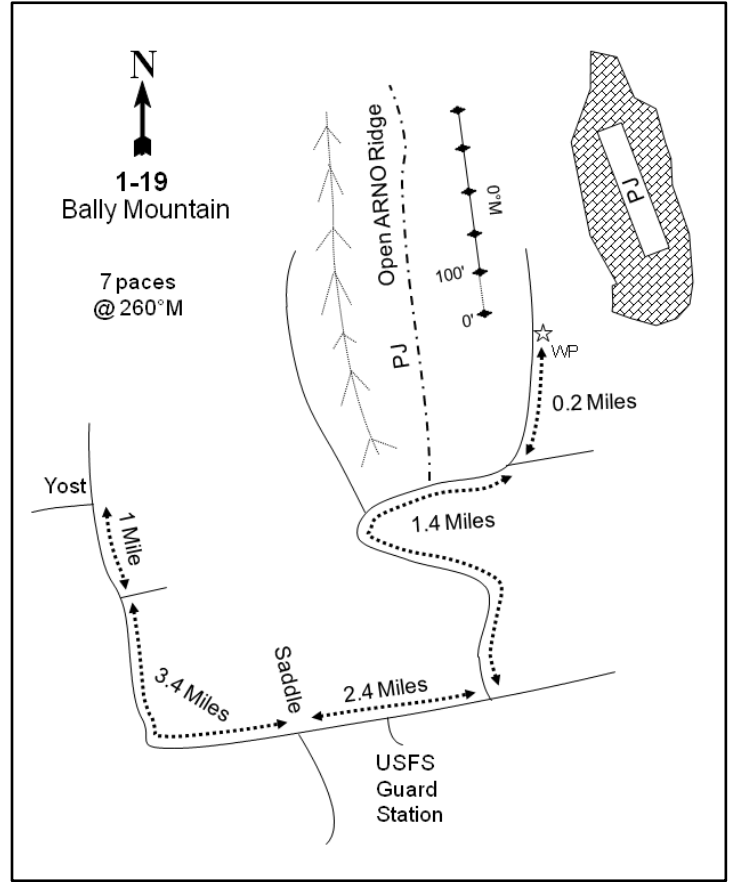


Study Locations	Unit Boundary
● RT, Active	▭ Unit -1 & 3



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

BALLY MOUNTAIN - STUDY NO. 01-19



Location Information

USGS 7.5 min Map Info Standrod NW; Township 14N, Range 14W, Section 04
 GPS (0' Stake) NAD 83 UTM ZONE 12, 296543 East 4649612 North

Transect Information

Browse Tag # (0' Stake) 135
 Transect Bearing 0° magnetic
 Length 500ft
 Belt Placement Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
 Belt Marker Placement Standard

Directions to Site

From the yield sign east of the town of Yost, travel south and then west towards Bally Mountain for 1.0 miles. Stay right and continue for 3.4 miles. Stay left and travel 2.4 miles. Proceed to the left and continue for 1.4 miles, then go right and proceed for 0.2 miles to the witness post. From the witness post, the 0-foot stake is 7 paces away at 260 degrees magnetic and is marked with browse tag #135. The baseline runs at 0 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	7,040ft (2,146m)
Aspect	Southwest
Slope	15%
Sample Dates	06/13/1996, 05/30/2001, 06/05/2006, 06/02/2011, 06/06/2016, 07/18/2022

Table 01-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed Fire	Bally Mountain Prescribed Fire	-	Fall 2003	-

Wildlife Habitat and Vegetation History**Table 01-19.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 01-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Black Sagebrush/Perennial Grass	Phase I
2001	Black Sagebrush/Perennial Grass	Phase I
2006	Perennial Grass	Phase I
2011	Perennial Grass	Phase I
2016	Perennial Grass	Phase I

Site Notes

No Notes

Soils**Table 01-19.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.8	26.7	42.0	31.3	5.0	6.0	297.6	0.7	06/13/1996

Site Potential

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Shallow Gravelly Ridge (Black Sagebrush)
NRCS Ecological Site #	R025XY415UT
States and Transitions	No state and transition model is available for this ecological site.

When the site was established in 1996, the plant community was dominated by black sagebrush (*Artemisia nova*) and a mixture of perennial grasses. A prescribed burn in 2003 reduced the cover of black sagebrush, transitioning the community type to one that is dominated by perennial grass, but black sagebrush has remained prominent site component (Table 01-19.12, Table 01-19.13). Since the fire the herbaceous understory has remained diverse with perennial grasses as the main component with bluebunch wheatgrass (*Pseudoroegneria spicata*) as the dominant species (Table 01-19.7, Table 01-19.10).

Trend Summary Tables**Table 01-19.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.3	4.1	-	-	-	-
2001	17.7	2.5	-	-	-	-
2006	2.3	0.8	-	2.7	0.6	-
2011	1.6	1.3	-	5.3	1.7	-
2016	3.3	14.4	-	5.6	14.6	-
2022	3.9	5.6	-	4.1	6.5	-

Table 01-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	3	394	292	355	0.0	12.3	2.3	12.1
2001	8	419	303	285	0.0	23.2	2.8	7.3
2006	3	417	195	316	0.0	39.3	1.1	9.5
2011	-	403	258	339	-	20.0	2.2	6.8
2016	47	404	324	377	0.8	22.4	2.2	13.1
2022	11	430	411	324	0.2	29.8	4.6	16.5

Table 01-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.2	2.9	28.9	11.3	6.5	44.1
2001	9.2	2.7	23.2	11.4	1.5	62.6
2006	19.4	1.0	18.5	17.0	5.1	49.8
2011	18.6	1.7	17.3	18.0	4.8	37.3
2016	12.2	1.0	24.9	14.2	5.2	57.0
2022	23.5	0.1	17.9	22.6	5.5	56.1

Table 01-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1996	3	13	2
2001	2	2	1
2006	-	3	4
2011	15	1	-
2016	9	-	4
2022	5	-	-
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	10.2 (25.1)	6.0 (14.9)	-
2006	-	4.7 (11.6)	-
2011	29.8 (73.5)	1.3 (3.3)	-
2016	18.1 (44.8)	-	-
2022	68.3 (168.6)	6.0 (14.9)	-

Table 01-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	14	3	2	-	-	-	64	-	301	334
2001	-	8	-	-	-	-	100	-	259	367
2006	3	3	-	6	-	-	188	-	277	359
2011	-	-	-	7	2	-	190	-	240	319
2016	-	47	-	30	51	-	145	-	240	339
2022	2	11	-	0	163	3	124	4	115	356
year	Average Cover (%)									
1996	0.3	0.0	0.0	-	-	-	1.1	-	4.6	6.3
2001	-	0.0	-	-	-	-	2.2	-	4.7	16.3
2006	0.0	0.0	-	0.2	-	-	8.0	-	5.6	25.5
2011	-	-	-	0.2	0.1	-	4.7	-	5.4	9.7
2016	-	0.8	-	0.4	2.1	-	3.6	-	4.3	12.1
2022	0.0	0.2	-	0.0	13.0	0.1	3.0	0.0	1.7	11.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 01-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria microphylla (littleleaf pussytoes)	Arabis puberula ^a (silver rockress)	Arenaria fendleri (Fendler's sandwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	4	2	-	6	37	160	117	-	-	-	11	36	13	-	3	275	2
2001	4	8	-	10	10	84	51	-	-	-	17	55	19	3	4	293	6
2006	7	3	1	12	10	161	84	-	5	-	5	-	71	10	6	117	3
2011	9	6	-	50	30	54	24	-	6	-	12	1	175	-	4	149	4
2016	18	4	98	47	32	150	124	1	21	74	15	-	244	-	2	94	23
2022	9	2	274	45	3	122	51	-	24	41	15	-	359	-	0	30	11
year	Average Cover (%)																
1996	0.0	0.0	-	0.1	0.1	1.0	1.5	-	-	-	0.0	0.2	0.2	-	0.0	1.8	0.0
2001	0.2	0.0	-	0.1	0.0	0.4	0.3	-	-	-	0.3	0.5	0.2	0.0	0.0	2.6	0.0
2006	0.1	0.0	0.0	0.3	0.1	2.2	0.3	-	0.0	-	0.0	-	0.3	0.0	0.2	0.2	0.0
2011	0.0	0.0	-	0.5	0.1	0.2	0.1	-	0.0	-	0.1	0.0	1.4	-	0.0	0.4	0.0
2016	0.1	0.0	0.3	0.9	0.1	0.8	1.9	0.0	0.1	0.2	0.3	-	1.0	-	0.0	0.2	0.1
2022	0.1	0.0	1.3	1.4	0.0	0.9	0.3	-	0.1	0.1	0.1	-	2.5	-	0.0	0.1	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis intermedia (limestone hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Eriogon pumilus (shaggy fleabane)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
1996	7	2	21	4	-	-	54	-	-	30	4	55	-	5	4	-	48
2001	-	-	-	-	-	-	24	-	-	1	11	6	-	7	-	4	25
2006	-	-	2	7	1	1	14	-	27	76	1	46	1	-	1	6	38
2011	-	7	4	11	5	-	29	5	1	14	13	92	2	1	-	29	69
2016	5	-	17	1	4	9	57	14	7	97	1	68	-	12	-	16	63
2022	3	-	6	-	-	1	69	-	-	108	-	47	1	-	-	34	45
year	Average Cover (%)																
1996	0.0	0.0	0.1	0.0	-	-	0.3	-	-	0.2	0.0	0.3	-	0.0	0.0	-	0.3
2001	-	-	-	-	-	-	0.1	-	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1
2006	-	-	0.0	0.1	0.0	0.0	0.3	-	0.1	0.3	0.0	0.5	0.0	-	0.0	0.0	0.5
2011	-	0.0	0.0	0.0	0.0	-	0.1	0.1	0.0	0.1	0.1	1.0	0.0	0.0	-	0.1	0.4
2016	0.0	-	0.1	0.0	0.0	0.0	0.4	0.1	0.0	0.2	0.0	0.3	-	0.0	-	0.0	0.3
2022	0.0	-	0.0	-	-	0.0	0.5	-	-	0.3	-	1.4	0.0	-	-	0.1	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon (beardtongue)	Penstemon comarthenus (dusty beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Viola (violet)
year	Nested Frequency									
1996	2	-	238	-	-	88	24	92	18	-
2001	-	-	183	6	-	50	6	69	6	3
2006	-	-	149	11	-	33	6	119	3	3
2011	-	-	175	17	4	35	18	66	18	1
2016	-	4	229	3	-	44	-	120	23	-
2022	-	-	270	-	-	36	4	18	13	-
year	Average Cover (%)									
1996	0.0	-	5.1	-	-	2.6	0.1	0.5	0.1	-
2001	-	-	3.7	0.0	-	0.8	0.2	0.6	0.0	0.0
2006	-	-	2.5	0.1	-	0.8	0.4	1.2	0.0	0.0
2011	-	-	3.3	0.1	0.0	0.3	0.2	0.3	0.1	0.0
2016	-	0.2	5.4	0.0	-	1.2	-	1.0	0.1	-
2022	-	-	10.2	-	-	0.5	0.1	0.2	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 01-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)							
	year							
Artemisia nova ^p (black sagebrush)	1996	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2001	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	2006	2.2	0.4	-	0.5	0.1	0.1	-
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	2011	3.9	1.4	0.2	1.4	-	-	0.1
Eriogonum microthecum ^p (slender buckwheat)	2016	4.4	0.7	-	3.8	0.5	10.6	0.2
Gutierrezia sarothrae (broom snakeweed)	2022	3.9	-	0.1	4.5	0.2	1.7	0.2
Pediocactus simpsonii (mountain ball cactus)	year	Quadrat Cover (%)						
Tetradymia canescens (spineless horsebrush)	1996	14.3	-	-	0.8	0.0	3.2	0.0
	2001	17.6	-	-	1.2	0.0	1.3	-
	2006	2.3	0.0	0.0	0.5	0.0	0.3	-
	2011	1.6	0.0	0.5	0.7	0.0	0.1	0.0
	2016	3.2	0.0	1.2	3.8	0.1	9.4	0.0
	2022	3.6	-	0.2	4.3	0.4	1.1	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 01-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1996	26540	380	19	77	4	76	3	1	14/38
2001	24880	180	7	86	7	3	0	1	14/31
2006	2920	-	6	88	6	34	5	1	14/29
2011	1660	20	27	40	34	52	0	28	16/38
2016	5580	400	52	47	1	9	0	3	13/37
2022	5820	60	31	63	6	26	3	28	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	20	-	100	0	0	0	0	0	20/47
2001	40	-	0	100	0	0	0	0	22/48
2006	20	-	0	100	0	0	100	0	59/110
2011	40	-	0	100	0	100	0	0	66/94
2016	-	-	-	-	-	-	-	-	59/121
2022	20	-	100	0	0	0	0	0	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
1996	20	-	100	0	0	0	100	0	- / -
2001	20	-	100	0	0	100	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2022	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1996	20	-	0	100	0	0	0	0	17/26
2001	20	20	0	0	100	0	0	0	- / -
2006	60	-	0	100	0	0	0	0	17/24
2011	380	40	42	47	11	5	0	16	11/11
2016	1260	-	29	70	2	3	0	2	25/41
2022	440	20	23	77	0	0	0	0	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
1996	500	-	32	68	0	20	0	0	12/21
2001	980	-	20	80	0	0	0	0	13/18
2006	240	-	25	75	0	0	0	0	11/16
2011	260	-	0	85	15	31	0	62	9/18
2016	460	120	13	87	0	4	4	0	15/27
2022	740	-	19	81	0	0	0	3	- / -
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	620	-	23	61	16	32	13	7	43/58
2001	720	-	33	28	39	0	0	19	38/52
2006	220	-	9	91	0	18	0	0	38/51
2011	360	-	11	72	17	11	6	6	49/61
2016	2280	20	24	74	3	7	0	10	44/61
2022	1960	-	10	80	10	0	0	14	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	19520	1160	28	70	2	0	0	1	8/11
2001	11080	340	12	85	3	0	0	2	6/12
2006	380	100	0	90	11	0	0	11	12/20
2011	460	80	22	61	17	0	17	0	6/15
2016	24160	760	36	64	0	0	0	0	12/22
2022	6140	-	26	74	0	0	0	0	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
1996	80	-	0	100	0	0	0	0	2/5
2001	-	-	-	-	-	-	-	-	- / -
2006	40	-	0	100	0	0	0	0	2/4
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	1/4
2022	-	-	-	-	-	-	-	-	- / -
Pinus monophylla¹ -- (singleleaf pinyon)									
1996	40	20	100	0	0	0	0	0	- / -
2001	20	40	100	0	0	0	0	0	- / -
2006	20	-	100	0	0	0	0	0	- / -
2011	20	-	100	0	0	0	0	0	- / -
2016	20	-	100	0	0	0	0	0	- / -
2022	20	-	100	0	0	0	0	0	- / -
Symphoricarpos orbiculatus -- (coralberry)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2022	20	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	42/83
2011	-	-	-	-	-	-	-	-	59/78
2016	-	-	-	-	-	-	-	-	32/80
2022	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
1996	20	-	0	100	0	0	0	0	28/42
2001	20	-	0	100	0	0	0	0	36/51
2006	60	-	67	33	0	0	0	0	20/23
2011	40	-	0	100	0	50	0	0	19/40
2016	20	-	0	100	0	0	0	0	28/52
2022	20	-	0	100	0	100	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

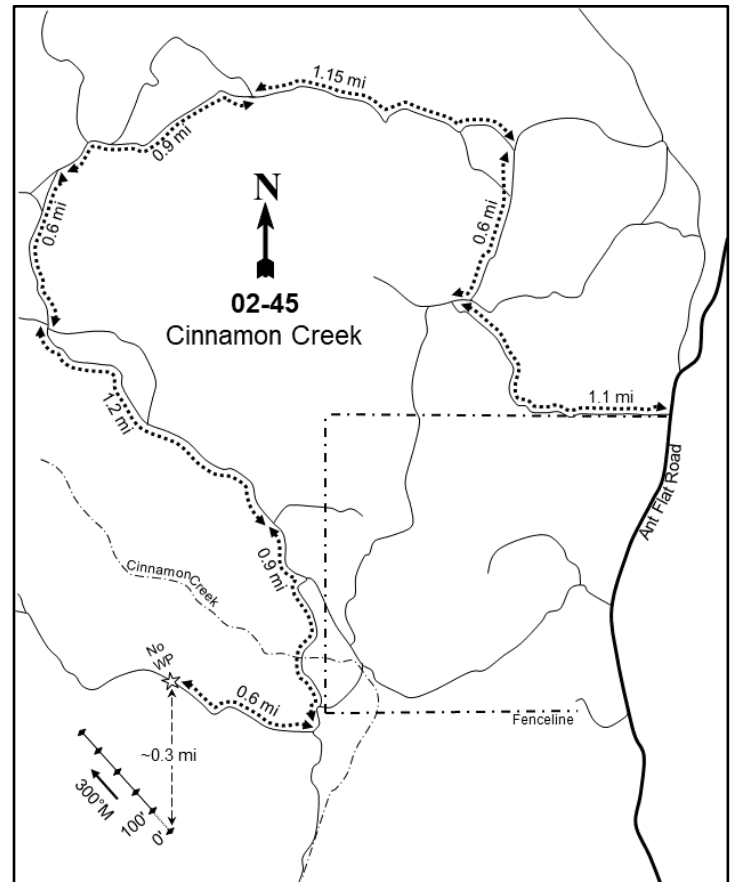
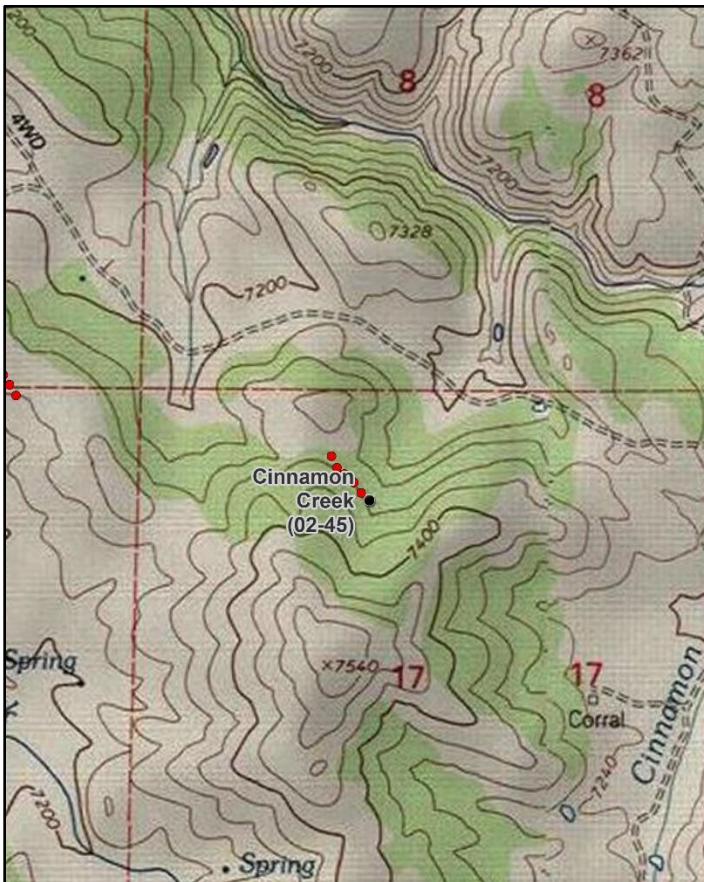
Table 01-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2022	6	100	-	-	-	-	1.0
Pinus monophylla (singleleaf pinyon)							
1996	6	-	-	-	-	-	4.6
2016	3	-	67	33	-	-	6.7
2022	5	20	40	40	-	-	8.6

Table 01-19.15 - Deer Desirable Components Index: Mountain Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.9	13.8	9.6	24.6	0.0	10.0	0.0	75.9	Good
2001	22.1	12.8	3.4	30.0	0.0	10.0	0.0	78.3	Good
2006	3.4	0.0	0.0	30.0	0.0	10.0	0.0	43.4	Poor
2011	6.6	7.6	9.8	30.0	0.0	10.0	0.0	63.9	Fair
2016	7.0	12.8	15.0	30.0	-0.6	10.0	0.0	74.2	Good
2022	5.1	0.0	0.0	30.0	-0.1	10.0	0.0	45.0	Poor

CINNAMON CREEK - STUDY NO. 02-45

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Sharp Mountain SE; Township 8N, Range 3E, Section 17
NAD 83 UTM ZONE 12, 447238 East 4587209 North

Transect Information

Browse Tag # (0' Stake)	62
Transect Bearing	300° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belts 4, 5: 2ft

Directions to Site

From the parking lot and gate of the Cinnamon Creek WMA and Ant Flat Road, travel west along the main road for 1.1 miles to a pond and stay left for another 0.6 miles to a "Y" intersection. Travel along this main road for another 1.15 miles to another intersection. Staying straight, travel for another 0.9 miles to an intersection. Stay straight for 0.6 miles to a four-way intersection. Continue straight for 2.1 miles and travel through a dense forested patch and past a private fence line to the east. At the "T" intersection, turn right (west) and travel another 0.6 miles to a clearing and park in the first available clear spot. Using a GPS, walk to the 0-foot stake, which can be identified by browse tag #62.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	7,300ft (2,225m)
Aspect	North
Slope	15%
Sample Dates	08/23/2022

Wildlife Habitat and Vegetation History**Table 02-45.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer
Shiras Moose	crucial	winter

Table 02-45.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Quaking Aspen	NA

Site Notes

In 2022, bald-faced hornet nests were located across the site in the trees at approximately eye-level and the hornets themselves were quite frequently seen in the area. Care should be taken to avoid aggravating said hornets during future sample years.

Soils**Table 02-45.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	30.6	38.1	31.3	8.5	8.4	309.0	0.6	08/23/2022

Site Potential

1981 - 2010 Average Annual Precipitation	31 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	F047XA508UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2022, this site was an aspen (*Populus tremuloides*) dominated plant community with an abundant perennial forb component. Perennial grasses were a minor component and provided low amounts of cover (Photos, Table 02-45.7, Table 02-45.10, Table 02-45.11). The shrub community was comprised of mountain snowberry (*Symphoricarpos oreophilus*) and chokecherry (*Prunus virginiana*) (Table 02-45.12). The aspen community was in good health and was a mixed stand of varying age classes of trees (Table 02-45.13a).

Trend Summary Tables

Table 02-45.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	13.2	-	4.3	18.9	-	69.0

Table 02-45.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	96	1	330	-	2.5	0.1	40.5

Table 02-45.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	2.7	-	84.5	0.0	-	49.3

Table 02-45.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
2022	1	1
Year	Days Use Per Acre (ha)	
	2022	6.7 (16.6)

Table 02-45.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus marginatus (mountain brome)	Elymus glaucus (blue wildrye)	Festuca subulata (bearded fescue)	Phleum pratense ⁱ (timothy)	Poa pratensis ⁱ (Kentucky bluegrass)
year	Nested Frequency				
2022	18	67	7	4	5
year	Average Cover (%)				
2022	0.4	1.7	0.1	0.2	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 02-45.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agastache urticifolia (nettleleaf giant hyssop)	Delphinium barbeyi (subalpine larkspur)	Heracleum maximum (common cowparsnip)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus lanszwertii (Nevada pea)	Mertensia lanceolata (prairie bluebells)	Osmorhiza occidentalis (western sweetroot)	Pseudostellaria jamesiana (tuber starwort)	Rudbeckia occidentalis (western coneflower)	Senecio serra (tall ragwort)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency												
2022	8	20	23	0	20	111	229	20	13	2	7	174	1
year	Average Cover (%)												
2022	0.4	1.2	1.0	0.0	0.9	4.8	18.8	0.3	1.7	0.0	0.2	11.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 02-45.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Populus tremuloides ⁱ (quaking aspen)	Prunus virginiana ^p (chokecherry)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover		
2022	69	5.3	13.6
year	Quadrat Cover (%)		
2022	4.3	2.4	10.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-45.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Prunus virginiana ^p -- (chokecherry)									
2022	800	-	88	13	0	3	3	0	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2022	3320	80	1	99	0	5	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-45.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

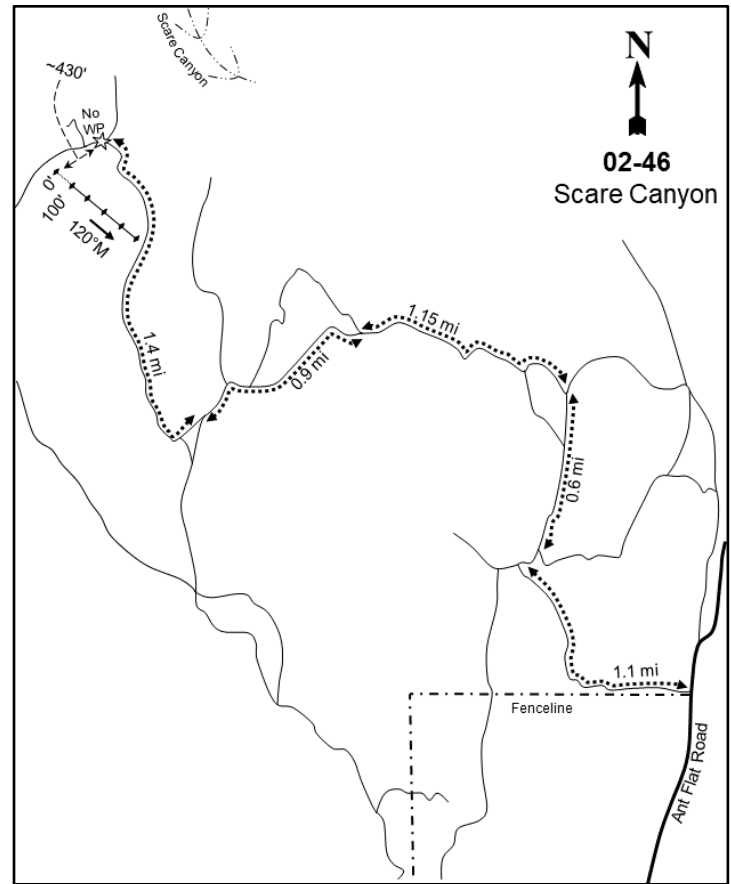
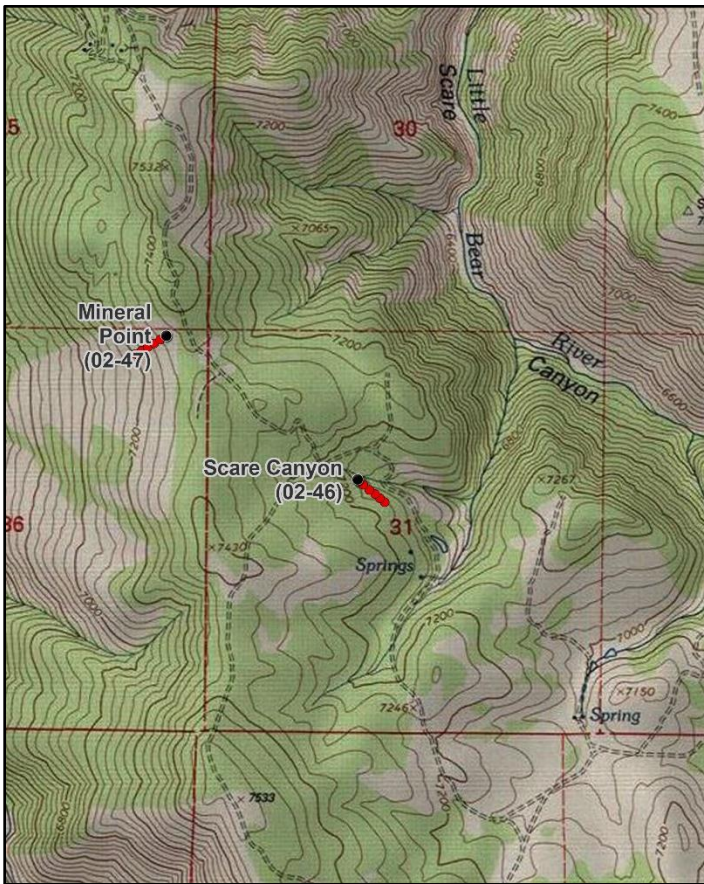
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2022	4440	32	28	17	23	13	0	5

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 02-45.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Populus tremuloides (quaking aspen)							
2022	2014	30	15	10	15	30	6.3

SCARE CANYON - STUDY NO. 02-46

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Sharp Mountain NE; Township 9N, Range 3E, Section 31
NAD 83 UTM ZONE 12, 445800 East 4591768 North

Transect Information

Browse Tag # (0' Stake)	60
Transect Bearing	120° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the parking lot and gate of the Cinnamon Creek WMA and Ant Flat Road, travel west along the main road for 1.1 miles to a pond and stay left for another 0.6 miles to a "Y" intersection. Travel along this main road for another 1.15 miles to another intersection. Staying straight, travel for another 0.9 miles to an intersection. Turn right and travel to a "T" intersection. Turn left and park in the first available clear spot. Using a GPS, walk to the 0-foot stake, which can be identified by browse tag #60.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	7,200ft (2,195m)
Aspect	Southeast
Slope	3%
Sample Dates	08/24/2022

Wildlife Habitat and Vegetation History**Table 02-46.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer
Shiras Moose	crucial	winter

Table 02-46.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Quaking Aspen	NA

Site Notes

In 2022, bald-faced hornet nests were located across the site in the trees at approximately eye-level and the hornets themselves were quite frequently seen in the area. Care should be taken to avoid aggravating said hornets during future sample years.

Soils**Table 02-46.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.9	38.5	46.2	15.3	13.4	35.3	361.0	0.3	08/24/2022

Site Potential

1981 - 2010 Average Annual Precipitation	34 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	F047XA508UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2022, this site was an aspen (*Populus tremuloides*) community with an abundant perennial grass and forb component (Photos, Table 02-46.7). The shrub community was comprised of mountain snowberry (*Symphoricarpos oreophilus*) (Table 02-45.12). The aspen community was in good health and was a mixed stand of varying age classes of trees (Table 02-46.13a).

Trend Summary Tables

Table 02-46.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	20.0	-	4.2	33.6	-	72.5

Table 02-46.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	-	286	50	328	-	16.2	2.6	28.5

Table 02-46.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	11.2	0.2	66.5	0.8	2.0	53.5

Table 02-46.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Black Bear	Rocky Mountain Elk
	Quadrat Frequency	
2022	-	1
Year	Days Use Per Acre (ha)	
2022	8.7 (21.5)*	1.3 (3.3)

*Pellets per acre (ha)

Table 02-46.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus marginatus (mountain brome)	Elymus glaucus (blue wildrye)	Elymus trachycaulus (slender wheatgrass)	Festuca subulata (bearded fescue)	Melica bulbosa (ontongrass)	Phleum pratense ⁱ (timothy)	Poa pratensis ⁱ (Kentucky bluegrass)
year	Nested Frequency						
2022	98	97	14	57	8	3	147
year	Average Cover (%)						
2022	2.7	3.6	0.5	1.7	0.2	0.0	7.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 02-46.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Achillea millefolium (Common yarrow)																		
Agastache urticifolia (nettleleaf giant hyssop)																		
Cirsium arvense ⁿⁱ (Canada thistle)																		
Delphinium barbeyi (subalpine larkspur)																		
Eucephalus engelmannii (Engelmann's aster)																		
Galium aparine ^a (stickywilly)																		
Hackelia patens (spotted stickseed)																		
Lathyrus lanszwertii (Nevada pea)																		
Maianthemum racemosum (feathery false lily of the valley)																		
Mertensia lanceolata (prairie bluebells)																		
Osmorhiza occidentalis (western sweetroot)																		
Perideridia gairdneri ssp. borealis (common yampah)																		
Phacelia heterophylla ^a (varileaf phacelia)																		
Polemonium foliosissimum (towering Jacob's-ladder)																		
Polygonum douglasii ^a (Douglas' knotweed)																		
Rudbeckia occidentalis (western coneflower)																		
Scrophularia lanceolata (lanceleaf figwort)																		
year	Nested Frequency																	
2022	70	81	14	6	16	25	2	80	6	41	166	1	15	3	2	43	3	
year	Average Cover (%)																	
2022	1.0	2.9	0.3	0.1	1.6	1.8	0.0	4.9	0.3	2.6	5.5	0.0	0.6	0.1	0.0	2.8	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES						
Senecio serra (tall ragwort)						
Taraxacum officinale (common dandelion)						
Thalictrum fendleri (Fendler's meadow-rue)						
Tragopogon dubius ⁿⁱ (yellow salsify)						
Vicia americana (American vetch)						
Viola (violet)						
year	Nested Frequency					
2022	49	0	40	8	6	52
year	Average Cover (%)					
2022	3.5	0.0	1.5	0.2	0.0	1.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 02-46.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Abies lasiocarpa ^t (subalpine fir)						
Acer grandidentatum ^t (bigtooth maple)						
Populus tremuloides ^t (quaking aspen)						
Pseudotsuga menziesii ^t (Douglas-fir)						
Sambucus nigra ssp. cerulea ^p (blue elderberry)						
Symphoricarpos oreophilus ^p (mountain snowberry)						
year	Line Intercept Cover (%)					
2022	2.5	2	66.5	1.5	0.1	33.5
year	Quadrat Cover (%)					
2022	0.8	1.0	2.4	0.0	0.5	19.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-46.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies lasiocarpa^t -- (subalpine fir)									
2022	40	-	0	100	0	0	0	0	- / -
Acer glabrum -- (Rocky Mountain maple)									
2022	20	-	100	0	0	0	0	0	- / -
Acer grandidentatum^t -- (bigtooth maple)									
2022	60	-	33	67	0	0	0	0	- / -
Pseudotsuga menziesii^t -- (Douglas-fir)									
2022	-	20	0	0	0	0	0	0	- / -
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
2022	60	-	0	100	0	33	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2022	5600	-	4	85	11	0	0	12	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-46.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

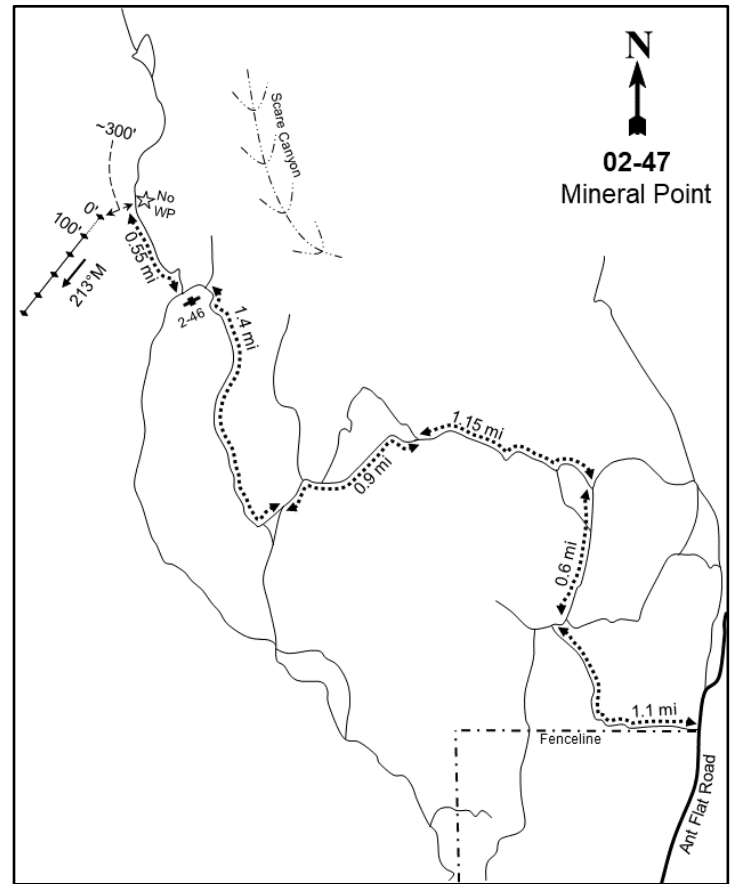
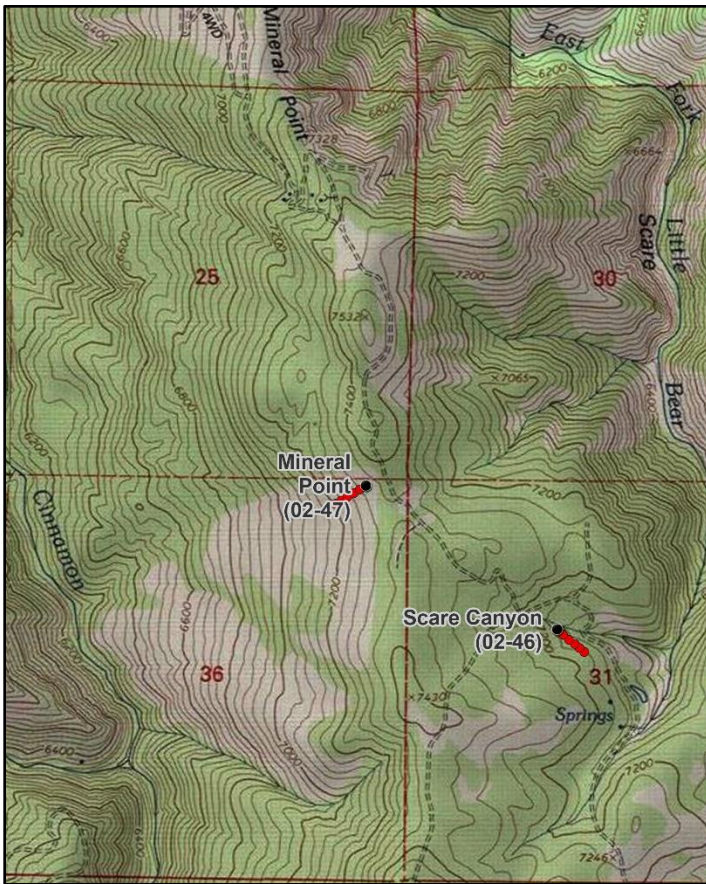
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2022	1520	29	21	7	43	0	0	2

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 02-46.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies lasiocarpa (subalpine fir)							
2022	12	-	-	-	-	100	10.0
Juniperus scopulorum (Rocky Mountain juniper)							
2022	2	-	-	-	-	100	18.0
Populus tremuloides (quaking aspen)							
2022	1823	-	10	25	15	50	7.3

MINERAL POINT - STUDY NO. 02-47

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Sharp Mountain NE; Township 9N, Range 2E, Section 36
NAD 83 UTM ZONE 12, 445024 East 4592350 North

Transect Information

Browse Tag # (0' Stake)	61
Transect Bearing	213° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the parking lot and gate of the Cinnamon Creek WMA and Ant Flat Road, travel west along the main road for 1.1 miles to a pond and stay left for another 0.6 miles to a "Y" intersection. Travel along this main road for another 1.15 miles to another intersection. Staying straight, travel for another 0.9 miles to an intersection and turn right. Travel for another 1.4 miles while traveling past study number 2-46, and drive for another 0.55 miles to a parking spot. Using a GPS, walk to the 0-foot stake, which can be identified by browse tag #61.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	7,400ft (2,256m)
Aspect	Southwest
Slope	25%
Sample Dates	08/23/2022

Wildlife Habitat and Vegetation History**Table 02-47.3 - Wildlife Seasonal Habitat.** DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer
Shiras Moose	crucial	winter

Table 02-47.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Mountain Big Sagebrush/Perennial Grass-Forb	No Encroachment

Site Notes

No Notes

Soils**Table 02-47.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.0	34.6	46.1	19.3	4.1	14.0	179.0	0.3	08/24/2022

Site Potential

1981 - 2010 Average Annual Precipitation	35 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2022, the plant community on this site was a healthy stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and little sagebrush (*A. arbuscula*). Other preferred shrubs provided additional forage for wildlife in moderate to low abundance (Table 02-47.12). Perennial grasses and forbs were fairly diverse and abundant (Table 02-47.7). The native species mule-ears (*Wyethia amplexicaulis*) provided most of the perennial forb cover (Table 02-47.11). However, a majority of the perennial grass cover was contributed by the introduced species bulbous bluegrass (*Poa bulbosa*) (Table 02-47.10).

Trend Summary Tables

Table 02-47.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	19.9	-	-	19.6	-	-

Table 02-47.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	19	314	298	184	0.4	19.6	5.3	18.0

Table 02-47.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	23.0	0.1	42.6	9.2	9.9	52.0

Table 02-47.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Shiras Moose
	Quadrat Frequency	
2022	5	1
Year	Days Use Per Acre (ha)	
	2022	0.7 (1.7)

Table 02-47.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (omiongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2022	2	4	29	15	27	20	5	20	2	203	107
year	Average Cover (%)										
2022	0.0	0.0	0.2	0.4	1.7	1.2	0.0	0.1	0.0	10.9	5.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 02-47.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Agoseris glauca (pale agoseris)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Arabis holboellii ^a (Holboell's rockcross)																		
Balsamorhiza hookeri (Hooker's balsamroot)																		
Balsamorhiza sagittata (arrowleaf balsamroot)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Collomia linearis ^a (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawkbeard)																		
Cryptantha ^a (annual cryptantha)																		
Descurainia pinnata ^a (western tansymustard)																		
Draba ^a (draba)																		
Epilobium brachycarpum ^a (tall annual willowherb)																		
Eriogonum heracleoides (parsnipflower buckwheat)																		
Hackelia patens (spotted stickseed)																		
Helianthella uniflora (oneflower helianthella)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
year	Nested Frequency																	
2022	6	4	3	55	1	99	57	17	4	13	62	25	16	4	11	7	1	
year	Average Cover (%)																	
2022	0.0	0.0	0.1	4.7	0.4	0.7	0.3	0.4	0.0	0.1	0.5	0.2	0.1	0.0	0.2	0.6	0.0	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Lappula occidentalis ^a (flatspine stickseed)												
Lupinus argenteus (silvery lupine)												
Machaeranthera canescens (hoary tansyaster)												
Microseris nutans (nodding microseris)												
Microsteris gracilis ^a (slender phlox)												
Packera multilobata (lobeleaf groundsel)												
Phlox longifolia (longleaf phlox)												
Polygonum douglasii ^a (Douglas' knotweed)												
Senecio integerrimus ^a (lambstongue ragwort)												
Tragopogon dubius ^{ai} (yellow salsify)												
Veronica biloba ^{ai} (two-lobed speedwell)												
Wyethia amplexicaulis (mule-ears)												
year	Nested Frequency											
2022	4	3	14	1	67	10	4	28	3	2	202	115
year	Average Cover (%)											
2022	0.0	0.0	0.1	0.0	0.6	0.1	0.0	0.3	0.0	0.0	2.3	11.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 02-47.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES								
Amelanchier utahensis ^p (Utah serviceberry)								
Artemisia arbuscula ^p (little sagebrush)								
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)								
Cercocarpus ledifolius var. ledifolius ^p (curl-leaf mountain mahogany)								
Purshia tridentata ^p (antelope bitterbrush)								
Sambucus ^p (elderberry)								
Sambucus nigra ssp. cerulea ^p (blue elderberry)								
Symphoricarpos oreophilus ^p (mountain snowberry)								
year	Line Intercept Cover (%)							
2022	0.5	6.7	8.6	0.4	2.5	-	0.1	0.8
year	Quadrat Cover (%)							
2022	0.4	7.5	8.2	0.4	3.0	0.1	0.0	0.3

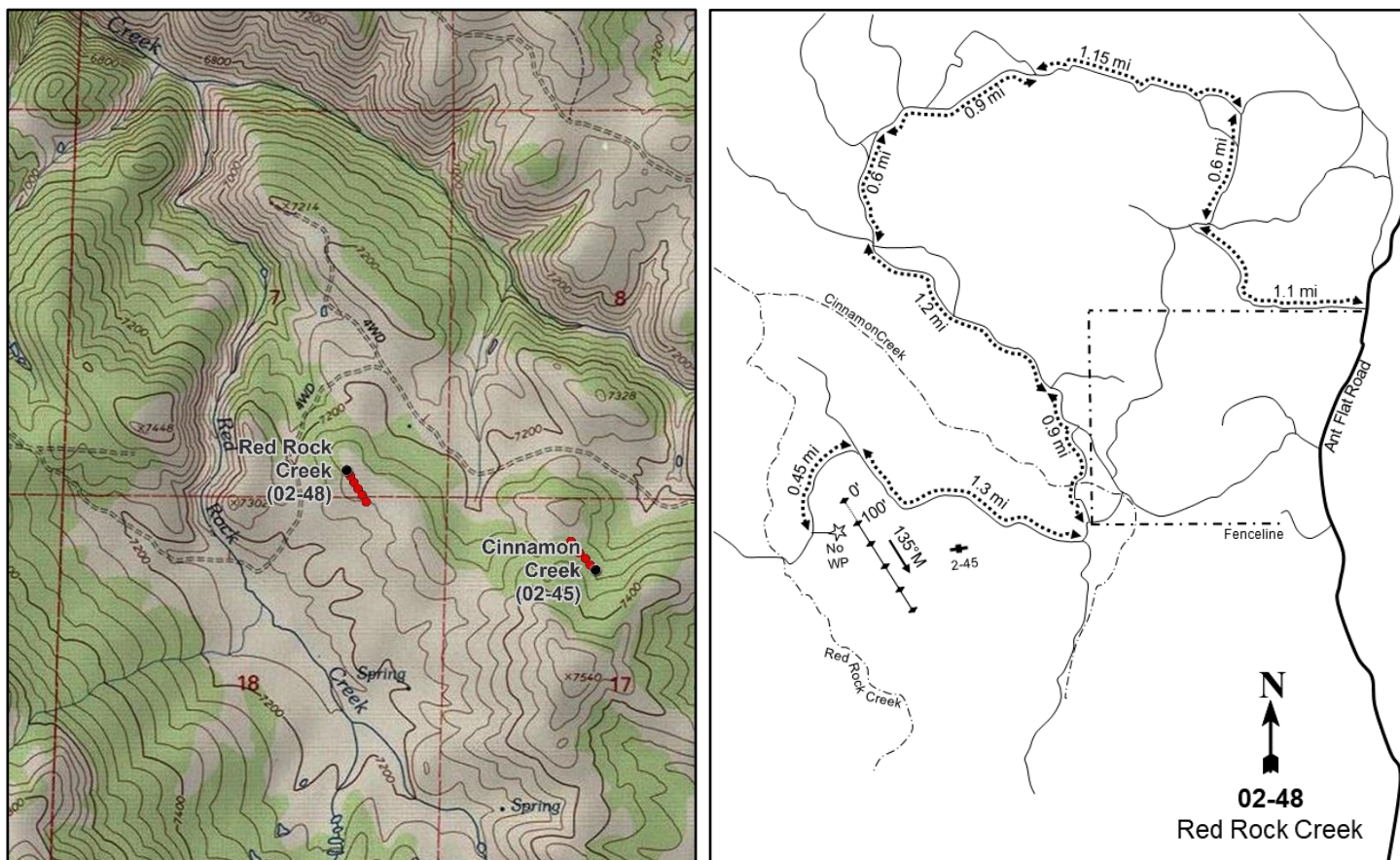
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-47.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis ^p -- (Utah serviceberry)									
2022	20	-	0	100	0	0	100	0	- / -
Artemisia arbuscula ^p -- (little sagebrush)									
2022	2420	-	6	90	4	2	0	4	- / -
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2022	1660	20	1	90	8	16	5	8	- / -
Cercocarpus ledifolius var. ledifolius ^p -- (curl-leaf mountain mahogany)									
2022	20	-	0	100	0	0	100	0	- / -
Purshia tridentata ^p -- (antelope bitterbrush)									
2022	600	-	0	97	3	13	87	3	- / -
Sambucus ^p -- (elderberry)									
2022	20	-	0	100	0	0	100	0	- / -
Sambucus nigra ssp. cerulea ^p -- (blue elderberry)									
2022	20	-	0	0	100	100	0	100	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2022	200	-	10	80	10	20	0	10	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

RED ROCK CREEK - STUDY NO. 02-48

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Sharp Mountain NE; Township 8N, Range 3E, Section 07
NAD 83 UTM ZONE 12, 446201 East 4587625 North

Transect Information

Browse Tag # (0' Stake)	63
Transect Bearing	135° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the parking lot and gate of the Cinnamon Creek WMA and Ant Flat Road, travel west along the main road for 1.1 miles to a pond and stay left for another 0.6 miles to a "Y" intersection. Travel along this main road for another 1.15 miles to another intersection. Staying straight, travel for another 0.9 miles to an intersection. Stay straight for 0.6 miles to a four-way intersection. Continue straight 2.1 miles and travel through a dense forested patch and past a private fenceline to the east. At the "T" intersection, turn right (west) and travel another 1.3 miles to a "Y" intersection and turn left. Drive another 0.46 miles and park in the first available clear spot. Using a GPS, walk to the 0-foot stake, which can be identified by browse tag #63.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	7,300ft (2,225m)
Aspect	Southwest
Slope	No data
Sample Dates	08/22/2022

Wildlife Habitat and Vegetation History

Table 02-48.3 - Wildlife Seasonal Habitat. DWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer
Shiras Moose	crucial	winter

Table 02-48.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2022	Introduced Perennial Grass/Low Sagebrush	No Encroachment

Site Notes

No Notes

Soils

Table 02-48.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.5	28.6	24.1	47.3	2.7	24.1	156.0	0.6	08/23/2022

Site Potential

1981 - 2010 Average Annual Precipitation	33 inches
NRCS Ecological Site	High Mountain Loam (Silver Sagebrush)
NRCS Ecological Site #	R47XA517UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2022, the plant community on this site was in poor condition with bulbous bluegrass (*Poa bulbosa*) being the dominant species. The herbaceous understory was fairly diverse, but introduced weedy species provided a majority of the cover (Table 02-48.7, Table 02-48.10, Table 02-48.11). Little sagebrush (*Artemisia arbuscula*) was the dominant shrub species (Table 02-48.12, Table 02-48.13).

Trend Summary Tables

Table 02-48.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2022	7.6	0.6	-	10.4	0.1	-

Table 02-48.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2022	46	387	215	311	1.1	30.0	8.5	22.5

Table 02-48.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2022	35.8	0.0	31.6	6.0	1.1	57.4

Table 02-48.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
2022	5	2	2
Year	Days Use Per Acre (ha)		
2022	4.4 (10.8)	11.4 (28.1)	2.0 (5.0)

Table 02-48.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Phleum pratense ⁱ (timothy)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency														
2022	37	3	40	6	96	101	1	63	15	40	7	3	234	11	3
year	Average Cover (%)														
2022	0.9	0.1	1.0	0.1	2.9	2.9	0.0	2.0	0.9	0.7	0.2	0.0	19.2	0.2	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 02-48.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Arenaria congesta (ballhead sandwort)	Astragalus miser (timber milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Calochortus nuttallii (sego lily)	Cirsium undulatum ^a (wavy/leaf thistle)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ^a (bird's-beak)	Crepis acuminata (tapertip hawksbeard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Geranium richardsonii (Richardson's geranium)
year	Nested Frequency																
2022	130	5	35	97	3	13	79	1	3	12	5	16	14	5	14	13	31
year	Average Cover (%)																
2022	3.7	0.2	0.1	2.5	0.0	0.3	4.1	0.0	0.0	0.4	0.1	0.1	0.1	0.0	0.3	0.2	1.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Isatis tinctoria ^{ami} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus lanszwertii (Nevada pea)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Penstemon comarrhenus (dusty beardtongue)	Potentilla gracilis (slender cinquefoil)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Thlaspi arvense ^{ai} (field pennycress)	Tragopogon dubius ^{ai} (yellow salsify)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency													
2022	11	112	4	2	5	1	7	1	4	184	1	26	37	65
year	Average Cover (%)													
2022	0.2	3.9	0.0	0.1	0.0	0.2	0.0	0.0	0.1	5.9	0.0	0.3	0.7	6.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 02-48.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia arbuscula ^p (little sagebrush)	Artemisia cana ^p (silver sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)					
2022	6.4	3.7	0.1	-	-	0.3
year	Quadrat Cover (%)					
2022	5.0	2.3	0.6	0.0	0.2	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 02-48.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia arbuscula^p -- (little sagebrush)									
2022	2120	60	5	76	19	53	0	61	- / -
Artemisia cana^p -- (silver sagebrush)									
2022	680	20	27	53	21	6	0	21	- / -
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
2022	400	-	5	95	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2022	120	-	0	100	0	0	0	0	- / -
Rosa woodsii^p -- (Woods' rose)									
2022	80	-	0	100	0	0	50	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

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APPENDIX A - VEGETATION TYPE

VEGETATION COMMUNITY TYPE CLASSIFICATION--

Vegetation Type Code	Vegetation Community Type Name*	Description
ANN GRASS	Annual Grass	Annual grasses provide the dominant vegetation cover.
PER GRASS	Perennial Grass	Perennial grasses provide the dominant vegetation cover.
ANN-PER GRASS	Annual-Perennial Grass	Mixture of Annual and Perennial grass species provide the dominant vegetation cover.
ANN GRASS-FORB	Annual Grass-Forb	Mixture of Annual grass and forb species provide the dominant vegetation cover.
PER GRASS-FORB	Perennial Grass-Forb	Mixture of Perennial grass and forb species provide the dominant vegetation cover.
ANN FORB	Annual Forb	Annual forbs provide the dominant vegetation cover
PER FORB	Perennial Forb	Perennial forbs provide the dominant vegetation cover
ANN-PER FORB	Annual-Perennial Forb	Mixture of Annual and Perennial forb species provide the dominant vegetation cover.
WEED	Annual-Perennial Weed	Annual and/or Perennial weedy species provide the dominant vegetation cover.
WET MEADOW	Wet Meadow	Riparian vegetation species provide the dominant vegetation cover
DRY MEADOW	Dry Meadow	High elevation subalpine meadow
RIPAR	Riparian	Riparian vegetation species provide the dominant vegetation cover.
ALP GRASS	Alpine Grass	Grass or grass-like species provide the dominant vegetation cover
ALP FORB	Alpine Forb	Forb species provide the dominant vegetation cover
ALP SHRUB	Alpine Shrub	Alpine shrub species provide the dominant vegetation cover
ALP MIX	Alpine-Mixed	Mixture of grass, forb, or shrub species provide the dominant vegetation cover
ARTRT	Basin Big Sagebrush	Major component of the site (typically >5% cover).
ARTRV	Mountain Big Sagebrush	Major component of the site (typically > 5% cover).
ARTRW	Wyoming Big Sagebrush	Major component of the site (typically >5% cover).
ARAR	Low Sagebrush	Major component of the site (typically >5% cover).
ARCA	Silver Sagebrush	Major component of the site (typically >5% cover).
ARNO	Black Sagebrush	Major component of the site (typically >5% cover).
ARSP	Bud Sagebrush	Major component of the site (typically >5% cover).
ARFR	Fringed Sagebrush	Major component of the site (typically >5% cover).
CHNA	Rubber Rabbitbrush	Major component of the site (typically >5% cover).
CHPA	Parry Rabbitbrush	Major component of the site (typically >5% cover).
CHVI	Low Rabbitbrush	Major component of the site (typically >5% cover).
GUSA	Broom Snakeweed	Major component of the site (typically >5% cover).
SAVE	Black Greasewood	Major component of the site (typically >5% cover).
CELA	Winterfat	Major component of the site (typically >5% cover).
ATCO	Shadscale	Major component of the site (typically >5% cover).
ATCA	Fourwing Saltbush	Major component of the site (typically >5% cover).
GRSP	Spiny Hopsage	Major component of the site (typically >5% cover).
MSDS	Mixed Salt Desert Shrub	Mixture of one or more Salt Desert species (ATCO, ATCA, GRSP, etc.) with no one species expressing dominance.
LARRE	Creosote Bush	Major component of the site (typically >5% cover).
CORA	Blackbrush	Major component of the site (typically >5% cover).
PRFA	Desert Almond	Major component of the site (typically >5% cover).
EPHED	Ephedra	Major component of the site (typically >5% cover).
QUGA	Gambel Oak	Major component of the site (typically >5% cover).

Vegetation Type Code	Vegetation Community Type Name*	Description
QUTU	Live Oak	Major component of the site (typically >5% cover).
SYOR	Snowberry	Major component of the site (typically >5% cover).
AMAL	Serviceberry	Major component of the site (typically >5% cover).
PUTR	Bitterbrush	Major component of the site (typically >5% cover).
PUGL	Desert Bitterbrush	Major component of the site (typically >5% cover).
ARCT2	Manzanita	Major component of the site (typically >5% cover).
CEMOM	True Mountain Mahogany	Major component of the site (typically >5% cover).
CELEL	Curlleaf Mountain Mahogany	Major component of the site (typically >5% cover).
COMES	Stansbury Cliffrose	Major component of the site (typically >5% cover).
KOPR	Forage Kochia	Major component of the site (typically >5% cover).
TAMARIX	Tamarix	Major component of the site (typically >5% cover).
MMB	Mixed Mountain Brush	Mixture of one or more Mountain brush species (ARTRV, AMAL, CEMOM, etc.) with no one species expressing dominance.
MB	Mixed Shrub	Mixture of various shrub species with none expressing dominance.
CHAPARRAL	Chaparral	Mixture of fire tolerant shrub species.
JUNIPER	Juniper	Major component of the site (Phase III ¹). No pinyon present.
PINYON	Pinyon	Major component of the site (Phase III ¹). No juniper present.
PJ	Pinyon-Juniper	Major components of the site (Phase III ¹). Pinyon and Juniper present.
POTR	Quaking Aspen	POTR provides the dominant overstory (typically >5% cover).
POTR-CE	Quaking Aspen-Conifer Encroached	Mixture of QUGA and Conifers (conifers typically provide >5% cover).
PIPO	Ponderosa Pine	PIPO provides the dominant overstory (typically >5% cover).
PSMEM	Douglas Fir	Major component of the site (typically >5% cover).
ABCO	White Fir	Major component of the site (typically >5% cover).
PIFL	Limber Pine	Major component of the site (typically >5% cover).
PICO	Lodgepole Pine	Major component of the site (typically >5% cover).
PILO	Bristlecone Pine	Major component of the site (typically >5% cover).
PIEN	Engelmann Spruce	Major component of the site (typically >5% cover).
ABLA	Subalpine Fir	Major component of the site (typically >5% cover).
SUBALP	Subalpine Forest	Mixture of PIEN and ABLA provide the dominant vegetation cover
MIX CON	Mixed Conifer Forest	Mixture of conifer tree species provide the dominant vegetation cover
AG-PAST	Agricultural-Pasture	Active or abandoned agricultural pasture
AG-CL	Agricultural-Cropland	Active or abandoned agricultural cropland
*Vegetation types can be co-dominant on the study site and when more than one vegetation community types are co-dominant and are major components of the site a (/) is used to separate vegetation community types.		
¹ Phase of woodland succession		