
Monitoring & Controlling Invasive Plants at Rohn Cabin: 2012 Update



February 2, 2013

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Prepared for:
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Introduction

In an effort to monitor invasive species at Rohn Cabin, the site was visited twice in the summer of 2012. The first visit was July 2-4, and the second visit was August 27-29. One goal of these trips was to inventory and remove non-native plant species from BLM property in the vicinity of the Cabin. Few invasive species were noted on the first trip, as it was relatively early in the season and many plants had not yet flowered. On the second trip, many more invasive plants were visible, including *Bromus inermis* ssp. *inermis* (smooth brome, 62*), *Hordeum vulgare* (common barley, 39), *Erysimum cheiranthoides* (wallflower mustard, not ranked) and *Taraxacum officinale* (common dandelion, 58). These four taxa had not previously been reported from the site.

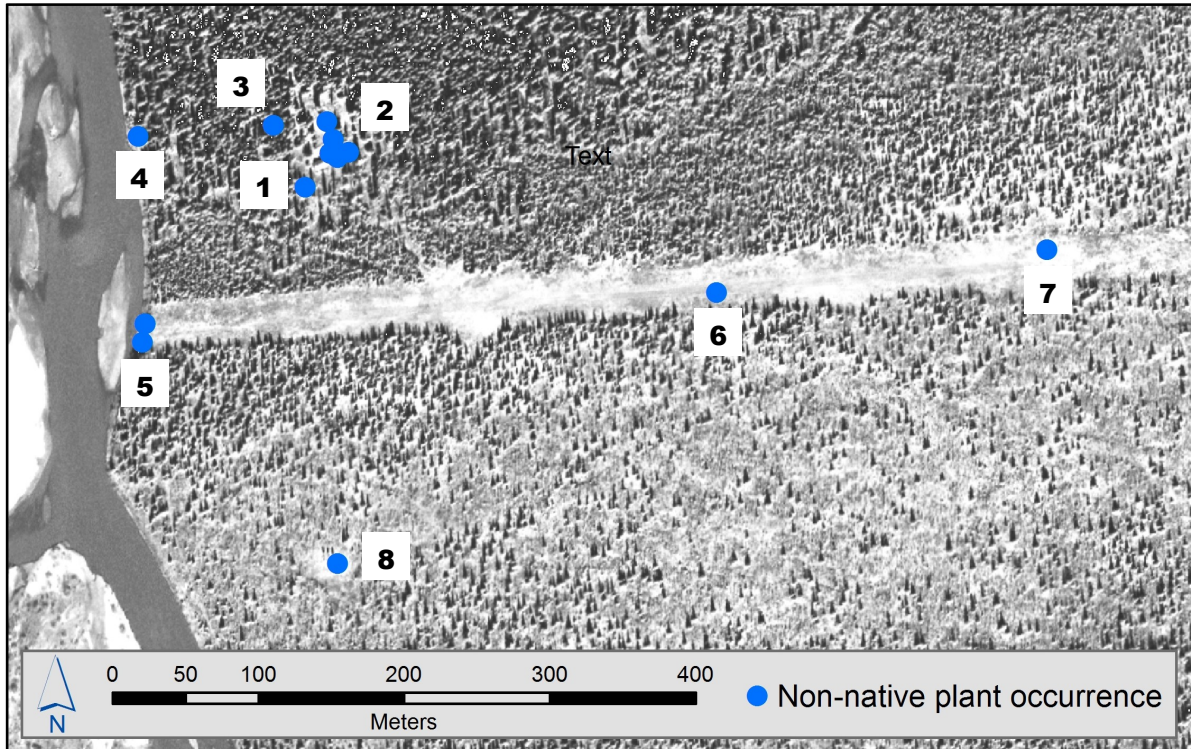
There was some confusion surrounding the native status of some yellow-flowered mustards found at Rohn Cabin. The *Descurainia* present at Rohn appears to be the native *Descurainia sophioides*. These plants have a pubescence that some authors (Hultén 1968) consider consistent with the non-native *D. sophia*. The total constellation of traits, however, is a good fit for more recent treatments of the native *D. sophioides*. This native species can behave in a very weedy manner and often reaches very high densities following fire and in human-disturbed areas. *Erysimum cheiranthoides* is generally considered to include native and non-native genotypes in Alaska, and because of the species' widespread nature and presence in undisturbed areas it is not included on AKNHP's non-native species list. Regardless of its statewide rarity, *E. cheiranthoides* is often introduced into new areas by human activity. If the BLM's vegetation management goals are to limit anthropogenic alterations to the ecology of this area, we recommend removal of these mustard species. However, this action should be set as a lower management priority than eradication of more invasive species that are not native to the state.

On both trips, the entirety of the area was inventoried for non-native plants, including the airstrip, FAA site, and the forest and meadow surrounding the cabin. On the July trip, GPS points were taken and species recorded at three locations: the cabin entrance; the doghouses in the meadow in front of the cabin; and where the trail that leads from the cabin, past the outhouse, and toward the river meets the Kuskokwim River South Fork. On the August trip, points were taken and invasive species were found at five sites: the cabin entrance, the doghouses in the meadow in front of the cabin, surrounding the outhouse, the airstrip and the FAA site. The following pages describe these locations, the taxa found and control efforts.

Appendix I is included to help future land managers at Rohn Cabin. It provides a complete list of all species identified at the site to date. Both natives and non-natives are listed.

*Number indicates Invasiveness Rank. The invasiveness rank is calculated based on a species' ecological impacts, biological attributes, distribution, and response to control measures. The ranks are scaled from 0 to 100, with 0 representing a plant that poses no threat to native ecosystems and 100 representing a plant that poses a major threat to native ecosystems. For more information visit <http://aknhp.uaa.alaska.edu/botany/akepic/>

All non-native species identified at Rohn Cabin 2009-2012



1 - Rohn Cabin

Brassica napus, *Brassica rapa*, *Capsella bursa-pastoris*, *Cerastium fontanum* ssp. *vulgare*, *Chenopodium album*, *Crepis tectorum*, *Descurainia* cf. *sophioides*., *Erysimum cheiranthoides*, *Galeopsis tetrahit*, *Hordeum jubatum*, *Matricaria discoidea*, *Phleum pratense*, *Plantago major*, *Poa pratensis* ssp. *pratensis* or ssp. *irrigata*, *Polygonum aviculare*

2 - Doghouses

Chenopodium album, *Descurainia* cf. *sophioides*., *Erysimum cheiranthoides*, *Galeopsis tetrahit*, *Hordeum jubatum*, *Hordeum vulgare*, *Matricaria discoidea*

3 - Outhouse

Crepis tectorum, *Descurainia* cf. *sophioides*, *Hordeum jubatum*

4- South Fork of the Kuskokwim River bank

Erysimum inconspicuum

5 - East end of airstrip

Crepis tectorum, *Descurainia* cf. *sophioides*

6 - Mid-airstrip

Bromus inermis ssp. *inermis*

7 - West end of airstrip

Poa annua, *Poa pratensis*

8 - FAA site

Crepis tectorum, *Descurainia* cf. *sophioides*, *Taraxacum officinale*

July 2-4, 2012

Rohn Cabin and the vicinity are situated within a spruce forest. In front (east) of the cabin is a meadow comprised mostly of Canada bluejoint (*Calamagrostis canadensis*) and fireweed (*Chamerion angustifolium*). The entire site is essentially flat at an elevation of about 1400 ft. Areas of disturbance include (1) the area immediately surrounding the cabin, (2) the meadow east of the cabin, (3) the area around the outhouse, (4) the gravel airstrip that runs east-west through the site, located south of the three aforementioned sites, and (5) the FAA site, a weather station situated south of the airstrip.

The following table lists all plants found on the early July visit that are considered non-native to Rohn Cabin. Below are photos corresponding to each of these taxa. *Descurainia* and *Erysimum* species are superficially extremely similar, so only one photo of each is provided here.

All plants present that are non-native to Rohn Cabin, July 2-4, 2012

Scientific Name	Common Name	Invasiveness Rank
<i>Chenopodium album</i>	Lamb's quarters	37
<i>Descurainia cf. sophioides</i>	Tansymustard	NA
<i>Erysimum cheiranthoides</i>	Wallflower mustard	NA ⁺
<i>Erysimum inconspicuum</i>	Smallflower wallflower	NA ⁺
<i>Galeopsis tetrahit</i>	Brittlestem hempnettle	50
<i>Matricaria discoidea</i>	Pineapple weed	32
<i>Polygonum aviculare</i>	Prostrate knotweed	45

⁺ Native to Alaska, possibly introduced to Rohn Cabin by anthropogenic disturbance



Chenopodium album



Descurainia sophioides



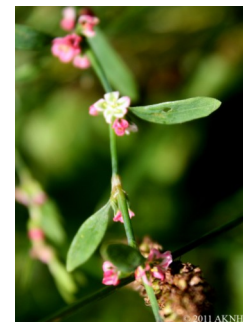
Erysimum cheiranthoides



Galeopsis tetrahit



Matricaria discoidea



Polygonum aviculare

July 2-4, 2012

Cabin entrance, ROHN2012-001

Clearing between the cabin entrance and meadow

62.29446, -153.37387

Precision: 46 ft

Plot size: 0.01 acre (12 ft radius)

The entrance to Rohn Cabin is one of the most disturbed sites in the area, and subject to high levels of foot traffic. There is a dense patch of the weakly invasive plant *Matricaria discoidea* at this site, as well as a dense mat of grass that had not yet flowered, but is now known to be *Hordeum jubatum* since the late August cabin visit.

A tarp was placed over the patch of *Matricaria discoidea*, because this seemed more reasonable than pulling out numerous tiny stems by hand. We covered the tarp with duff collected from the surrounding forest floor, so that it would not appear so out of place. One small patch of *Matricaria discoidea* that did not fit under the tarp was hand pulled and covered with moss sod collected from the surrounding forest.

The two mustards, *Erysimum cheiranthoides* and *Descurainia cf. sophioides*, were growing along the edge of the meadow, where it meets the clearing.

Scientific Name	Common Name	Percent Cover	Stem Count	Control Action
<i>Descurainia cf. sophioides</i>	Tansymustard	0.01	1-5	None
<i>Erysimum cheiranthoides</i>	Wallflower mustard	5	26-50	None
<i>Matricaria discoidea</i>	Pineapple weed	50	151-500	Pulled/tarped
<i>Polygonum aviculare</i>	Prostrate knotweed	0.01	1-5	Pulled



Site 1: Cabin entrance
Before laying tarp and sod (left) and after (right)

July 2-4, 2012

Doghouses, ROHN2012-002

Doghouses in the meadow in front of the cabin

62.29486, -153.137357

Precision: 20 ft

Plot size: 0.01 acre (12 ft radius)

Dominant native species in the meadow include Canada bluejoint (*Calamagrostis canadensis*) and fireweed (*Chamerion angustifolium*). Only one site of disturbance was located in the meadow. After the second visit in August, it became clear that this was the middle of the three doghouses, where straw is burned each year. There is a dense patch of *Chenopodium album* here, with some yellow-flowered mustards mixed in (these mustards were pulled on the second visit), and only a couple stems of *Galeopsis tetrahit*. A grass at this location was not in flower at the time, but was later determined to be *Hordeum jubatum*.

Scientific Name	Common Name	Percent Cover	Stem Count	Control Action
<i>Chenopodium album</i>	Lamb's quarters	50	151-500	Pulled
<i>Descurainia cf. sophioides</i>	Tansymustard	0.01	151-500	None
<i>Erysimum sp.</i>	Wallflower	0.01	6-25	None
<i>Galeopsis tetrahit</i>	Brittlestem hempnettle	10	1-5	Pulled



Site 1: Doghouses
Before removing *Chenopodium album* (top left) and after (bottom right)



Dominant plants in this photo include
Chenopodium album
Hordeum jubatum
Descurainia cf. sophioides

July 2-4, 2012

Kuskokwim River bank, ROHN2012-003

Where the trail that leads from the cabin, past the outhouse, meets the Kuskokwim River South Fork

62.29478, -153.37608

Precision: 12 ft

Plot size: 0.01 acre (12 ft radius)

The entire area behind (west of) the cabin was inventoried for invasive plants. None were found, but a data point was taken where the foot path meets the river because a latitude and longitude record were required to go along with native plant collections from this site. *Erysimum inconspicuum* was documented from this site, however it is native to Alaska and does not exhibit weedy characteristics as some other yellow-flowered mustards do, so it is not recommended for control.

Scientific name	Common Name	Percent Cover	Stem Count	Control Action
<i>Erysimum inconspicuum</i>	Smallflower wallflower	0.01	1-5	None

Site 3: Bank of the Kuskokwim River South Fork



August 27-29, 2012

The following table lists all plants found on the late August visit that are considered non-native to Rohn Cabin. Below are photos corresponding to each of these taxa that were not previously presented on the page listing taxa found July 2-4.

All plants present that are non-native to Rohn Cabin, August 27-29, 2012

Scientific Name	Common Name	Invasiveness Rank
<i>Bromus inermis</i> ssp. <i>inermis</i>	Smooth brome	62
<i>Chenopodium album</i>	Lamb's quarters	37
<i>Crepis tectorum</i>	Narrowleaf hawkweed	56
<i>Descurainia</i> cf. <i>sophioides</i>	Tansymustard	NA
<i>Galeopsis tetrahit</i>	Brittlestem hempnettle	50
<i>Hordeum jubatum</i>	Foxtail barley	63
<i>Hordeum vulgare</i>	Common barley	39
<i>Matricaria discoidea</i>	Pineapple weed	32
<i>Polygonum aviculare</i>	Prostrate knotweed	45
<i>Taraxacum officinale</i>	Common dandelion	58



Bromus inermis ssp. *inermis*



Crepis tectorum



Hordeum jubatum



Hordeum vulgare



Taraxacum officinale

August 27-29, 2012

Cabin entrance, ROHN2012-004

Clearing between the cabin entrance and meadow

62.29467, -153.37329

Precision: 30 ft

Plot size: 0.01 acre (12 ft radius)

There is a dense patch of *Hordeum jubatum* at this site, as well as additional stems reaching out into the surrounding meadow. Individual plants (those not growing in a dense mat) were pulled out by the roots and bagged. Digging up the entire dense patch did not seem practical, because it would cause massive soil disturbance and likely support the establishment of other invasive species that thrive on disturbed ground. It would also yield a large quantity of dirt that would need to be flown off site. Instead, the flowers were collected before they set seed and removed from the site, and the remaining grass was covered with a tarp that should remain on until next summer. Tarping is an experimental approach for this site; there is no literature supporting this technique, but was worth trying given restrictions on the use of herbicides. Outlying stems of *Hordeum jubatum* surrounding the cabin were pulled out by the roots.

On the first visit in early July, a patch of *Matricaria discoidea* at this site was tarped, and in the short term, at least, this method appears successful. The tarp was removed in August and the bare soil that was left exposed was covered with moss sod collected from nearby forested areas.

Scientific Name	Common Name	Percent Cover	Stem Count	Control Action
<i>Chenopodium album</i>	Lamb's quarters	0.01	1-5	Pulled
<i>Crepis tectorum</i>	Narrowleaf hawkbeard	0.01	1	Pulled
<i>Descurainia cf. sophioides</i>	Tansymustard	1	6-25	Pulled
<i>Hordeum jubatum</i>	Foxtail barley	15	500+	Tarped/pulled
<i>Matricaria discoidea</i>	Pineapple weed	5	51-150	Pulled
<i>Polygonum aviculare</i>	Prostrate knotweed	0.01	1	Pulled



Site 1: Cabin entrance

Before (left) and (after) the tarp was relocated and exposed soil covered with moss sod



August 27-29, 2012

Doghouses, ROHN2012-005

Doghouses in the meadow in front of the cabin

62.29475, -153.37349

Precision: 20 ft

Plot size: 0.1 acre (37 ft radius)

The meadow in front of the cabin is used as a sled dog staging area during the Iditarod Race in the winter, and straw is used here for dog bedding. Many weed seeds are potentially spread through straw, so invasive plants at this site are to be expected.

There is a dense patch of *Hordeum jubatum* at the middle of the three doghouses, where straw is burned each year. As with the cabin entrance site, it was impractical to remove all this grass by the roots; instead, the flowers were collected to limit the seed bank. An outlying patch of *Hordeum jubatum* was also removed, located at the meadow-forest border about 20 ft south of the doghouses.

Although there were a few mature plants of *Galeopsis tetrahit*, most individuals were <8 inches tall, growing beneath a dense cover of native fireweed and Canada bluejoint grass. Many were pulled, but it was impossible to collect all of the numerous small stems.

Scientific Name	Common name	Percent Cover	Stem Count	Control Action
<i>Chenopodium album</i>	Lamb's quarters	.01	1-5	Pulled
<i>Descurainia cf. sophioides</i>	Tansymustard	10	151-500	Pulled
<i>Galeopsis tetrahit</i>	Bristlestem hempnettle	10	500+	Some pulled
<i>Hordeum jubatum</i>	Foxtail barley	20	500+	Pulled/flowers collected
<i>Hordeum vulgare</i>	Common barley	.01	1-5	Pulled
<i>Matricaria discoidea</i>	Pineapple weed	.01	1-5	Pulled

Site 2: Doghouses in the meadow



August 27-29, 2012

Outhouse, ROHN2012-006

About a 30 foot radius around the outhouse

62.29484, -153.37428

Precision: 20 ft

Plot size: 0.1 acre (37 ft radius)

The area surrounding the outhouse has a moderately dense canopy of spruce trees and a ground cover of mostly fireweed. *Descurainia* sp. was found in the clearing at the front and sides of the outhouse, while *Hordeum jubatum* and *Crepis tectorum* were found scattered throughout the surrounding area. At this site, *Hordeum jubatum* was spread out enough that each plant was pulled out by the roots.

Scientific name	Common name	Percent Cover	Stem Count	Control Action
<i>Crepis tectorum</i>	Narrowleaf hawksbeard	.01	6-25	Pulled
<i>Descurainia</i> cf. <i>sophioides</i>	Tansymustard	5	51-150	Pulled
<i>Hordeum jubatum</i>	Foxtail barley	5	51-150	Pulled

Site 3: Outhouse and vicinity



August 27-29, 2012

Airstrip, ROHN2012-007

South side of airstrip, near the middle of the strip

62.29379, -153.36842

Precision: 17 ft

Plot size: 0.001 acre (3.7 ft radius)

The airstrip at Rohn Cabin consists of a gravel runway with low-growing vegetation on either side that consists of a variety of grasses and forbs. In the past, invasive species have been found at both ends of the airstrip, but not elsewhere along its length. The east end of the airstrip is where people usually gather water from the river. The west end of the airstrip is where the Iditarod Trail comes onto the site. The main length of the runway sees little human traffic.

However, on this visit a patch of *Bromus inermis* ssp. *inermis* was found mid-airstrip. Only 3-5 stems had flowers; others plants were <2 feet tall culms. This grass was growing where the dense vegetation meets the mostly bare gravel runway.

Scientific Name	Common Name	Percent Cover	Stem Count	Control Action
<i>Bromus inermis</i> ssp. <i>inermis</i>	Smooth brome	1	26-50	Pulled

Site 4: Mid-airstrip, south side



August 27-29, 2012

FAA site, ROHN2012-008

62.29215, -153.37349

Precision: 20 ft

Plot size: 0.1 acres (37 ft radius)

The FAA site is surrounded by spruce-alder forest, while the clearing around the weather station hosts willows and a variety of grasses and forbs.

Few stems of invasive plants were found here and were only present immediately around the structure's base. Conversations with other visitors to this site indicate that *Crepis tectorum* was pulled from this site in the past, possibly along with other species, but no records are present in the AKEPIC database.

Scientific Name	Common Name	Percent Cover	Stem Count	Control Action
<i>Crepis tectorum</i>	Narrowleaf hawksbeard	0.01	1	Pulled
<i>Descurainia cf. sophioides</i>	Tansymustard	1	26-50	Pulled
<i>Taraxacum officinale</i>	Common dandelion	0.01	1	Pulled

Site 5: FAA site



Progress 2009 to Present

With data taken from the Alaska Exotic Plants Information Clearinghouse (AKEPIC), a comparison can be made across years in the establishment and removal of invasive species at Rohn Cabin. In summary,

- Seven taxa appear to have been eradicated from the area, given that they have not been reported since 2009: *Brassica napus*, *Capsella bursa-pastoris*, *Cerastium fontanum ssp. vulgare*, *Phleum pratense*, *Plantago major*, *Poa pratensis* and *Poa annua*.
- Three new non-native species were reported in 2012: *Bromus inermis ssp. inermis*, *Taraxacum officinale* and *Hordeum vulgare*
- Two new species native to Alaska but not known from this area were reported in 2012: *Erysimum cheiranthoides* and *Erysimum inconspicuum*
- All the species reported in 2011 were also found in 2012, with the exception of *Brassica rapa*.

CABIN		2009	2011	2012 ¹
<i>Brassica napus</i>	Rapeseed mustard	x		
<i>Brassica rapa</i>	Birdsrape mustard	x	x	
<i>Capsella bursa-pastoris</i>	Shepherd's purse	x		
<i>Cerastium fontanum ssp. vulgare</i>	Big chickweed	x		
<i>Chenopodium album</i>	Lamb's quarters	x	x	x
<i>Crepis tectorum</i>	Narrowleaf hawksbeard	x	x	x
<i>Descurainia sp.</i> ²	Herb sophia/tansymustard	x	x	x
<i>Erysimum cheiranthoides</i> ³	Wallflower mustard			x
<i>Erysimum inconspicuum</i> ³	Smallflower wallflower			x
<i>Galeopsis tetrahit</i>	Brittlestem hempnettle	x	x	x
<i>Hordeum jubatum</i>	Foxtail barley	x	x	x
<i>Hordeum vulgare</i>	Common barley			x
<i>Matricaria discoidea</i>	Pineapple weed	x	x	x
<i>Phleum pratense</i>	Timothy	x		
<i>Plantago major</i>	Common plantain	x		
<i>Polygonum aviculare</i>	Prostrate knotweed	x		x
<i>Poa pratensis</i> ⁴	Bluegrass	x		
EAST END OF AIRSTRIP		2009	2011	2012
<i>Poa annua</i>	Annual bluegrass	x		
<i>Poa pratensis</i> ⁴	Bluegrass	x		
WEST END OF AIRSTRIP		2009	2011	2012
<i>Crepis tectorum</i>	Narrowleaf hawksbeard		x	
<i>Descurainia sophia</i> ²	Herb sophia	x	x	
NEW TAXA/LOCATIONS FOR 2012				
<i>Bromus inermis ssp. inermis</i>	Smooth brome			Mid-airstrip
<i>Erysimum cheiranthoides</i> ³	Wallflower mustard			Cabin entrance/doghouses
<i>Erysimum inconspicuum</i> ³	Smallflower wallflower			Kuskokwim R. bank
<i>Hordeum vulgare</i>	Common barley			Doghouses
<i>Taraxacum officinale</i>	Common dandelion			FAA site

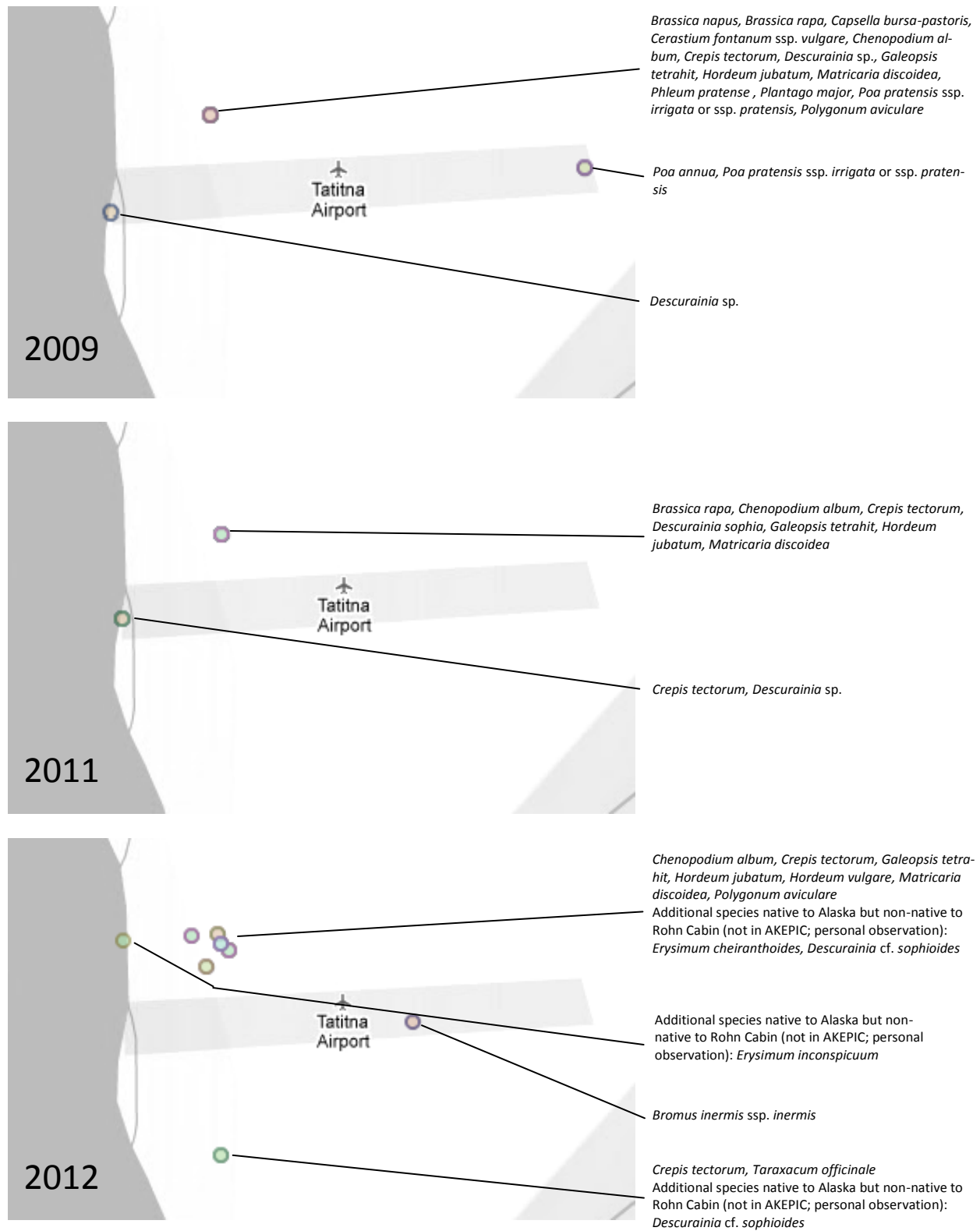
¹ Taxa indicated as present in 2012 represent the combined sites in the vicinity of the cabin: cabin entrance (ROHN2012-001 & -004), doghouses (ROHN2012-002 & -005), outhouse (ROHN2012-006).

² Determined to species *Descurainia sophia* in 2009 and 2011; determined to be *D. sophioides* in 2012.

³ Possibly present before 2012 but not apparent here because records were taken from the AKEPIC database, and these taxa are not included in the database because they are native to Alaska.

⁴ AKEPIC records indicate this is either *Poa pratensis ssp. pratensis* or *P. pratensis ssp. irrigata*. Both are non-native.

AKEPIC data for species identified at Rohn Cabin across years



Recommended Treatment Plan by Site

Rohn Cabin entrance

- *Brassica napus*, *Brassica rapa*, *Capsella bursa-pastoris*, *Cerastium fontanum* ssp. *vulgare*, *Chenopodium album*, *Crepis tectorum*, *Galeopsis tetrahit*, *Phleum pratense*, *Plantago major*, *Poa pratensis* ssp. *pratensis* or ssp. *irrigata*, *Polygonum aviculare*

These species were either not present at the cabin entrance on the 2012 visits, or were present in low numbers that could be easily hand pulled. Future control efforts should be on the lookout for these species, and should remove them by digging the plant and roots out by hand. If they are not eradicated from the cabin entrance by 2015, a new approach should be considered.

- *Descurainia* cf. *sophioides*, *Erysimum cheiranthoides*

These species were present in somewhat larger numbers, but consensus of their nativity is lacking. The *Descurainia* present at Rohn appears to be the native *Descurainia sophioides*. These plants have a pubescence that some authors (Hultén 1968) consider consistent with the non-native *D. sophia*. The total constellation of traits, however, is a good fit for more recent treatments of the native *D. sophioides*. This native species can behave in a very weedy manner and often reaches very high densities following fire and in human-disturbed areas. *Erysimum cheiranthoides* is generally considered to include native and non-native genotypes in Alaska, and because of the species' widespread nature and presence in undisturbed areas it is not included on AKNHP's non-native species list. Regardless of its statewide rarity, *E. cheiranthoides* is often introduced into new areas by human activity. Assuming removal of weedy regionally introduced species such as these is a BLM goal, we recommend hand pulling prior to flowering over multiple years. These species behave primarily as biennials and are easily pulled by hand; if they are removed prior to seed drop, control of populations should be attainable. Additionally, reducing open mineral soil by encouraging other plant establishment will limit recruitment of the seed bank. Overall, because these species are native to the state and widespread, we place a low priority on their control and elimination.

- *Hordeum jubatum*, *Matricaria discoidea*

These form a dense mat in front of the cabin. *Matricaria discoidea* is only weakly invasive, having little documented negative effects on ecosystems (see Carlson et al. 2008), and does not persist without disturbance and/or trampling. It is included here because it forms a near continuous mat with *Hordeum jubatum* at the cabin entrance.

Hordeum jubatum is native to Alaska, but has spread dramatically in recent decades due to anthropogenic disturbance. It is a perennial weed and difficult to control. It has fibrous, shallow roots that form dense mats but do not penetrate very deep. Tarping this population was tried on the August 2012 visit to Rohn Cabin, but there is no literature suggesting this is an effective method. If the method is successful, then we recommend that it should be implemented in the future, until the seed bank is depleted. Seeds remain viable for only a short period of time, with viability quickly decreasing after three years (Conn and Deck 1995).

Tarping perhaps slowed down the reproduction and spread of *Hordeum jubatum*, but more than likely additional control measures will be needed. Spring tillage can control this plant, due to the absence of rhizomes or stolons (Conn and Deck 1995). Tilling will increase weed seed germinations and emergence, so all weeds at the site will need to be removed before setting seed. However, as weed emergence increases, the longevity of the seed bank decreases (Roberts and Feast 1972, 1973). Consequently, the long-term benefits should outweigh the short-term costs of necessary follow-up treatments in the same growing season after tillage (Conn 2006).

Species growing in the vicinity of the *Hordeum jubatum* mat at the cabin entrance and in the meadow that would be affected by tilling include *Chenopodium album*, *Descurainia sophioides*, *Erysimum cheiranthoides*, and *Galeopsis tetrahit*. These are all annuals that reproduce by seed only. Therefore tilling any or all of these species will have roughly the same outcome; seed emergence will initially increase, but the seed bank will be exhausted more quickly. The duration of seed viability varies between species (AKEPIC Species Biographies), but all favor disturbed areas and are unlikely to persist after native plants reclaim sites.

If tarping and tillage are not effective, it may be necessary to use herbicide. The most effective method for controlling *Hordeum jubatum* in Alaska, as determined by Conn and Deck (1995), is to use a combination of 1.1 kg/ha glyphosate, 2.2 kg/ha ammonium sulfate, and 0.5% nonionic surfactant, applied between early August and mid-September. Timing is important, as efficacy greatly increases after plants flower and seeds mature; herbicides are least effective while stems are undergoing seed fill. As previously mentioned, seeds remain viable for up to three years, so follow up treatments will be needed for at least that long, or until the population is contained or eradicated.

Given the abundance of native plants in the surrounding area, there should be enough dispersal to re-establish native vegetation on disturbed sites without human intervention. However, if it is observed that this is not occurring, areas disturbed by weed removal could be reseeded manually. Ideally, seeds of native *Calamagrostis canadensis* should be collected at Rohn Cabin the summer of 2013 and stored for future use.

Doghouses

- *Chenopodium album*, *Descurainia cf. sophioides*, *Galeopsis tetrahit*, *Hordeum jubatum*

These species are found in the greatest numbers and density immediately surrounding the middle and northernmost doghouses. Densities decrease farther away from the doghouses, but stems can still be found reaching into the surrounding meadow. The recommendations provided for *Hordeum jubatum* at the cabin entrance apply to the central dense patch of weeds in the meadow. If tarping, tilling, or herbicide use takes place, this central patch can be delineated by where the ratio of non-native to native plants is 50:50. Areas with less than 50% non-native plants should be hand pulled, and the central patch of dense weeds should be treated with one or more of the aforementioned methods.

- *Erysimum cheiranthoides*, *Hordeum vulgare*, *Matricaria discoidea*

Few stems of these species were found around the doghouses in the meadow. The stems found within the central dense patch discussed above would be treated along with the aforementioned species. Those solitary stems creeping into the meadow should be hand pulled.

Outhouse and vicinity

- *Descurainia cf. sophioides*

This weedy species native to Alaska, yet locally introduced, is also found immediately around the outhouse, along the front and sides. This and other unwanted plants will likely continue to be a modest problem at this site, due to frequent disturbance and trampling. For now, we recommend implementing hand pulling to keep weeds in check. Should the abundance or diversity of unwanted plants increase in the future, more aggressive management strategies may be needed.

- *Crepis tectorum*, *Hordeum jubatum*

These were found scattered throughout the undergrowth in the vicinity of the outhouse. The best approach for removing these dispersed stems is to pull each out by the roots. However, this is a time consuming process, and plenty of time should be allowed to completely survey the area. The density, infested area, and number of stems should be documented on each visit; if it appears this method is not effective, more aggressive management strategies may be needed in the future.

- *Elymus trachycaulus*

There is a dense patch of grass behind the outhouse, which at first glance may resemble non-native *Elymus repens* (quackgrass). However, this is the native *Elymus trachycaulus*, which is unusually wide-leaved and robust, and should not be removed.

South Fork of the Kuskokwim River bank

- *Erysimum inconspicuum*

Although the BLM has requested removing all yellow-flowered mustards from the vicinity of Rohn Cabin, this is a native and non-weedy species. The river bank is the only place this plant was found; it was nowhere near disturbed sites or other weedy mustards. It is recommended that *Erysimum inconspicuum* is not removed.

East end of airstrip

- *Crepis tectorum*, *Descurainia cf. sophioides*

These two species were not found on the 2012 site visit and may have been eradicated from this location. The east end of the airstrip should be monitored on each visit, and if weeds reappear, they should be hand pulled. We recommend collecting *Descurainia* specimens in late flower to fruit to confirm that they are not the species alien to Alaska.

Mid-airstrip

- *Bromus inermis* ssp. *inermis*

Only found in 2012, this young population was discovered and pulled early enough that it may not reappear in 2013. If it does, hand-pulling is recommended, ensuring all roots are removed. A 20 m radius around the population should be carefully surveyed to look for any outlying stems.

West end of airstrip

- *Poa annua*, *Poa pratensis*

These grasses were not found on the 2012 site visit, and may have been eradicated from this location. The west end of the airstrip should be monitored on each visit, and if weeds reappear, they should be hand pulled. If *Poa pratensis* is relocated, we recommend collection of material for identification as the subspecies identity is unclear for this site.

FAA site

- *Crepis tectorum*, *Descurainia* cf. *sophiodes*, *Taraxacum officinale*

On the 2012 visit there were extremely few stems of each of these species. Monitoring and hand pulling at this site should continue until no weeds are found for three consecutive years. There is relatively little traffic at this site and therefore little opportunity for reintroduction of weed seeds or propagules.

Conclusions and Recommendations

Much progress has been made in removing and limiting the spread of non-native and unwanted weedy plants at Rohn Cabin. Although efforts have been successful, continued vigilance is needed to prevent the establishment of a greater abundance and variety of plants in the future. The following suggestions are intended to help protect the ecological integrity of Rohn Cabin and the surrounding area.

- Upon visiting the Rohn Cabin site, begin monitoring and treatment activities at areas with the least abundance or likelihood of finding weeds. Start with the FAA site, airstrip, and survey areas behind the cabin and elsewhere where weeds have not yet been reported. Next, move into areas with known, dense populations, including the cabin entrance, outhouse, and doghouses. This will help avoid unintentionally spreading seeds into uninfested areas.
- A thorough accounting and accurate identification of species around Rohn Cabin is necessary to track progress between years. All non-native plant populations should be documented in detail to ensure effective monitoring, assess the efficacy of control over time, and allow for changes to

treatment approaches where appropriate. A change of three sampling locations in 2009, two in 2011, and six in 2012 reflects the survey strategies of different botanist involved on each trip. It would be beneficial to have the same botanist do surveys each year.

- All weeds should be collected (prior to fruiting) in contractor bags or doubled-up garbage bags and flown off site for disposal. On site disposal by burning bags of weeds in a contained unit, such as a burn barrel may be an acceptable alternative if transportation costs and volume of weeds are too high.
- BLM staff and volunteers visiting Rohn Cabin in the summer should take care to clean boots, gear, and equipment before leaving Anchorage or other cities, to avoid transporting weed seeds from the urban center to the site.
- Timing a weed collection trip for late July or early August would be ideal. The first week of July is too early to scout for invasive species. By the last week of August some mustards have already set seed, but other species can still be managed. Treatment of some species may require springtime tillage, so a trip may also be necessary in late May or June.
- Iditarod Trail Race considerations
 - ◆ Certified weed-free straw is currently required for special use permits at Rohn Cabin. This should be a permanent requirement and should continue to be enforced.
 - ◆ Offer dog team owners in the area information on where weed-free straw for dog bedding is available.
 - ◆ Encourage those using snow machines on-site to inspect and clean their machines before bringing them to the cabin.
 - ◆ Encourage those working in support of the Iditarod Race to clean their boots and gear before leaving for Rohn Cabin; seeds can be transported even in winter.
- Provide training and educational materials regarding plant identification, impacts, and preventative actions to the public, and to those involved with Rohn Cabin activities. Update educational materials in the Rohn Cabin binder, including plant identification and prevention practices.
- Although the yellow-flowered mustards *Descurainia sophioides*, *Erysimum cheiranthoides*, and *Erysimum inconspicuum* are considered introduced to the Rohn Cabin site, they are native to Alaska and found in habitats similar to Rohn Cabin. *Descurainia sophioides* and *E. cheiranthoides* can form high-density weedy patches on disturbed substrates that can be counter to management goals. *Erysimum inconspicuum*, on the other hand, is not known to us to form dense patches and is unlikely to interfere with management goals. We recognize that the first two species may be targeted for control, but we recommend that clearly non-native taxa are higher priorities.
- For future invasive plant managers at Rohn Cabin, Appendix I includes a full species list of plants collected or identified from the site to date. This should be helpful in the future for identifying plants and distinguishing between natives and non-natives.

Works Cited

AKEPIC Species Biographies. Alaska Exotic Plant Information Clearinghouse. Alaska Natural Heritage Program, University of Alaska, Anchorage. Available at <http://aknhp.uaa.alaska.edu/botany/akepic/non-native-plant-ranks-and-biographies/#content>.

Carlson, M.L., I.V. Lapina, M. Shephard, J.S. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley and J. Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. USDA Forest Service, R10-TP-143. 218 pp.

Conn, J.S. and R.E. Deck. 1995. Optimal glyphosate application time for control of foxtail barley (*Hordeum jubatum*). *Weed Technology* 9: 267-269.

Hultén, Eric. 1968. *Flora of Alaska and neighboring territories: a manual of the vascular plants*. Stanford CA. 1008 pp.

Roberts, H.A. and P.M. Feast. 1972. Fate of seeds of some annual weeds in different depths of cultivated and undisturbed soil. *Weed Res.* 12: 316-324.

Roberts, H.A. and P.M. Feast. 1973. Emergence and longevity of seeds in annual weeds in cultivated and undisturbed soil. *J. Appl. Ecol.* 10: 133-143.

Appendix I: All native and non-native species identified at Rohn Cabin to date

Family	Scientific Name	Common Name	Not native to Rohn Cabin
Asteraceae	<i>Achillea millefolium</i>	yarrow	
Asteraceae	<i>Eurybia sibirica</i>	arctic aster	
Asteraceae	<i>Crepis tectorum</i>	narrowleaf hawksbeard	x
Asteraceae	<i>Matricaria discoidea</i>	pineapple weed	x
Asteraceae	<i>Taraxacum ceratophorum</i>	horned dandelion	
Asteraceae	<i>Taraxacum officinale</i>	Common dandelion	x
Asteraceae	<i>Solidago multiradiata</i>	arctic goldenrod	
Boraginaceae	<i>Mertensia paniculata</i>	tall bluebells	
Brassicaceae	<i>Capsella bursa-pastoris</i>	shepherd's purse	x
Brassicaceae	<i>Brassica napus</i>	rapeseed mustard	x
Brassicaceae	<i>Brassica rapa</i>	field mustard	x
Brassicaceae	<i>Descurainia sophia</i>	flixweed	x
Brassicaceae	<i>Descurainia sophioides</i>	flixweed/northern tansy mus-	
Brassicaceae	<i>Erysimum cheiranthoides</i>	wallflower mustard	x
Brassicaceae	<i>Erysimum inconspicuum</i>	smallflower wallflower	x
Brassicaceae	<i>Draba aurea</i>	golden draba	
Brassicaceae	<i>Draba cana</i>	cushion draba	
Caryophyllaceae	<i>Cerastium</i> sp.	chickweeds	
Caryophyllaceae	<i>Cerastium fontanum</i>	common chickweed	x
Caryophyllaceae	<i>Stellaria</i> sp.	starworts	
Caryophyllaceae	<i>Sagina</i> sp.	pearlworts	
Caryophyllaceae	<i>Moehringia lateriflora</i>	bluntleaf sandwort	
Chenopodiaceae	<i>Chenopodium album</i>	lambquarters	x
Elaeagnaceae	<i>Shepherdia canadensis</i>	russet buffalo berry	
Ericaceae	<i>Arctostaphylos uva-ursi</i>	bearberry, kinnikinnick	
Ericaceae	<i>Moneses uniflora</i>	single delight	
Ericaceae	<i>Orthilia secunda</i>	one-sided wintergreen	
Ericaceae	<i>Vaccinium vitis-idaea</i>	lignon berry	
Fabaceae	<i>Hedysarum alpinum</i>	alpine sweetvetch	
Fabaceae	<i>Oxytropis campestris</i>	field locoweed	
Gentianaceae	<i>Gentianella</i> (cf. <i>propinqua</i>)	four part dwarf gentian	
Lamiaceae	<i>Galeopsis tetrahit</i>	bristlestem hempnettle	x
Linnaeaceae	<i>Linnaea borealis</i>	twinflor	
Onagraceae	<i>Chamerion angustifolium</i>	fireweed	
Onagraceae	<i>Chamerion latifolium</i>	dwarf fireweed	

**All native and non-native species identified at Rohn Cabin to date
(continued)**

Family	Scientific Name	Common Name	Not native to Rohn Cabin
Orchidaceae	<i>Goodyera repens</i>	dwarf rattlesnake plantain	
Pinaceae	<i>Picea glauca</i>	white spruce	
Plantaginaceae	<i>Plantago major</i>	common plantain	x
Poaceae	<i>Bromus inermis</i> spp. <i>inermis</i>	smooth brome	x
Poaceae	<i>Calamagrostis canadensis</i>	Canada bluejoint	
Poaceae	<i>Elymus trachycaulus</i>	slender wild rye	
Poaceae	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	slender wheatgrass	
Poaceae	<i>Elymus violaceus</i>	Alaskan wheatgrass	
Poaceae	<i>Hordeum jubatum</i>	foxtail barley	x
Poaceae	<i>Hordum vulgare</i>	common barley	x
Poaceae	<i>Phleum</i> (cf <i>pratense</i> (invasive) or <i>alpinum</i> (native))	common timothy or alpine timothy	y/n
Poaceae	<i>Poa annua</i>	annual bluegrass	x
Poaceae	<i>Poa interior</i>	inland bluegrass	
Poaceae	<i>Poa pratensis</i> ssp. <i>irrigata</i>	spreading bluegrass	x
Poaceae	<i>Poa pratensis</i> ssp. <i>alpigena</i>	Kentucky bluegrass	
Poaceae	<i>Trisetum spicatum</i>	spike trisetum	
Polygonaceae	<i>Polygonum aviculare</i>	prostrate knotweed	x
Rosaceae	<i>Rosa acicularis</i>	prickly rose	
Rosaceae	<i>Dryas drummondii</i>	Drummond's mountain-avens	
Rosaceae	<i>Dasiphora fruticosa</i>	shrubby cinquefoil	
Salicaceae	<i>Populus balsamifera</i>	balsam poplar	
Salicaceae	<i>Salix</i> sp.	willows	
Santalaceae	<i>Geocaulon lividum</i>	false toadflax	
Saxifragaceae	<i>Saxifraga tricuspidata</i>	three toothed saxifrage	
Valerianaceae	<i>Valeriana capitata</i>	sharpleaf valerian	