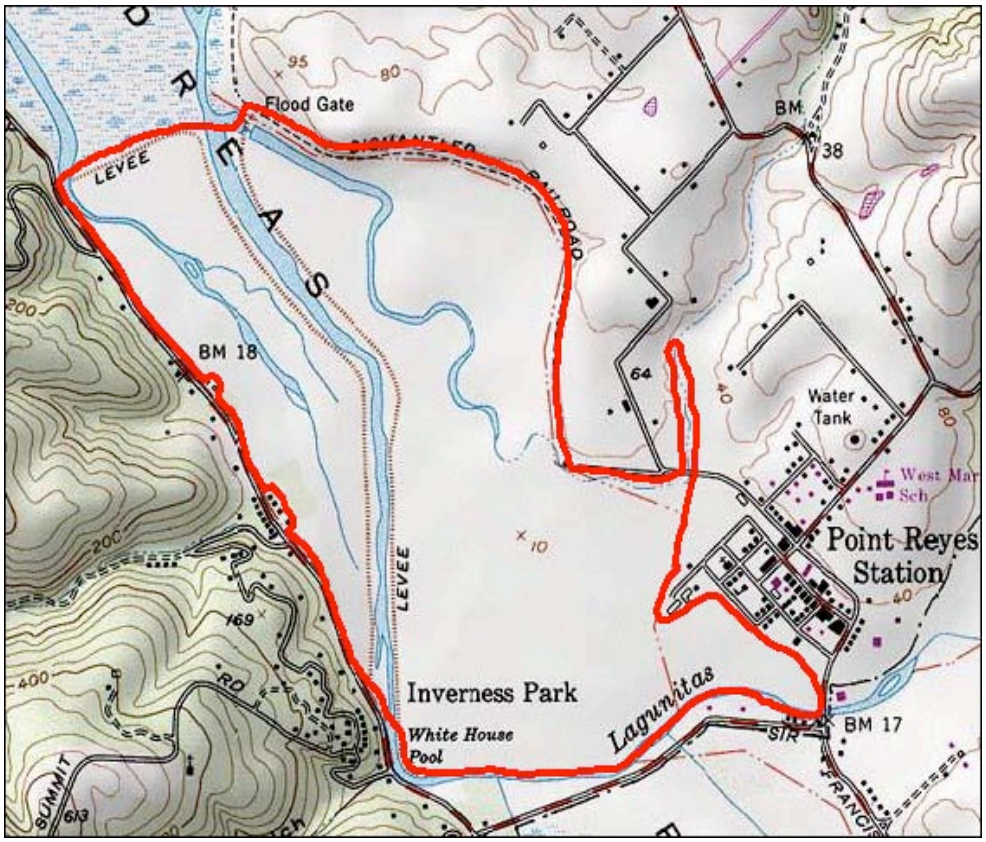
Giacomini Marsh Restoration Site
Special Status Animal Species:
Reconnaissance and Compliance

Final Report to the National Park Service

Point Reyes National Seashore



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Giacomini Wetlands Restoration Site

Special Status Animal Species:

Reconnaissance and Compliance

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Giacomini Wetlands Restoration Site
Special Status Animal Species

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Section I. Executive Summary

As a necessary component of the compliance phase of the Giacomini Wetland Restoration Project, this report documents wildlife use and occurrence of special status animal species on the restoration study site. We collected information from the California Natural Diversity Data Base (NDDB), the USFWS Threatened and Endangered Species System (TESS), as well as National Park Service (NPS) biologists, local scientists and naturalists. We also conducted general surveys to document overall wildlife use and focused surveys to document use by special status species.

The Giacomini wetlands lie in the historic floodplain of Lagunitas Creek, the dominant watercourse in the Tomales Bay watershed. Beginning in 1947, the mouth of Lagunitas Creek was channelized and manmade levees were constructed along the northern edge of the tidal marsh in order to convert the historic wetlands into pastureland for the Giacomini ranch. The channelization of Lagunitas Creek and the diking and conversion of tidal marsh to agricultural pasture has resulted in a general decline in wildlife resources. Nevertheless, the study site currently supports a diverse array of animal species, a large proportion of which have some special status because their populations are considered at-risk. The biodiversity found on the study site mirrors that found in adjacent habitats and the wider region. The mosaic of habitats in the project area, and the close proximity of a diverse mix of wetlands, provides a complex of habitats that further enhances the wildlife use of the study site. Nearby wetland habitats include open bay, estuarine sloughs and creeks, tidal flats, tidal marsh, brackish and freshwater marsh, and riparian thickets. Upland habitats in the immediate vicinity include mixed broadleaf evergreen forest, conifer forest, coastal scrub, coastal grassland, and remnant coastal prairie.

In total, 77 special status species occur on or immediately adjacent to the project area. The preponderance (approximately 70%) of these special status species would not be affected by habitat restoration, largely because their occurrence is incidental to the habitat characteristics of the site. Twenty one special status species known to occur on or adjacent to the site that might be potentially affected by habitat changes include— one reptile, one amphibian, one mammal, two invertebrates, five fish, and eleven birds (Table

I). Almost all of these species are associated with wetland habitats—riparian, fresh, brackish or tidal marshes, or associated watercourses.

Table I. Special status species potentially occurring at the Giacomini wetlands that may be directly affected by restoration alternatives.

Scientific name	Common name	Status†	Habitat
Mammals			
Lutra canadensis sonorae	southwestern river otter	CSC	watercourse
Birds			
Agelius tricolor	tricolored blackbird	CSC, BSSC1	pasture, marsh
Circus cyaneus	northern harrier	BSSC2.	marsh & field
Coturnicops noveboracensis	yellow rail	BSSC2	Marsh
Dendroica petechia brewsteri	yellow warbler	BSSC2,S 2	riparian forest
Elanus leucurus	white-tailed kite	CSC, S3	marsh & fields
Empidonax difficilis	pacific-slope flycatcher	CSC	Riparian
Geothlypis trichas sinuosa	common yellowthroat	CSC, BSSC2	Marshes
Laterallus jamaicensis coturniculus	California black rail	CT	Marsh
Nycticorax nycticorax	black-crowned night-heron	CSC, S3	riparian/marsh
Porzana Carolina	sora	BSSC3	Marsh
Rallus longirostris obsoletus	California clapper rail	FE	Marsh
Amphibians & Reptiles			
Rana aurora draytonii	California red-legged frog	FT	fresh marsh
Clemmys marmorata mormorata	northwestern pond turtle	CSC	fresh marsh
Fishes			
Eucyclogobius newberryi	tidewater goby	FE	tidal waterways
Lavinia symmetricus ssp 2	Tomales roach	CSC	tidal waterways
Oncorhynchus kisutch	coho salmon	FT	tidal waterways
Oncorhynchus mykiss irideus	steelhead	FT	tidal waterways
Oncorhynchus tshawytscha	chinook salmon	FT	tidal waterways
Invertebrates			
Ischnura gemina	San Francisco forktail damselfly	FC	upland marsh fresh pools
Syncaris pacifica	California freshwater shrimp	FE	fresh stream

† Listing codes
FE Federal Endangered; FT Federal Threatened; FC Federal Candidate; CT California Threatened; CSC California Special Concern Species (CDFG 2002c); BSSC California Department of Fish and Game Bird Species of Special Concern, numeral following (1-3) indicates priority ranking (CDFG 2002a); S = Natural Heritage status rankings at the S (subnational) level for California S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation or extinction. S4 =Statewide population apparently secure, factors exist to cause concern (NatureServe 2001; see for expanded definitions).

Several species that occur on the site serve to illustrate the opportunities available and the constraints imposed by special status species if habitat restoration, conversion, or enhancement occurs.

• The endangered tidewater goby was discovered during this study in a remnant portion of lower Tomasini Creek. The creek's course had been altered as part of the water budget management operation on the Giacomini ranch, however a malfunctioning tide gate at the mouth has allowed some tidal influence, a fortuitous situation for this estuarine fish whose habitat had been eliminated elsewhere on the study site. The opportunity for restoration and/or enhancement of tidewater goby habitat on the site is high.

• The threatened California red-legged frog has a viable breeding population in the freshwater marsh on the western portion of the study site. This population exists because of the perennial flow of freshwater into a remnant tidal marsh and because of a relatively abundant source population of frogs on adjacent lands. The delicate salinity range tolerated by this species, and its susceptibility to predation by bullfrogs (also present on portions of the study site), is a constraint that will have to be addressed as restoration alternatives are evaluated.

• The threatened California black rail is resident in the fully-tidal marsh immediately adjacent to the study site; during the spring bird surveys at least one individual was found on territory in brackish marsh within the study site. Without the source population in the adjacent tidal marsh, it is unlikely that black rails would occupy the brackish marsh on the site. The opportunity to improve black rail habitat within the study site is augmented by the presence of the neighboring population and the potential for a mixture of emergent wetland habitat types on the site.

• The endangered California clapper rail occurred in the lower reaches of Tomales Bay historically, when the tidal marshes at the mouth of Lagunitas Creek were more

extensive. Currently, this species occurs only sporadically and does not persist to breed. If restoration alternatives provide for an increase in a tidally-influenced slough system and an increase in emergent tidal marsh, there is an opportunity for clapper rails to recolonize Tomales Bay.

• Lagunitas Creek and its tributaries support viable populations of two threatened salmonids (coho and steelhead) and possibly a founding population of a third (chinook). Restoration of the hydrological complexity of the marsh system at the mouth of the creek would improve habitat values for salmon fry and would likely promote higher survival rates for these at-risk populations.

II. Introduction and overview

The National Park Service (NPS) recently purchased the 'Giacomini Ranch,' 563 acres of mostly historic wetlands located at the mouth of Lagunitas Creek, at the south end of Tomales Bay near the town of Point Reyes Station, Marin County, California. The NPS is in the planning stages of initiating a marsh restoration project of wetlands and associated habitats on the site. This effort may restore tidal influence and enhance other hydrological regimes to the Lagunitas Creek delta by removing or reconfiguring levees and tide gates that were built in 1947 (or thereafter) for the purpose of converting tidal wetlands to agricultural pasturelands. As conceived, the restored wetland will improve habitat values for a variety of rare, threatened, and endangered species, however many special status species currently occur on and around the site. In an effort to address the questions of environmental compliance that will arise in consultation with various regulatory agencies, this report provides baseline biological data on the special status animals that presently (or potentially) occur—necessary first step in the evaluation of restoration alternatives.

II-a. Regional context

Tomales Bay floods the northern 20 km of the San Andreas Fault-generated Olema Valley on the central California coast, about 50 km north of San Francisco. The bay is a 28 km^2 shallow (mean depth = 3 m), highly unidirectional, Mediterranean-type, coastal estuary, alternating between a classical estuary (net dilutive basin) during the wet winter and a hypersaline estuary (net evaporative basin) during the dry summer (Hollibaugh et al. 1988). The two primary sources of freshwater inflow (Lagunitas Creek and Walker Creek) are partially dammed for several reservoirs. There are several smaller perennial and ephemeral streams entering the bay along either shore. Most of those on the western shore are unimpeded and flow rather rapidly through granitic substrate. Those on the eastern shore flow through Franciscan formation of marine origins and many are interrupted by agricultural stock ponds. Because the 223-square mile (561 km^2) Tomales Bay watershed is non-industrial and has a low-human population density (11,000 people; ~20 persons/km^2), the bay is relatively pristine and hosts a relatively intact community of native plants and animals, including a rich complement of special status species.

With the exception of the diked historic tidal wetlands that are the subject of this study, and several small marshes isolated along the eastern shore, the bay is fully tidal. Coastal upwelling of the California current is the primary oceanographic influence from March to August, and the tidal pulse provides cool sea water with elevated nutrient levels and high primary productivity. In late summer and fall, evaporative loss of freshwater exceeds the supply of freshwater via precipitation and runoff and the inner estuary becomes hypersaline. The average annual maximum tidal swing is 2.5 m, with a difference between mean high and mean low tide of about 1.1 m. (Hollibaugh et al. 1988, Kelly 2001).

The Mediterranean climate of the region is characterized by winter rain and summer drought. Depending on location within the watershed, the 120-year average rainfall ranges from ~30 to 61 inches/year, with 95% of the precipitation occurring from October to April. Over the past 130 years, sedimentation in the bay has averaged 1 $kg \bullet m^{-2} \cdot yr^{-1}$. This rate was amplified by poor agricultural practices and logging that produced rapid sediment delivery between 1930 and 1957 (6 $kg \bullet m^{-2} \cdot yr^{-1}$), however in recent years the rate of sedimentation has been near the long-term average (Rooney 1995), and recent land use practices have reduced the annual load.

Because the west coast of North America has relatively recent geologic history, estuaries are relatively rare and tend to be more geomorphologically dynamic than in other regions of the continent. This natural dynamism is amplified by the San Andreas fault which underlies the estuary. The "near-natural" condition of the estuary is the reason it has been chosen for numerous long-term studies (Largier *et al.* 1997, Smith and Hollibaugh 1997, Kelly & Tappen 1998, etc.).

The rarity of emergent tidal marsh habitat in coastal California estuaries, and its degradation since the mid-1850s (Goals Report 1999) accounts for the subject of this investigation—the 563 acre Giacomini Wetlands restoration effort that is underway in the south-end of Tomales Bay. The Giacomini wetlands lie in the historic floodplain of Lagunitas Creek, the dominant watercourse in the watershed. Beginning in 1947, the mouth of Lagunitas Creek was channelized by manmade levees to convert the historic wetlands into pastureland for the Giacomini ranch. Except during periods of extreme inundation (e.g,, the El Niño events in the winters of 1982-84 and 1992), this system of

levees confines Lagunitas Creek to its current course, essentially bisecting the study site. This downstream reach of Lagunitas Creek is variably estuarine, depending on seasonal precipitation, upstream water releases, and tidal influence. The subsidiary Olema and Bear Valley creeks are confluent with Lagunitas Creek at the southern boundary of the project area. Other significant freshwater sources include Tomasini Creek, which flows in from the east and is currently diverted from entering the pastureland east of Lagunitas Creek, and Fish Hatchery Creek, which flows in from the west and feeds emergent fresh to brackish marsh habitat west of Lagunitas Creek. Prior to the construction of the levee system, all of these watercourses converged and, with the tidal waters, contributed to the dynamism of the Lagunitas Creek delta. This hydrologic complex and its associated habitats supported different communities of species and abundances than currently exist (e.g., see California black rail account, Section III). In the species accounts (Section III), we address and evaluate these past, present, and potential changes in the faunal characteristics of the site on a species-by-species basis.

II-b. Wildlife resources

The Giacomini wetlands, located in one of the most biologically diverse environments in North America, support a diverse array of animal species, a large proportion of which have some special status because their populations are considered at-risk. The biodiversity found on the study site reflects that of the wider region. This natural 'betadiversity' is enriched by the mosaic of habitats surrounding this particular site, including—open bay, estuarine sloughs and creeks, tidal flats, tidal marsh, brackish and freshwater marsh, riparian thickets, mixed broadleaf evergreen forest, conifer forest, coastal scrub, coastal grassland, and remnant coastal prairie.

In total, 77 special status species occur on or immediately adjacent to the project area (Tables II-a and II-b). About two-thirds of these special status species will not be directly affected by habitat restoration, largely because their occurrence is a function of betadiversity and is, therefore, incidental to the habitat characteristics of the site. Almost all of the twenty-one special status species that might be potentially affected by habitat change on site are associated with wetland habitats—riparian, fresh, brackish or tidal marshes, or associated watercourses.

In the remaining portions of Section II, we discuss each class of potentially affected fauna, and identify those special status species that might be affected by various restoration alternatives.

II-c. Invertebrates

Of the 16 potentially occurring special status invertebrates, two are known to occur within or adjacent to the study site (Tables II-A and II-B). Of these, the endangered California freshwater shrimp (*Syncaris pacifica*) was considered the most critical and the most sensitive to past and potential hydrological changes and habitat parameters; however, a focused survey of freshwater shrimp conducted in September 2001 found no shrimp present on the site (Appendix B). The San Francisco forktail damselfly has been found in emergent marsh near the mouth of Tomasini Creek (Hafernik and Mead 1992) outside the study site itself. Locations indicate that this damselfly is associated with shallow ponds adjacent to emergent tidal marsh.

II-d. Fishes

At least 32 fish species potentially occur on the study site, including seven special status species (Table II-A; Section III, and Appendix C; Tables C-1 & C-2). The lower reaches of Lagunitas Creek support at least 23 species of fish, including federally-threatened steelhead, coho and chinook salmon, and the Tomales roach, a California Department of Fish and Game (CDFG) "Species of Special Concern." The federally-endangered tidewater goby (*Eucyclobius newberryi*) had been extirpated from Lagunitas Creek, but was found during this reconnaissance effort in the channelized portion of Tomasini Creek (Appendix C). Tomasini and Fish Hatchery creeks hold remnant runs of steelhead and coho, which occur sporadically. The irrigation ditches on the Giacomini ranch provide habitat for a small assemblage of tolerant fish species such as mosquitofish and threespine stickleback. Tidal marsh habitats in Tomales Bay, adjacent to the study site, support a diverse community of marine and estuarine fish (Tomales Bay Association 1995).

Currently, the study site provides marginal fish habitat except for Lagunitas Creek, and even that habitat is compromised by channelization, reduction in freshwater

flows due to upstream damming, impact of cattle to the creek bed, and reduced riparian cover due to grazing and disturbance associated with levee maintenance. A summer dam on Lagunitas Creek (erected in the years 1940-1997) was a barrier to fish movement and eliminated brackish water habitat from the creek flood plain in the summer months, but that was removed in 1998, improving the habitat for estuarine and anadromous species. Tomasini Creek has been diverted and channelized to flow along the eastern edge of the east pastureland, and a leaky tide gate at the mouth allows muted tidal influence along its lower reaches. Riparian vegetation along the lower reaches has also been suppressed by ongoing cattle grazing and levee maintenance activities. Freshwater inflow is interrupted as well, due to stock ponds and other upstream diversions. Fish Hatchery Creek has been channelized along its lower reaches and has built up considerable sediment, becoming quite shallow as it passes through pasture. It, too, has been considerably degraded by cattle and has a malfunctioning tide gate at the north levee that allows muted tidal influence.

These various modifications to the habitat associated with the dairy operation, as well as the construction of the dams and other land use changes in the watershed, have resulted in a diminution of habitat quality and fish use. Coho and steelhead populations have declined significantly, the former to 10 percent of its historic runs of between 4,000 to 5,000 individuals. Lagunitas Creek, however, still holds one of the more important coho salmon runs in California (Smith 1986). Tidewater goby and California freshwater shrimp were believed to have been eliminated, or their populations drastically reduced, along the lower reach of Lagunitas Creek by the hydrological modifications associated with agricultural practices. Since the Giacomini summer dam was eliminated, however, populations of Tomales roach have apparently increased (Pearson 2000).

Restoration of the site to a more natural and dynamic hydrological funtion, if it occurs, is expected to provide improved habitat for fish species and for special status fish in particular. Juvenile salmon often use estuarine wetlands as they migrate to the ocean, although overall use and residence times differ among populations. Removal of the water control structures would improve access for salmonids to Tomasini and Fish Hatchery creeks. Restoration would also provide food and habitat for *Neomysis,* an important prey item for salmon and other fish in Lagunitas Creek (Bratovich and Kelly 1988), and

habitat values might be significantly improved for tidewater goby, Tomales roach and California freshwater shrimp. If removal of levees and rerouting of Tomasini Creek to more natural configuration is contemplated, the impacts to tidewater goby populations during the construction and post construction period until habitat values are restored should be taken into consideration.

II-e. Herpetofauna

Of the ten species of herpetofauna considered (six reptiles, four amphibians-Table II-A), only two occur on the site: (1) California red-legged frog, a federally-listed threatened species, and (2) northwestern pond turtle, a California species of concern. A focused survey of the frog population in 2001-2002 found that red-legged frogs were abundant (population estimate of 100 adults) in the freshwater marsh on the west side of Fish Hatchery Creek (Fellers and Guscio 2002; Appendix A). This field study also recorded presence and locations of pond turtles (Appendix A, Fig. 3); turtles were most numerous and fairly common on the eastern portion of the property. Both of these species are apt to be among the most susceptible to changes in hydrology and habitat values in the event of restoration. A summary of the local status and ecological requirements of each species is provided in Section III.

Parameters of salinity tolerances, breeding habitat requirements and availability, and predation (bullfrogs are threat to both species) will have to be considered for these two species when restoration alternatives are evaluated.

II-f. Birds

The Giacomini wetlands are located in one of the richest environments in North America for birds. Over 480 avian species have been recorded from the Point Reyes Peninsula (Stallcup 2000) and Tomales Bay supports unusually high abundances of waterbirds —more than 20,000 shorebirds and more than 20,000 waterfowl, on average, annually (Kelly & Tappen 1998, Kelly 2000). Although winter is the season of greatest abundance, the breeding avifauna is also diverse, with nearly 150 species of birds nesting in Marin County (Shuford 1993); most of those species occur in coastal areas. In addition to the usual breeding and wintering species, the area attracts an unusual array of migrants

and vagrants; indeed, nearly half of the species on the Point Reyes list are classified as "rare" or "extremely rare' (Stallcup 2000).

Of 194 species detected on the site in the course of the field surveys conducted for this study (Appendices D, E & F), about 49 (25%) were year-round resident species, a pattern that mirrors the region in general (Evens 1993, Stallcup 2000). Because of the seasonal variation in avifauna locally, we divided the year into three seasons—fall (July-October), winter (November-February) and breeding (March-June)—to evaluate the occurrence and status of birds in and around the Giacomini wetlands. Spring migration was captured during the breeding season surveys. During the breeding season, 103 species were detected; 136 species were found in winter, and 144 were detected on the site during autumn. Winter is the period of greatest use (overall numbers) because of the influx of shorebirds and waterfowl, a pattern that also mirrors the region in general.

Special status birds

Seventy-three special status bird species occur or have occurred in the watershed and were evaluated as part of this reconnaissance effort. Of those special status species, 58 (80%) have been detected on the site or in the immediate vicinity (Table II-A). Five federally threatened or endangered bird species were considered as potentially occurring on the site (California brown pelican, western snowy plover, bald eagle, California clapper rail, northern spotted owl); of those, only the clapper rail will potentially be affected by restoration, and then only if tidal marsh habitat is expanded over present conditions. Two species that are listed 'threatened' at the state level (CDFG 2002a) but not federally—California black rail and sandhill crane—also occur on the site; of those, only the black rail is expected to be affected by marsh restoration (see species accounts, Section III). The preponderance of sensitive species occurring on the site are associated with riparian or with fresh, brackish or tidal marsh habitats. Special status species most apt to be affected by habitat changes include: northern harrier, yellow rail, California black rail, California clapper rail, sora, "salt marsh" common yellowthroat, yellow-breasted chat, and perhaps belted kingfisher and black-crowned night-heron. A thorough treatment of each can be found in Section III.

Breeding season avifauna

A summary of the results of the breeding season bird surveys are provided in Appendix D. Considering all detections, 103 species were recorded in the study site during the 2002 breeding season Of the total, 23 (22.3%) were special status species; of these, eleven (10.7%) had breeding territories within or partially within the study site (Table D-7); the remaining 12 species (11.7%) were transients or visitors during the breeding season (Tables D-8 and D-9). Of all species detected, 75 (72.8%) had breeding territories within or partially within the study site, and 28 (27.2%) were non-breeders—either late winter residents (e.g., golden-crowned sparrow), spring migrants (e.g., lazuli bunting), or transients (e.g., Caspian tern). We summarized the results of avian surveys using two distance radii from the observer: all detections (i.e., unlimited distance) and only those detections within 50 m. The 50-m method standardizes detection effort (to conform with other studies), accommodates the probability that detections to 50 m in many habitat types are most reliable, and ensures independence of samplings points. Counting only those detections within 50-m of the observer (Table D-5), 76 species were detected, which included 59 breeding species (77.6% of total) and 17 non-breeding visitors (21.5% of total). For birds detected within 50m, the Shannon-Weiner index was relatively high at 38.9 (a rank of above 20 is considered an indication of high avian diversity). Considering all detections from all points, the species diversity also ranked relatively high with a Shannon-Weiner index of 35.59.

Wintering birds

Of the 136 avian species detected during winter, 21 (15.4 %) were species of special concern (Table E-1). Each species detected was assigned to one or more of nine habitat types. Riparian habitat associations accounted for nearly 40 percent of species occurring. Open water habitats were also important in attracting wintering waterfowl and shorebirds. If open water habitats (Lagunitas Creek, shallow ponds, and ditches) are lumped together, another one-quarter of the avifauna is accounted for. Tidal and cattail marshes together account for about 17 percent of species richness, and the dairy operation (dairy and cultivated field) accounts for about 16% of the total. Coastal scrub is a fairly

discrete habitat patch (limited in extent to the west slope of the Point Reyes Mesa) and supported less than 10 percent of the winter bird diversity.

Birds tend to use an array of habitats, however, and many of the riparian species also forage in adjacent ruderal or cultivated field, cattail marsh, coastal scrub, or tidal marsh. In general, the local avifauna benefits from the heterogeneity of habitat types available in close proximity to the site. (Habitat heterogeneity also introduces potential adverse impacts due to increased edge effect— nest predation, feral cats, human visitors, introdiction of non-native pests, or other disturbances.) Many species common on Tomales Bay use the site as a supplement to more extensive habitats (tidal flats, open water) available off site. Many waterfowl species, especially "dabbling ducks" (e.g. gadwall, wigeon, teal), are attracted to the flooded fields in the northeast portion of the site when they become shallowly flooded in the winter months. Shorebirds also gather here in rather high numbers to roost and forage when adjacent tidal flats are inundated on high tides. Most of the larger waterbirds (pelicans, cormorants, grebes) and the diving ducks (scaup, goldeneye, merganser) are confined to the main stem of Lagunitas Creek. One exception is the bufflehead, a small diving duck that occurs in very high winter densities on Tomales Bay (Kelly & Tappen 1998); buffleheads utilize the ranch ponds with some regularity.

The current wetland features of the site—the riparian/marsh/open water complex—contribute heavily to the avian diversity and accounts for about three-quarters of the species found on the site during winter. Of particular value, in terms of special status species, is the mosaic of emergent wetland habitat (tidal marsh, cattail marsh, damp ruderal field, and riparian) that hosts some of the rarest and most sensitive of these special status species (yellow rail, black rail, virginia rail, sora and common yellowthroat). Additionally, although not detected on these surveys, the endangered California clapper rail has occurred in the adjacent tidal marsh during four of the last six winters (Stallcup and Evens, pers. obs.). If the extent of tidal marsh increases in the future, the suitability of the habitat for this and the other marsh dependent species is expected to improve.

Autumn birds

Evens and Stallcup conducted four complete autumn bird surveys of the site and made many partial visits to determine presence/absence of transient and resident species. A list of all species detected and the habitat affinity of each is provided in Appendix F. Focused surveys for rail species were initiated during the end of the fall period (Appendix D; Fig. 2). From 15 July through 15 October 2001, a period that spans the migratory pulse of most locally occurring species, we detected 144 species on or adjacent to the study site; 31 (21.5%) of these were special status species (Appendix F). As in winter, approximately 40 percent of total species were associated with riparian thickets in the southeastern and northwestern corners of the site, areas that also received the most thorough coverage. Of the special status species, most (21 species) were associated primarily with vegetated wetland habitats (riparian-emergent marsh-wet ruderal fields), and most of the rest were either large waterbirds attracted to Lagunitas Creek or wide-ranging raptors. Other than overflying raptors, tricolored blackbird was the only special status species whose primary association on site was not wetland habitat; as in winter, the tricoloreds are attracted to grain piles at the dairy.

Rarities

Given the attractiveness of the region to rare migrants and vagrants, it is no surprise that our rather intense coverage of the study site detected several rare species—transients whose time was brief, but notable for its rarity. Rarities included—white-faced ibis (75 in May 2002), Eurasian wigeon, (several, Dec-Feb 2001), yellow rail (Jan. I, 2002), sandhill crane (June 2001), Hammond's flycatcher (Jan 31- Feb 2, 2002), and bobolink (three in Oct 2001).

II-g. Mammals

Fifty or more mammal species potentially occur on or near the Giacomini wetlands site (Appendix G-Table 1), and 21 special status species were determined to occur in the geographic region, of which nine are thought to occur in, adjacent to, or over the study site (Tables II-A, II-B; and, Section III). Of these, six are aerial insectivores (bats), two

are endemic rodents, and one is an aquatic mustelid. The six special status bat species—pallid, Townsend's western big-eared, long-eared myotis, fringed myotis, Yuma myotis, long-legged myotis— may use the site as foraging habitat and several may roost in suitable trees and structures on the Giacomini ranch. The two special status rodents are the Point Reyes jumping mouse and the Point Reyes mountain beaver. No Point Reyes jumping mouse (California Species of Concern; Table II-A) was caught in 200-trap nights in potential habitat on the site and none have been observed there (Appendix G). (Jumping mouse, however, is notoriously difficult to catch—G. Fellers, pers. comm.) Point Reyes mountain beaver apparently occurs on the heavily-wooded slopes west of the site, but no burrows were noted on the study site where there is little or no suitable habitat (Appendix G). The aquatic mustelid—southwestern river otter—was formerly extirpated from the Tomales Bay watershed but has returned to the Bay and the study site over the last decade. It was noted on the site frequently and is thought to breed along Lagunitas Creek; the local population seems to tolerate the estuarine reach of the creek quite well. Because of this species' federal and state status (Table II-A), consideration of the otter's habitat requirements should be factored into an evaluation of restoration alternatives.

The current dairy pasture provides habitat for small rodents such as voles (*Microtus*), gophers (*Thomomys*), and shrews (*Sorex),* but is generally poor quality habitat for most other native species. Tidal marsh habitats do not support mammals in the numbers or diversity of upland habitats, but restoration of the site would provide a greater mix of habitat types that will benefit a diversity of native species. In terms of special status species, tidal marsh restoration could benefit river otter by providing improved foraging habitat, elimination of the levees along Lagunitas Creek, and removal of the water control structures on Tomasini and Fish Hatchery creeks. Point Reyes jumping mouse avoids heavily-grazed pasture; restoration of riparian forest and natural, ungrazed meadow, or reversion to ruderal fields, could provide more suitable habitat for this species. The several special status bats may also benefit from (or be unaffected by) marsh restoration, but all structures on the ranch should be surveyed for active roosts before removal.

Table II-A. Special status animals potentially occurring at Giacomini Wetlands Restoration Site, Golden Gate National Recreation Area.

Common names in **bold face** indicate those taxa known to occur, present or past, that are treated more fully in the species accounts (Section III). Occurrence status ("Occurs?") bracketed by parentheses indicates uncertain status and no detection during this study.

SCIENTIFIC NAME	COMMON NAME	LISTING †	OCCURS?
MAMMALS (21 taxa)			
Antrozous pallidus	pallid bat	CSC	Yes
Aplodontia rufa phaea	**Point Reyes mountain beaver**	CSC	No
Arctocephalus townsendi	Guadalupe fur seal	FT	No
Balaenoptera borealis	sei whale	FE	No
Balaenoptera musculus	blue whale	FE	No
Balaenoptera physalus	finback whale	FE	No
Corynorhinus townsendii townsendii	Townsend's western big-eared bat	CSC	Yes
Eschrichtius robustus	gray whale	FD	No
Eubalaena glacialis	right whale	FE	No
Eumetopias jubatus	Steller sea lion	FT	No
Eumops perotis californicus	greater western mastiff-bat	CSC	(No)
Lutra Canadensis sonorae	**southwestern river otter**	CSC	Yes
Megaptera novaeangliae	humpback whale	FT	No
Myotis evotis	**long-eared myotis bat**	CSC	(Yes)
Myotis thysanodes thysanodes	**fringed myotis bat**	CSC	Yes
Myotis volans longicrus	**long-legged myotis bat**	CSC	(Yes)
Myotis yumanensis saturatus	Yuma myotis bat	CSC	Yes
Phoca vitulina richarii	**Pacific harbor seal**	FP	Yes
Physeter catodon	sperm whale	FE	No
Zalophus californianus	California sea lion	FP	Yes
Zapus trinotatus orarius	**Point Reyes jumping mouse**	CSC	(No)
BIRDS (73 taxa)			
Accipiter cooperi	**Cooper's hawk**	CSC	Yes
Accipiter striatus	**sharp-shinned hawk**	CSC	Yes
Agelius tricolor	**tricolored blackbird**	CSC, BSSC1	Yes
Ammodramus savannarum	**grasshopper sparrow**	CSC, BSSC2	Yes
Amphispizabelli belli	Bell's sage sparrow	CSC	No
Aquila chrysaetos	**golden eagle**	CSC, S3	Yes
Anser albifrons elgasi	tule greater white-fronted goose	BSSC2	Yes
Ardea alba	**great egret**	S4	Yes
Ardea herodias	**great blue heron**	S4	Yes

SCIENTIFIC NAME	COMMON NAME	LISTING †	OCCURS?
Asio otus	long-eared owl	BSSC2	(Yes)
Asio flammeus	**short-eared owl**	CSC	Yes
Athene cunicularia	**burrowing owl**	BSSC1	(Yes)
Aythya americana	redhead	BSSC2	Yes
Botarus lengtiginosus	**American bittern**	CSC, BSSC3	Yes
Brachyramphus marmoratus	marbled murrelet	FT	No
Branta bernicla nigricans	black brant	BSSC3	Yes
Branta canadensis leucoparia	**Aleutian Canada goose**	FD	Yes
Branta canadensis minima	cackling Canada goose	BSSC2	No
Bucephala albeola	**bufflehead**	BSSC3	Yes
Buteo regalis	**ferruginous hawk**	CSC	Yes
Catharus ustulatus	**Swainson's thrush**	BSSC2	Yes
Ceryle alcyon	**belted kingfisher**	BSSC3	Yes
Chaetura vauxi	Vaux's swift	CSC, BSSC2	Yes
Charadrius alexandrinus nivosus	**western snowy plover**	FT	No
Chlidonias niger	black tern	CSC, BSSC3	(Yes)
Chondestes grammacus	lark sparrow	CSC	Yes
Circus cyaneus	**northern harrier**	BSSC2.	Yes
Contopus cooperi	**olive-sided flycatcher**	CSC, BSSC2	Yes
Coturnicops noveboracensis	**yellow rail**	BSSC2	Yes
Cypseloides niger	**black swift**	CSC	(Yes)
Dendroica occidentalis	**hermit warbler**	CSC	Yes
Dendroica petechia brewsteri	**yellow warbler**	BSSC2,S2	Yes
Egretta thula	**snowy egret**	S4	Yes
Elanus leucurus	**white-tailed kite**	CSC, S3	Yes
Empidonax difficilis	**Pacific-slope flycatcher**	CSC	Yes
Empidonax traillii	**willow flycatcher**	CE (nesting)	Yes
Eremophila alpestris actia	California horned lark	BSSC3	(Yes)
Falco peregrinus anatum	American peregrine falcon	FD, CE	Yes
Falco columbarius	**merlin**	CSC	Yes
Falco mexicanus	prairie falcon	BSSC3	(Yes)
Gavia immer	**common loon**	CSC	Yes
Geothlypis trichas sinuosa	**saltmarsh common yellowthroat**	CSC, BSSC2	Yes
Grus canadensis	**sandhill crane**	ST	Yes
Haliaeetus leucocephalus	**bald eagle**	FT, CE	Yes
Histrionicus histrionicus	harlequin duck	CSC, BSSC1	No
Icteria virens	**yellow-breasted chat**	BSSC3	Yes

SCIENTIFIC NAME	COMMON NAME	LISTING †	OCCURS?
Ixobrychus exilis hesperis	western least bittern	S1, BSSC3	(Yes)
Lanius ludovicianus	**loggerhead shrike**	CSC	Yes
Larus californicus	California gull	S2, CSC	Yes
Laterallus jamaicensis coturniculus	**California black rail**	CT	Yes
Melospiza melodia samuelis	San Pablo song sparrow	CSC	No
Numenius americanus	**long-billed curlew**	CSC	Yes
Nycticorax nycticorax	**black-crowned night-heron**	CSC, S3	Yes
Oceanodroma homochroa	ashy storm-petrel	CSC, BSSC2	No
Pandion haliaetus	**osprey**	CSC	Yes
Pelicanus erythrorhynchos	American white pelican	S1, BSSC1	Yes
Pelecanus occidentalis californicus	**California brown pelican**	FE, CE	Yes
Phalacrocorax auritus	**double-crested cormorant**	S3, CSC	Yes
Phoebastria albatrus	short-tailed albatross	FPE	No
Plegadis chihi	**white-faced ibis**	S1	Yes
Porzana carolina	**sora**	BSSC 3	Yes
Progne subis arboricola	purple martin	BSSC 1	Yes
Ptychotamphusaleuticus	Cassin's auklet	BSSC2	No
Rallus longirostris obsoletus	**California clapper rail**	FE	Yes
Riparia riparia	bank swallow	CSC, ST	No
Selasphorus rufus	**rufous hummingbird**	CSC	(Yes)
Selasphorus sasin	**Allen's hummingbird**	CSC	Yes
Strix occidentalis caurina	**northern spotted owl**	FT	Yes
Sphyrapicus ruber	**red-breasted sapsucker**	CSC	Yes
Sterna elegans	elegant tern	CSC, BSSC3	Yes
Synthliboramphus hypoleucus	Xantus' murrelet	CSC; BSSC2	No
Thryomanes bewickii	**Bewick's wren**	CSC	Yes
Toxostoma redivivum	California thrasher	CSC	No
Vireo bellii pusillus	least Bell's vireo*	FE ; CE (nesting)	No
REPTILES (6 taxa)			
Caretta caretta	loggerhead turtle	FT	No
Chelonia mydas	green turtle	FT	No
Clemmys marmorata mormorata	**northwestern pond turtle**	CSC	Yes
Dermochelys coriacea	leatherback turtle	FE	No
Lepidochelys olivacea	olive ridley sea turtle	FT	No
Phrynosoma coronatum frontale	California horned lizard	CSC	No
AMPHIBIANS (4 taxa)			
Ambystoma californiense	California tiger salamander	FC	No
Rana aurora aurora	northern red-legged frog	CSC	No

SCIENTIFIC NAME	COMMON NAME	LISTING †	OCCURS?
Rana aurora draytonii	**California red-legged frog**	FT	Yes
Rana boylii	foothill yellow-legged frog	CSC	No
FISHES (10 taxa)			
Acipenser medirostris	**green sturgeon**	CSC, FC	Yes
Eucyclogobius newberryi	**tidewater goby**	FE	Yes
Hypomesus transpacificus	delta smelt	FT	No
Lampetra tridentate	**Pacific lamprey**	CSC	Yes
Lavinia symmetricus ssp 2	**Tomales roach**	CSC	Yes
Oncorhynchus kisutch	**coho salmon – central CA coast**	FT, FC	Yes
Oncorhynchus mykiss irideus	**steelhead —central CA coast**	FT	Yes
Oncorhynchus tshawytscha	**chinook salmon —s. OR/CA coast**	FT	Yes
Pogonichthys macrolepidotus	Sacramento splittail	FT	No
Spirinchus thaleichthys	**longfin smelt**	CSC	(No)
INVERTEBRATES (16 taxa)			
Adela oplerella	Opler's longhorn moth	CSC	No
Caecidotea tomalensis	Tomales isopod	CSC, S2	(Yes)
Carterocephalus palaemon ssp	Sonoma arctic skipper	CSC	No
Cicindela hirticollis gravida	sandy beach tiger beetle	CSC	No
Coelus globosus	globose dune beetle	CSC	No
Danaus plexippus	monarch butterfly	S3	Yes
Haliotes chracherodii	black abalone	FC	No
Haliotes sorenseni	white abalone	FPE	No
Helminthoglypta arrosa williamsi	William's bronze shoulderband snail	CSC	No
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	CSC	No
Icaricia icarioides	Point Reyes blue butterfly	CSC	No
Incisalia mossii	Marin elfin butterfly	CSC	No
Ischnura gemina	**San Francisco forktail damselfly**	FC	Yes
Lichnanthe ursine	bumblebee scarab beetle	CSC	No
Speyeria zerene myrtleae	Myrtle's silverspot butterfly	FE	No
Syncaris pacifica	**California freshwater shrimp**	FE	Yes

† Listing codes

FE Federal Endangered; FT Federal Threatened; FC Federal Candidate; FPE Federal Proposed Endangered; FPT Federal Proposed Threatened; FSC Formerly, Federal Species of Concern (USFWS 2002B); FD Federal Delisted (5-year monitoring ongoing); FP Federal protection afforded under the Marine Mammal Protection Act; CT California Threatened; CE California Endnagered; CSC California Special Concern Species (CDFG 2002c); BSSC California Department of Fish and Game Bird Species of Special Concern (proposed), numeral following (1-3) indicates priority ranking.

Natural Heritage status rankings at the S (subnational) level for California (NatureServe 2001; see for expanded definitions). S1 = critically imperiled, S2 = imperiled, S3 = vulnerable to extirpation or extinction. S4 =Statewide population apparently secure, factors exist to cause concern.

Table 1I -B. Annotated list of special status animal species occurring or potentially occurring at the Giacomini Wetland Restoration Site, Golden Gate National Recreation Area.

Bold type faced common names indicate those taxa that are treated in more detail in Section III. "Special status species known or potentially to have occurred in the Giacomini Wetlands Restoration site.")

Common Name *	**Habitat & local occurrence**	**Source**
MAMMALS		
pallid bat	Fairly common. Open, dry habitats with rocky areas for roosting. Occurrences near Tocaloma & Olema. Probably found in project area in any structure or tree hollow.	NDDB 2001 Fellers 2001 Fellers & DelOsso 1985
Point Reyes mountain beaver	Coastal areas; north facing slopes of hills and gullies with sword fern and thimbleberry. Historic occurrences near Mt. Wittenberg, Bear Valley Ranch, and Inverness; 1981 survey did not locate extant populations at first two locations. Has occurred in drainage west of Sir Francis Drake Boulavard.	NDDB 2000 NPS. S. Benson; Pers.comm
Guadalupe fur seal	No records within Tomales Bay	NPS
sei whale	Offshore occurrence; no records within Tomales Bay	NPS
blue whale	Offshore occurrence; no records within Tomales Bay	NPS
finback whale	Offshore occurrence; no records within Tomales Bay	NPS
Townsend's western big-eared bat	Roost near Tocaloma, upper Lagunitas Creek. Maternity roost 1/4 mi. from project area in Inverness Park.	NDDB 2001 Fellers 2001
gray whale	Occurs as migrant in nearitic waters along outercoast; occasionally enters outer Tomales Bay. Dead carcass found in 1976.	NPS
right whale	Offshore occurrence; no records within Tomales Bay	NPS
Steller sea lion	Historically bred at Point Reyes Headlands.	Allen 2001

Common Name *	**Habitat & local occurrence**	**Source**
greater western mastiff-bat	Not known to occur locally.	Fellers 2001
southwestern river otter	Observed in vicinity in 1992, Pups seen in 2001. Present and apparently breeding 2002; apparently increasing locally.	PWA 1993 Allen 2001 Authors
humpback whale	Occurs around Point Reyes Headlands	Allen 2001
long-eared myotis bat	Uncommon. Douglas-fir forest. Occurrences near Five Brooks. May fly over project area.	Fellers & DelOsso 1985 Fellers 2001
fringed myotis bat	Common. May be found in barn or any structure in project area. Flies over project area.	Fellers 2001
long-legged myotis bat	Uncommon. Occurs in Pt. Reyes NS and may occur in vicinity of project area; may be found in barn or any structure in project area.	Evens 1993 Fellers 2001
Yuma myotis bat	Fairly common. Observed in Bear Valley at Pt. Reyes NS; may be found in barn or any structure in project area.	Fellers & DelOsso 1985, Fellers 2001
Pacific harbor seal	Wanders with the tide up the estuarine reach of Lagunitas Creek on occasion.	Authors
sperm whale	No records within Tomales Bay	Authors
California sea lion	Occurs in northern portion of Tomales Bay coincident with herring runs.	Evens 1993
Point Reyes jumping mouse	No known occurrence within the study area. See Appendix G.	Fellers 2001
BIRDS		
Cooper's hawk	Common migrant and fairly common winter resident at southern end of Tomales Bay and Olema Marsh; breeds irregularly on e. slope of Inverness Ridge	Authors
sharp-shinned hawk	Status is the same as Cooper's Hawk, above.	Authors
tricolored blackbird	Nests colonially in freshwater marsh habitat; has bred locally infrequently, but not on site. Large flocks occur on outer Point Reyes and around feed lot at ranch and pastures on site most months; most abundant in fall-winter..	See species acct.
grasshopper sparrow	Short to mid-height grassland. Fairly common	See

Common Name *	**Habitat & local occurrence**	**Source**
	breeder (Apr-Aug) on east shore of Tomales Bay. Present in pasture on site in June 2002.	species acct. & Appdx. D.
Bell's sage sparrow	Breeds in chaparral and arid shrub habitat; distribution confined to Carson Ridge, Mt. Tamalpais. Not recorded nor expected on study site. Very rare vagrant to PRNS.	Shuford 1993 Stallcup 2000
tule greater white-fronted goose	Rare winter visitor to moist pasture and pond edges on site.	Appdx. F
great egret	Common in all wetland sites around Tomales Bay; nests in Inverness Park and forages locally in shallow estuarine waters and tidal, freshwater and brackish marshes and moist pastureland.	Kelly & Tappen 1998 Shuford 1993
great blue heron	Nesting colony in Inverness Park; forages throughout study site and local area	Kelly & Tappen 1998, Shuford 1993
long-eared owl	Uncommon and irregular visitor to conifer forest and riparian thickets (e.g. Olema Marsh). Has bred locally.	Authors
short-eared owl	Fall and winter visitor to tidal marshes, lowland meadows and swales. Occurs sporadically in tidal marsh n. of Giacomini levee; roosts at Millerton Point.	See Species account
burrowing owl	Observed in 1993 in project area, but occurs very rarely in coastal Marin; not detected in 2001-02 study. Opportunities for creating upland breeding sites adjacent to study site.	PWA 1993 Shuford 1993, Stallcup 2000
redhead	Occurs regularly in calm embayments on outer Tomales Bay (e.g., Walker Creek mouth); occurs irregularly on stock pond on site.	Kelly & Tappen 1998
American bittern	Sporadic occurrence at Olema Marsh; likely to utilize restored tule marsh habitat.	Authors
marbled murrelet	Nests in old growth conifer forest; not known to bred in Marin Co., but occurs in nearshore waters most months. No records on Tomales Bay, however.	Shuford 1993, Kelly & Tappen 1998
black brant	Abundant fall and spring migrant and common winter visior to outer Tomales Bay. Straggler to stock ponds on study site.	Kelly & Tappen 1998

Common Name *	Habitat & local occurrence	Source
Aleutian Canada goose	Rare but perhaps regular fall/winter visitor to Giacomini pasture and adjacent lowlands.	Appdx. E
cackling Canada goose	Very rare transient through area; no records on study site.	Authors
bufflehead	Common on open water—estuary, slough & pond; Tomales Bay "may provide the most important winter habitat on Pacific Coast."	Kelly & Tappen 1998
ferruginous hawk	Casual visitor to the area with several sightings, mostly during fall & winter, on Giacomini pasturelands & wetlands.	JE, RS Spp. Acct.
Swainson's thrush	Locally common breeder in densely vegetated riparian thickets and forest understory. Breeds on site in riparian and moist coastal scrub mosaic habitats (e.g. Point Reyes Bluff)	Appdx. D
belted kingfisher	Nests in banks along Lagunitas Creek and road banks along Sir Francis Drake Blvd.; common year-round resident	Appdx. D,E,F.
golden eagle	Rare fall and winter visitor to shores of Tomales bay.	RS, pers. comm.
Vaux's swift	Locally uncommon, suspected of breeding in mature and decadent conifer forests of Bolinas and Inverness ridges. Uncommon aerial transient over study area.	Shuford 1993 Stallcup 2000
western snowy plover	Nests outer coastal beaches at Point Reyes; may have bred formerly and/or occasionally at Dillon Beach, but does not bred along the shoreline of Tomales Bay. Occasional migrant/winter records for tidal flats at s. end Tomales Bay.	Stenzel et al. 1979. PRBO. Shuford 1993
black tern	Rare vagrant over tidal shallows.	Stallcup 2000
lark sparrow	Breeds on eastern slope (Chileno Valley) and east shore of Tomales Bay; rare spring & fall transient in grassland at s. end of Tomales Bay.	Appdx. D
northern harrier	Observed in project area since 1961. Nests in or adjacent to tidal marsh n. of project area near Willow Pt. and Bivalve marsh. Common forager over site; breeds in NW corner of site.	Stallcup 2000 authors
olive-sided flycatcher	Nests on Inverness Ridge in Douglas fir/Bishop pine association. Occurs marginally in riparian forest at site [July 2002]	Shuford 1993 Appdx. D
yellow rail	Very rare, but apparently regular fall/winter visitor to tidal marshes at s. end of Tomales Bay. A dozen	Shuford et al. 1989

Common Name *	Habitat & local occurrence	Source
	sightings since 1996 [e.g.1 Jan '02]; suffers predation by egrets, herons and hawks on flood tides.	RS, JE
black swift	Very rare fall migrant through area, but probably overlooked (too high). Observed at Dillon Beach and Point Reyes in migration; not known to breed in Marin County.	**NDDB 2001**
hermit warbler	Uncommon breeder in Douglas fir forest on Inverness ridge; uncommon migrant through riparian corridor.	Authors Shuford 1993
yellow warbler	Breeds regularly near confluence of Olema Creek and Lagunitas Creek and near Inverness Park in study area (1979, 1980, 1981-RS). Common fall migrant through riparian corridor.	Shuford 1993, Evens & Stallcup 1997, Appdx D.
snowy egret	Potential breeder in study area. Commonly forages on shoreline, marsh and ponds throughout.	Shuford 1993
white-tailed kite	Common breeder on edge of project area; forages over irrigated pasture commonly.	Shuford 1993
Pacific-slope flycatcher	Breeds in riparian thickets in project area and adjacent woodlands. Common.	Shuford 1993
willow flycatcher	Does not breed at Point Reyes NS or in Marin County. Uncommon migrant through area in spring and fall; recorded on site in Aug-Sep 2001.	Harris et al. 1988 Shuford 1993
California horned lark	Uncommon visitor to short grass pasture (outer Point Reyes); probably occurs in study area.	Appdx F
American peregrine falcon	May breed at Point Reyes NS; regularly observed within project area. Fairly common, foraging over area and at tidal marsh just n. of site.	Appdx E Appdx F
Merlin	Uncommon but regular winter visitor to s. end of Tomales Bay.	This study
prairie falcon	Rare transient, but documented foraging at s. end of Tomales Bay. Two overwintered in 2001-02.	RS
common loon	In open water on Tomales Bay; occasionally wanders up Lagunitas Creek.	PWA et al. 1993
saltmarsh common yellowthroat *	Breeds in coastal marshes throughout Pt. Reyes and Olema and Bear Valley marshes. Common breeder in project area with an estimated 239 breeding pairs at Point Reyes in 1996.	Evens et al., 1997 Appdx D, E, F
sandhill crane	Very rare visitor to moist pastureland on site; last seen June 2001.	JE
bald eagle	Does not breed at PRNS. Very rare fall/winter visitor; seen at Giacomini pasture; 3 individuals at Tomales Bay 2002.	RS, JE
harlequin duck	Rare winter visitor to rocky Tomales Bay shoreline;	Kelly &

Common Name *	Habitat & local occurrence	Source
	not present every year .	Tappen 1998 RS
yellow-breasted chat	Has bred in riparian thicket within project area; most recent sighting July 2001.	authors
western least bittern	Bred at Olema Marsh 1998. Very rare and sporadic occurrence in area. [e.g. June 2002]	authors
loggerhead shrike	Uncommon Sept-April visitor to coast; breeds in arid interior areas of watershed, e.g., Chileno Valley.	Shuford 1993
California gull	Non-breeding visitor; fairly common. Only nesting colonies are of concern.	Appdx E
California black rail	Year-round resident in Tomales Bay tidal marsh; suffers high predation rate on Giacomini Levee during high winter tides. Breeding season presence on site 2002. Observed in tidal marsh directly downstream from site annually since 1985. Also occurs, though less commonly, in Olema and Bear Valley brackish and freshwater marshes	Evens & Page1986. PWA1993 Appdx D
San Pablo song sparrow	Does not occur in Tomales Bay watershed.	Shuford 1993
long-billed curlew	Occurs regularly on tidal flats to north of site and on flooded pasture in fall & winter.	Kelly 2001
black-crowned night-heron	Fairly common in non-breeding season (though declining); roosts in willow thickets adjacent to marsh, creek, and tidal flats. Local breeding at Inverness Park and Inverness, 2001-2002.	Shuford 1993, authors
ashy storm-petrel	Observed in northern portion of Tomales Bay and Point Reyes Headlands (PRBO). Extremely unlikely in southern Tomales Bay.	PRBO Ainley 1976
osprey	Breeds on Inverness Ridge. Observed in project area in 1993 and 2001-2. Approx. 20 nest/year distributed along Inverness Ridge from Five Brooks north to Tomales Bay State Park.	NDDB 2001. Evens 1989. PWA 1993
American white pelican	Fairly common non-breeding visitor to s.Tomales Bay; roosts with some regularity near mouth of Lagunitas Creek.	Appdx E
California brown pelican	Does not breed at Point Reyes NS but fairly common non-breeding visitor to Tomales Bay	PRBO.
double-crested cormorant	Common year round resident in lower Tomales Bay and along Lagunitas Creek. Breeds on outer coast and in Tomales Bay at Hog I. with 56 nests in 2002 (J. Kelly, pers. comm.)	Kelly & Tappen 1998, ACR, PRBO
short-tailed albatross	Closest breeding colony on Izu, Japan; extremely rare wanderer far off shore, but becoming more frequent.	authors
white-faced ibis	Rare visitor. Flock of 150+ in Giacomini Pasture,	authors

Common Name *	**Habitat & local occurrence**	**Source**
	June 2000; 75 in May 2002.	
sora	Uncommon breeder in vegetated brackish and fresh marsh; winters in tidal and brackish marsh.	Appdx. D
purple martin	Breeds regularly on eastern slope of Inverness Ridge; forages over Olema marsh and study area. [Aug. 2001]	Stallcup 2000
Cassin's auklet	Beeds at SE Farallon I. Extremely rare in Tomales Bay near mouth.	Kelly & Tappen 1998
California clapper rail	Occurs sporadically in tidal marsh adjacent to site with apparent increase in recent years; potential breeder as extent of tidal marsh increases. None detected in 2001-2002.	Albertson & Evens 2000. Authors
bank swallow	Rare transient over site, mostly in early fall.	Stallcup 2000
rufous hummingbird	Uncommon transient, spring and fall.	Stallcup 2000
Allen's hummingbird	Common breeder; breeds in riparian thickets and blackberry brambles within project area.	Appdx. D
northern spotted owl	Nests in east slope canyons on Inverness Ridge about 1 km from site. See NPS data base for recent breeding locations. Roadkill found on edge of study area 1995.	NPS. JE-USFWS coll.
red-breasted sapsucker	Uncommon winter visitor; very rare breeder in watershed.	Shuford 1986, 1993
elegant tern	Fairly common to abundant fall transient in shallow estuarine waters, s. end Tomales Bay.	authors
Xantus' murrelet	No records of this marine species from Tomales Bay. Oceanic habits; not likely to be seen from shore. Candidate for federal endangered status.	Stallcup 2000. USFWS.
Bewick's wren	Fairly common breeder locally; nests in upland edge in thickets & cavities in project area.	Appdx D
California thrasher	Closest breeding population on Carson Ridge; does not occur in project area.	Shuford 1993. authors
least Bell's vireo	Has occurred as extremely rare vagrant in riparian corridor along Lagunitas Creek within project area.[Dec. 1985]	authors
REPTILES		
loggerhead turtle	Offshore in oceanic waters.	NPS
green turtle	Offshore in oceanic waters.	NPS
northwestern pond turtle	Reported in project area in 1993; confirmed in 2001. Fairly common on site in lower Tomasini Creek, Lagunitas Creek and Olema marsh and irrigation ditches; probably nests in adjacent riparian and moist	PWA 1993 **NDDB 2000**

Common Name *	Habitat & local occurrence	Source
	upland. (JE).	Appdx A.
leatherback turtle	Offsore in oceanic waters.	NPS
olive Ridley sea turtle	Offshore in oceanic waters.	NPS
California horned lizard	No local records	NDDB 2002
AMPHIBIANS		
California tiger salamander	No local records	NDDB 2002
northern red-legged frog	No local records	NDDB 2002
California red-legged frog	Present in numerous areas in Tomales Bay and Point Reyes NS. Area is within core recovery area designated by USFWS. Observed in project area in 1993, 2000-2002. One hundred breeding adults estimated in western portion of study site.	PWA 1993 Appdx A.
foothill yellow-legged frog	Observed near Salmon Creek and Walker Creek (NDDB 2001). Nearest occurrence reported 2 miles from project area. Occurs in Lagunitas Creek watershed in Big Carson Canyon.	NDDB 2002, authors
FISHES		
tidewater goby	Brackish water in shallow lagoons and lower stream reaches Last observed in Lagunitas Creek in 1953 (PWA 1993). Surveyed in 1998/99; not found, but present in 2002 in Tomasini Creek	Appdx B. Appdx C.
delta smelt	Found only in Sacramento and San Joaquin rivers (CNDDB). Listed as occurring (in "Tomales Bay Watershed") is questionable.	NDDB TBA 1995
Pacific lamprey	Anadromous in high flow systems. Listed as common in Lagunitas Creek.	Moyle et al. 1995 TBA 1995
Tomales roach	Small streams and isolated pools; estuarine reaches of coastal embayments. Observed in tributaries to Tomales Bay. Abundant in many areas such as the middle reaches of Walker Creek (P. Moyle, unpubl. data) (NDDB 2002). Known to occur formerly in Lagunitas Creek (PWA 1993).	PWA 1993 Moyle et al. 1995 CDFG 1999. Pearson 2000.
Coho salmon – central Calif. ESU	Spawn in Olema Creek, Lagunitas Creek, Devil's Gulch, and San Geronimo Creek.	TBA 1995 PWA 1993 CDFG 2002d
coastal steelhead —central CA	Historically abundant (and currently present in Lagunitas Creek B. Ketcham, 2001), although not as abundant as formerly	PWA 1993 USFWS 2002a NPS 2002

Common Name *	Habitat & local occurrence	Source
coastal chinook salmon	Observed in Lagunitas Creek apparently spawned in 2001 (B. Ketchum, 2001), although considered to occur ". . . in all estuaries n. of San Francisco Bay except Tomales Bay" in nearlier references.	USFWS 2002a Maragni 2000 Appdx.C
Sacramento splittail	Endemic to Central Valley; largely confined to Delta, Suisun Bay, Suisun Marsh, and Napa Marsh. Site sampled in 1983 and 1999, but none found. Not mentioned in "Tomales Bay Watershed" fish list (but see Sommer 2000).	USFWS 2002a Pearson 2000 TBA 1995
longfin smelt	Site sampled in 1983, 1999; none found (Pearson, 2000). Occurs at Estero San Antonio.	Wernette 2000
INVERTEBRATES		
Opler's longhorn moth	Confined to serpentine soil based grassland; this habitat does not occur in project area or vicinity. Opler's longhorn moth is recorded from 18 sites extending along the west side of the San Francisco Bay from 5 miles southeast of Nicasio in Marin County south to the Gilroy area of Santa Clara County and from the Oakland area on the inner Coast Ranges. A single population is known from central Santa Cruz County.	USFWS 2002a
Tomales isopod	No information on distribution or abundance in Tomales Bay watershed. Status unknown.	USFWS 2002a
Sonoma arctic skipper	Food plants of larvae are grasses, including purple reedgrass (*Calamagrostis purpurascens*). Adult habitat includes glades and openings in heavily forested woods, moist meadows, and streamsides. Native grasslands is an essential habitat requirement.	USGS 2002
sandy beach tiger beetle	Inhabits clean, dry, light-colored sand in upper zone of beach dunes. No habitat present in study area	CDFG 2001
globose dunebeetle	Inhabits coastal sand dune habitats commonly burrowing beneath the san surface and dune vegetation of the foredunes and sand hummocks. No habitat present at site.	CDFG 2001
monarch butterfly	Common migrant through area, with significant winter roosts in Bolinas and Stinson Beach, but declining regionwide.	NDDB 2000
black abalone	Found in intertidal and shallow subtidal zones down to a depth of about 20 feet. Range from Mendocino to southern California; common at Point Reyes.	CDFG 2002b. S. Allen.
white abalone	Found in the subtidal zone down to at least 200 feet in open, exposed areas. Most found in the Channel Islands.	CDFG 2002b
William's bronze	Only known from Hog Island on lower slopes of	NDDB

Common Name *	**Habitat & local occurrence**	**Source**
shoulderband snail	island, 12 mi. n. of project site.	2001 NPS
Ricksecker's water scavenger beetle	Found in pond habitat in San Francisco Bay Area.	CDFG 2002b
Point Reyes blue butterfly	Lupine is host plant. Distribution and abundance not well known, but 1992 surveys located this butterfly at Tomales Point and North Beach dunes.	CDFG 2002b D. Adams.
Marin elfin butterfly	Perhaps in adjacent Douglas-fir forest habitat on Inverness Ridge	
San Francisco forktail damselfly	Frequents wetlands with emergent vegetation and ponds or slow moving creeks; present along lower reaches of Tomasini Creek.	Hafernik & Mead 1992
bumblebee scarab beetle	Inhabits coastal dunes from Sonoma to San Mateo Counties. Observed at MCI/RCA site, outer Pt. Reyes. No habitat present on study site.	NPS
Myrtle's silverspot butterfly	Populations of Myrtle's silverspot are restricted to areas immediately adjacent to the coast: dunes, scrub, and grasslands. Only four extant populations known. Potential breeding habitat at Tomales Dunes.	NNDB 2001 CDFG 2002b
California freshwater shrimp	Found primarily in Sonoma, Marin, and Napa counties. Observed in Walker Creek and tributary to Keys Creek (NDDB 2000). Reported upstream in Lagunitas Creek and Olema Creek (NDDB 2000). Reportedly found on study site near former location of Giacomini seasonal dam, 2000.	Appdx B. Pearson 2000.

* Common names are arranged alphabetically by genus, as in Table II-A.

Section III. Special status species known to occur, or potentially occurring, on the Giacomini Wetlands Restoration Site.

Special status species are grouped below according to ranking status, with federal species given priority, followed by state listed species. Those species with both federal and state status (e.g. California clapper rail—endangered at both the federal and state level), are listed under the "higher" category.

For each taxon, the following information is provided:
Status: official listing status and reference.
Local distribution and abundance: a general summary of distribution and abundance in the region (San Francisco Bay Area, Marin County, Point Reyes Peninsula).
Status on the study site: a summary of what is known about occurrence on the site with reference to appended studies, where pertinent.
Ecological requirements: this subheading accompanies accounts of those species that currently occur and may be potentially affected by restoration alternatives (e.g., black rail, red-legged frog), or those species that may not occur currently, but whose distribution may be influenced by future habitat changes as the result of restoration alternatives (e.g., jumping mouse, clapper rail).
Summary of findings: a brief evaluation of the population status on the site with comments on the potential effect that may result from changes in the habitat values.

INDEX OF SPECIES ACCOUNTS FOR SPECIAL STATUS SPECIES.

III-a. Federally Threatened and Endangered Species (or formerly): page 33-45

II-B. California Species of Concern, formerly **Federal Species of Concern**

II-c. California Species of Concern

II-d. "Species to watch"

III-e. Unlisted species of local concern or conservation importance

III-f. Candidate species (proposed or denied)

III-a. Federally Threatened and Endangered Species (currently or formerly)-12 taxa

http://endangered.fws.gov/esa.html#Lnk02

Aleutian Canada Goose *Branta canadensis leucoparia*

Status: This small subspecies of the Canada goose was listed as federally endangered in 1967, downgraded to federally threatened in 1990, and delisted in 2001, when the population was deemed recovered. Currently it is a "Delisted Taxon," meaning that this subspecies is considered "Recovered, Being Monitored First Five Years" (USFWS; TESS, July 2002).

Local distribution and abundance: This goose breeds in coastal Alaska and the Aleutian Islands and winters primarily in California's Central valley. Migratory flocks may occur in wet pastures, shallow flooded fields, and marshes anywhere along coastal Marin, especially during fall and winter.

Status on the study site: Two to four individuals were observed on the site during winter avian surveys, January 2002; may occur in small numbers annually.

Summary of findings: Because those *leucoparia* that occur here are often transient and remain for only brief periods, and because there is an abundance of habitat available in the region, changes in the habitat at the Giacomini Ranch is not expected to influence local occurrence or abundance.

Western Snowy Plover *Charadrius alexandrinus nivosus*

Status: On March 05, 1993, the western snowy plover was designated as threatened in the U.S.A. (CA, OR, WA) and Mexico (58 FR 12864).

Local distribution and abundance: The study site is located within Designated Critical Habitat area of the western population (Dec 07, 1999; 64 FR 68507). Dune beaches near the mouth of Tomales Bay may provide critical winter habitat (USFWS 1995), however this species is only rarely recorded on the tidal flats at the south end of the Bay (Kelly 2001).

Status on the study site: None detected during field surveys in 2001-2002; occurs occasionally on tidal flats near the mouth of Lagunitas Creek, several hundered meters north of the property.
Summary of findings: Changes in land use or management practices in the Giacomini wetlands are not expected to affect the abundance or distribution of this species either locally or regionally.

Bald Eagle *Haliaeetus leucocephalus*
Status: Federally threatened (nesting and wintering habitat); proposed for delisting; State endangered (CDFG 2002c).
Local distribution and abundance: Rare winter visitor to coastal estuaries in the greater San Francisco Bay region.
Status on the study site: Rare winter visitor; two or three immature individuals were present on Tomales Bay in 2002. This species may forage occasionally on study site but was not detected during 2001-02 reconnaissance surveys.
Summary of findings: Changes in land use or management practices in the Giacomini wetlands are not expected to affect the abundance or distribution of this species either locally or regionally.

California Brown Pelican *Pelecanus occidentalis californicus*
Status:. Federally endangered, June 02, 1970 (35 FR 16047)..
Local distribution and abundance: Occurs commonly on local estuaries and nearshore waters as a non-breeding visitor, especially during summer and fall, with several hundred individuals sometimes present in Tomales Bay. Winter numbers on Tomales Bay are fewer; mean winter abundance 1989-1996 was 15.5 birds (range 0-56) (Kelly and Tappen 1998).
Status on the study site: Irregular visitor to site in small numbers, most commonly in fall and most commonly foraging in open water or roosting on shoreline along Lagunitas Creek, near mouth.
Summary of findings: Pelicans are not likely to be affected by habitat changes that may occur as a result of restoration.

California Clapper Rail *Rallus longirostris obsoletus*

Status: Designated as Endangered in the entire range on October 13, 1970 (35 FR 16047). The California clapper rail is also designated as "endangered' by the state, as are two other subspecies (*levipes & yumanensis*) that do not occur locally (CDFG 2000).

Local distribution and abundance: Although once more widely distributed along the California coast, present distribution is restricted almost exclusively to the emergent salt and brackish tidal marshes of San Francisco Bay. Recent records from coastal estuaries outside of San Francisco Bay are sporadic and represent presumed dispersants or vagrants. That said, there have been fall and winter records of clapper rails in the tidal marshes just north of the study area (on the west side of Lagunitas Creek) for four of the past six years (JE, RS, unpubl. field notes). In the early 1900s, when the population was apparently stronger and tidal marshes more extensive, clapper rails were reported as occurring in Tomales Bay (Grinnell and Miller 1944). Therefore, except for the intermittent presence of wandering or wintering birds, clapper rails are apparently extirpated.

Status on the study site: Intermittent visitor in small numbers to adjacent tidal marsh; no recent breeding records, however. One bird was heard on the site in October 1980 from the flooded pasture adjacent to Tomasini Creek (JE unpubl. field notes).

Ecological requirements: Preferred habitat is subject to direct tidal circulation and is characterized by predominant coverage by pickleweed (*Salicornia virginica*) with extensive stands of Pacific Cordgrass (*Spartina foliosa*), and sometimes *Scirpus robustus*, abundant high marsh cover, and an intricate network of tidal sloughs which provide abundant invertebrate populations as well as escape routes from predators. Generally, the higher marsh elevations are dominated by pickleweed, with saltgrass (*Distichlis spicata*), alkali heath (*Frankenia palmeri*), and jaumea (*Jaumea carnosa*) occurring at the highest elevations, as well as gumplant (*Grindelia* spp.) along the upper edge of some tidal sloughs. The lower marsh elevations are dominated by stands of Pacific cordgrass, which may also occur along the banks of tidal sloughs within the marsh. Low marsh areas with sparse vegetation, mudflats, and tidal sloughs are important foraging areas for rails. Higher marsh areas with dense vegetation are used for nesting and high-tide refugia (Albertson and Evens 2000). California Clapper Rails also occur in brackish wetlands

consisting of bulrush (*Scirpus* spp.). In these areas, rails use bulrush plant materials for nest building and cover, but nests are still associated with tidal channels, as in pickleweed-dominated marshes. Natural habitat for *obsoletus* is the saline and marginally brackish tidal marshland with small channels that extend through or into patches of tall monocot vegetation. The ecological functions of salinity and tidal action are unknown. The tidal channels serve an important function as areas for foraging and as protected pathways. The monocot vegetation is used as nesting material. At marshland elevations near Mean High Water (MHW), the vegetation must be at least 50 cm tall to permit the construction of a nest that is low enough to be concealed by the natural plant canopy and yet high enough that it will not be inundated by the maximum high tides of the breeding season. At marshlands of higher elevation, shorter vegetation may be utilized. Rail density seems to be positively correlated to channel density, although minimum and maximum values of channel density are not obvious from the data collected thus far. Suitable habitat is provided by most of the youthful marshlands that have evolved since the middle of the last century, as well as the remaining fragments of historical, mature marshlands. Populations of breeding California clapper rails are most dense where patches of habitat are at least 100 ha in size. Such patches typically comprise some historical and youthful marshlands together. Physical attributes of a marsh that influence rail use and may contribute to creating a self sustaining population of rails include size of the marsh, location relative to other marshes, buffer areas between marsh and upland, marsh elevation, and hydrology. These "high quality" characteristics play an integral part in the daily survival of the clapper rail as they provide food resources, cover from predators, breeding and nesting habitat, and refuge areas at high tides. Hence, the quality of a marsh will determine how many rails can be supported in a particular marsh (Albertson and Evens 2000).

Summary of findings: During 2002, no clapper rails were detected despite intense survey efforts, however sporadic occurrences over the past few years (andseveral decades), as well as earlier in the century, suggests the possibility for recolonization, particularly if tidal marsh habitat increases in extent.

Northern Spotted Owl *Strix occidentalis caurina*

Status: Designated as federally threatened in the entire range, June 26, 1990 (55 FR 26114). Critical habitat was designated 13 March 2001 (66 FR 14625).

Local distribution and abundance: Marin County, near the southern extent on the coastal range of this subspecies, hosts a relatively high number of nesting spotted owls that is actively monitored by the National Park Service (NPS). Since the mid-1990s, 25 to 35 territories have been identified annually, mostly in the western portion of the county. In the Tomales Bay watershed, spotted owls have been found nesting in most of the canyons that drain eastward off Inverness and Bolinas Ridges. Ongoing surveys by the NPS have located those territories in dense conifer stands at mid-elevations on east-flowing drainages of Inverness Ridge. USFWS requires a 0.4 km 'buffer zone' from the activity center of spotted owl territories (C. Hibbard, USFWS, pers. comm.). In 2002, seven activity centers were located within 2.8 km (1.7 mi.) of the study site, however none was within 0.4 km. The closest of these activity centers (NPS #MRO21) was 1.0 km from the project site boundary (D. Adams, NPS, pers. comm.); other sites ranged from 1.1 km to 2.8 km distant (average 1.75 km). Recommended buffer zones for northern spotted owls are currently under review by U.S. Fish and Wildlife Service (C. Hibbard, USFWS, pers. comm).

Status on the study site: Several territories have been active for many years within 2 km of the western boundary of the project area, however no records nor habitat exists on the site itself. One roadkill found (fall 1996) on Sir Francis Drake Blvd within 10 m. of the alder forest on the west edge of the site (near the base of Drake's View Dr.) suggests that individuals occur on occasion in riparian habitat. The specimen was accessioned to the National Park Service collection (JE, pers. comm.)

Summary of findings: Changes in landuse or management practices in the Giacomini wetlands are not expected to affect the abundance or distribution of this species either locally or regionally

California Red-legged Frog *Rana aurora draytonii*

Status: Listed as a Federally Threatened species on 23 May 1996 (61 FR 25813). The listing was necessary because the frog is absent from more than 70 percent of its original range and is threatened within its remaining range by a wide variety of human activities including urban encroachment, construction of reservoirs and water diversion, contaminants, agriculture, and livestock grazing (Draft Recovery Plan, January 2000). Also listed as a California Species of Concern (CDFG 2000).

Local distribution and abundance: The entire Giacomini wetland project area falls within the Point Reyes Critical Habitat Unit (Unit 12) as defined by the U.S. Fish and Wildlife Service (66 FR 14625), however the court rescinded this designation. Some of the largest extant populations are within Point Reyes National Seashore, Marin County, where there are more than 120 breeding sites with a total adult population of several thousand frogs.

Status on the study site: A survey of California red-legged frogs at the Giacomini wetlands was conducted from fall 2001 through spring 2002. Most frogs and all egg masses were found west of Lagunitas Creek in the freshwater marsh near the mouth of Fish Hatchery Creek where investigators estimated an adult population of 100 individuals (Fellers and Goscio 2002; Appendix-A).

Ecological requirements: see Fellers and Goscio 2002 [Appendix-A].

Summary of findings: Red-legged frogs were not evenly distributed within the Giacomini wetlands complex. While a few frogs were found in most areas surveyed, the main concentration was in the freshwater marsh on the west side of Fish Hatchery Creek. Although Red-legged frogs were found (but were not abundant) on the east side of Lagunitas Creek, neither eggs nor tadpoles were found on the east side of the property and it is unlikely that red-legged frogs breed in this area. Conversely, bullfrogs, *Rana catesbeiana*, known predators of red-legged frogs and their tadpolls were found east but not west of Lagunitas Creek. Spring surveys found a considerable decline in the breeding population; it is not known whether red-logged frogs are year-round residents of the marsh or if they move upland following the breeding season. Activities that might lead to a change in the habitat structure, water table, or salinity of the marsh will need to be

addressed in any restoration planning documents, and fully mitigated as directed by USFWS.

Tidewater Goby *Eucyclogobius newberryi*

Status: Designated as Endangered in the entire range on February 4, 1994 (59 FR 5494). Critical habitat was designated 20 Nov. 2000 (65 FR 6993). Also listed as a California Species of Concern (CDFG 2000). Proposed for Delisting (populations north of Orange County only) 1999.

Local distribution and abundance: The tidewater goby is endemic to California and is distributed in brackish-water habitats along the California coast. It is estimated that the goby has disappeared from nearly 50 percent of the coastal lagoons since 1900 (U.S. Fish and Wildlife Service, 1994). Swift *et al.* (1989) estimated that of 94 localities from which specimens of tidewater gobies have been collected, the gobies have been extirpated from, or are likely soon to be extirpated from, 53 (56%) locales. They probably also occurred, but are now gone, from a minimum of 46 other localities that once had suitable habitat.

Status on the study site: The population in Tomasini Creek on the study area is the only population left in the Tomales Bay watershed, having been extirpated from Walker and Lagunitas Creeks. Historic records indicate that the tidewater goby was last observed in 1953 in Lagunitas Creek within the project vicinity (Swift *et al.* 1989). In fish sampling for this report, we found tidewater goby in Tomasini Creek when twelve adults were captured and released during the Marsh 2002 sampling activities at Tomasini Creek. More adults captured during the April 2002 sampling effort appeared to be in breeding condition (B. Carmen, pers. comm.)

Ecological requirements: The tidewater goby is a small benthic fish (<50 mm standard length) found in coastal waters in California from San Diego to Del Norte counties. It differs from other species of gobies in California in that it is able to complete its entire life cycle in fresh or brackish water (Wang 1982, Irwin and Soltz 1984, Swift *et al.* 1989). This goby appears to be mainly an annual species, although according to Swift (1980), individuals in the northern part of the range live up to 3 years. The diet consists mostly of small crustaceans (i.e., mysid shrimp, ostracods, amphipods), aquatic insects (i.e., chironomid larvae, diptera larvae), and molluscs (Swift 1980, Wang 1982, 1986,

Irwin and Soltz 1984, Swift *et al.* 1989). In San Francisco Bay area streams, peak spawning occurs from late August to November when water temperature ranges from 13.5-21° C (Wang 1982).

Tidewater gobies are found in shallow lagoons and lower stream reaches where the water is brackish (salinities usually <10 ppt) to fresh and slow-moving or fairly still, but not stagnant (Irwin and Soltz 1984). They avoid open areas where there is strong wave action or strong currents. Particularly important for their persistence in lagoons is the presence of backwater, marshy habitats where they can avoid winter flood flows.

Tidewater gobies are capable of living in saline water ranging from 0 to over 50 ppt salinity and at temperatures of 8-23° C (Swift *et al.* 1989). Suitable water conditions for nesting have been reported as 5-10 ppt salinities and 18-22° C temperatures (Federal Register 1992). Water depth in tidewater goby habitat ranges from 25-100 cm and dissolved oxygen tend to be fairly high (Irwin and Soltz 1984). Gobies sometimes can persist, however, under anoxic conditions that eliminate other fish species. They have been observed to come up and gulp air at the water surface. The substrate usually consists of sand and mud, with abundant emergent and submerged vegetation (Moyle 1976). Severe salinity changes and tidal or flow fluctuations may have a detrimental effect on the survival of tidewater gobies, resulting in population declines (Irwin and Soltz 1984).

Summary of findings: Tidewater goby has been extirpated from Lagunitas Creek due to habitat destruction caused by conversion of tidal marsh to pasture, annual erection of the Giacomini seasonal dam, and introduction of non-native predators such as the yellowfin goby (*Acanthogobius flavimanus*). Tidewater goby was found in Tomasini Creek in 2002. Restoration of tidal marsh and the natural marsh/creek interface could benefit this species, however it will be important to evaluate other natural systems and compare to the study site (D. Fong, pers. comm.). As noted above, particularly important for their persistence is the presence of backwater, marshy habitats where they can avoid winter flood flows. With consideration of these habitats requirements, tidewater goby are expected to recolonize Lagunitas Creek after restoration. Consultation with USFWS would be required before modification.

Coho salmon – central CA coast ESU *Oncorhynchus kisutch*

Status: On November 20, 1996, the coho salmon was designated as Threatened in the U.S.A. (CA) for naturally spawning populations in streams between Punta Gorda, Humboldt Co., CA and the San Lorenzo River, Santa Cruz, Co., CA. Critical habitat for 19 ESUs was designated on 16 Feb 2000 (65 FR 7764). On July 28, 2000, the Fish and Game Commission received a petition to list coho salmon north of San Francisco as an endangered species under provisions of the California Endangered Species Act (CESA). The Commission referred the petition to the Department of Fish and Game on August 7, 2000, for evaluation. The Department found that the information in the petition was sufficient to indicate the action may be warranted and recommended the Commission accept the petition. The petition was accepted by the Commission on April 5, 2001. On April 27, 2001, the Commission published a Notice of Findings in the California Regulatory Notice Register declaring coho salmon a candidate species, thereby starting the candidacy period.

Local distribution and abundance: In California, it is found in many of the short, coastal drainages from the Oregon border south to Monterey Bay. Central California populations of coho have shown a precipitous decline over the last 50 years. Presently, there are probably less than 5,000 wild coho salmon (no hatchery influence) spawning in California each year. Their populations show large fluctuations, but the general trend has been downward in the wild populations of small coastal streams. Of 582 coastal streams that historically held coho, at least 19 percent and perhaps up to 40-50 percent have lost their runs (Brown *et al.* 1994). Numerous factors have adversely affected populations in the area—dam construction, logging, road construction, urban development, intensive grazing, and mining in watersheds. Within spawning streams, loss of large woody debris, riparian habitat, and increased sedimentation have reduced available habitat.

Status on the study site: Lagunitas Creek watershed once supported a substantial run of coho with an annual escapement of between 3,000 and 5,000. The current escapement of fewer that 500 cßoho nevertheless represents a major portion of the run left in California (Smith 1986).

Summary of findings: Tidal marsh and riparian restoration would benefit coho populations. Restoring tidal marsh and riparian habitat would provide potential foraging areas for juvenile steelhead. Restoration would provide increased habitat values for *Neomysis* shrimp, the major prey of outmigrating salmonids in Lagunitas Creek (Bratovich *et al.* 1984).

Steelhead—central CA coastal ESU *Oncorhynchus mykiss irideus*

Status: Designated as federally threatened (65 FR 42421) on July 10, 2000. Critical habitat was designated Feb. 16, 2000 (65 FR 7764).

Local distribution and abundance: Numerous factors have adversely affected their populations in the area such as dam construction, logging, road construction, urban development, grazing, and mining in the watershed. Within spawning streams, loss of large woody debris, riparian habitat, and increased sedimentation have reduced available habitat.

Status on the study site: The steelhead population in the Lagunitas Creek watershed has declined, but absolute numbers are lacking. Less is known about populations in Tomasini and Fish Hatchery creeks, but these areas have certainly experienced even greater declines. Although occassionally observed in in Fish Hatchery Creek currently, historic observations indicate that steelhead were fairly abundant in the late 1800s. steelhead were observed in Fish Hatchery Creek during field reconnaissance in 2002. (Appendix C2).

Summary of findings: Tidal marsh and riparian restoration would benefit steelhead. Restoring tidal marsh and riparian habitat would provide potential foraging areas for juvenile steelhead. Restoration would provide increased habitat values for *Neomysis* shrimp, the major prey of outmigrating salmonids in Lagunitas Creek (Bratovich *et al.* 1984). Removal of water control structures and providing a more natural marsh/creek interface in Tomasini and Fish Hatchery creeks would benefit this species.

Chinook (=King) Salmon—CA coastal ESU *Oncorhynchus tshawytscha*

Status: On Dec. 29, 1999, the chinook salmon-California coastal ESU (all naturally spawned spring-run populations from Redwood Creek south to Russian River) was

designated as threatened (64 FR 72960). Critical habitat was designated Feb. 16, 2000 (64 FR 14051).

Local distribution and abundance: Chinook salmon are found from the Bering Strait south to southern California. Historically, they ranged as far south as the Ventura River, California. The ESU (an Evolutionarily Significant Unit) that includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River to the Russian River is listed as a federal threatened species due to significant declines in population numbers.

Status on the study site: Chinook spawn irregularly in Lagunitas Creek, primarily when high population numbers coincide with high rainfall. Smolts were captured during the March 2002 fish sampling efforts in Lagunitas Creek (Appendix C).

Summary of findings: As with steelhead and coho, tidal marsh and riparian restoration could potentially benefit this population.

California Freshwater Shrimp *Syncaris pacifica*

Status: On Oct. 31, 1988 the California freshwater shrimp was listed by the U.S. Fish and Wildlife Service as endangered (55 FR 43884) in the entire range; this species is the only extant member of the genus.

Local distribution and abundance: The shrimp is endemic to 17 coastal streams in Marin, Sonoma, and Napa counties north of San Francisco Bay, California.

Status in study area: Within Point Reyes National Seashore and Golden Gate National Recreation Area (hereafter referred to as "Parks"), the shrimp is found within the Lagunitas Creek watershed. The shrimp was first observed and collected in Lagunitas Creek in 1877 (Hedgpeth 1975). The current range of the shrimp within Lagunitas Creek extends from Shafter Bridge in Samuel P. Taylor Park to roughly 1.6 km below the confluence with Nicasio Creek (Serpa 1991, Hedgpeth 1975). Near the project area, the shrimp has been found in lower Olema Creek (Fong 1999).

Ecological requirements: Habitat features known to be important to shrimp include: water depth, undercut stream banks, quality and complexity of submerged tree roots and herbaceous vegetation, water clarity, water quality, and substrate condition. See Fong (2002) for a more thorough discription of habitat requirements [Appendix B.]

Summary of findings: All surveyed habitats within the project area were generally rated as either "fair" or "poor" sites for shrimp (Appendix B. Table 1). No California freshwater shrimp were captured during Fong's surveys in September 2001. Many of the required habitat components were either absent or not available on a consistent basis. The presence of the introduced mosquitofish in the freshwater ditches likely precludes the presence of freshwater shrimp. Threats to existing populations include "introduced fish, deterioration and loss of habitat resulting from water diversion, impoundments, livestock and dairy activities, agricultural activities and developments, flood control activities, gravel mining, timber harvesting, migration barriers, and water pollution" (USFWS 1998). All of these threats have historically occurred along Lagunitas and Olema creeks. Marsh restoration efforts would remediate, and perhaps reverse, the deleterious effects of these land use practices.

III-B. California Species of Concern, formerly Federal Species of Concern (28 taxa)

The Sacramento Fish & Wildlife Office maintains a list of *Species of Concern*. These species receive no legal protection, and the use of the term does not mean that they will eventually be proposed for listing. Species of concern is an informal term that refers to those species that might be declining or be in need of concentrated conservation actions to prevent decline. http://sacramento.fws.gov/es/spp_lists/animal_sp_concern.cfm

Chiropterids (4 species)

Long-eared Myotis *Myotis evotis*

Fringed Myotis *Myotis thysanodes thysanodes*

Long-legged Myotis *Myotis volans longicrus*

Yuma Myotis *Myotis yumanensis saturatus*

Status: All four species of bats are considered California species of concern.

Local distribution and abundance: Both *M. thysanodes* and *yumanensis* are considered locally common; the status of the other two species is unclear, however, each is known to occur locally.

Status on the study site: Occurrence is poorly known; assumed to fly over.

Summary of findings: Lack of site specific information, however, the aerial habits of these species suggest that habitat changes on the ground are not likely to affect aerial distribution. Structures (barns, pump houses, etc.) on the site may harbor roosts and should be examined before removal or renovation.

Point Reyes Jumping Mouse *Zapus trinotatus orarius*

Status: California Species of Concern and, because it's an endemic race, a species of local concern (NPS) and conservation importance.

Local distribution and abundance: *Z. t. orarius* is apparently confined to a small area on the Point Reyes Peninsula, Marin County, California (Krutzsch, 1954), with no records from the immediate shores of Tomales Bay. Freshwater swales and damp meadows seem to provide habitat for this poorly known species. Apparently, most appropriate habitat is on the coastal slope of the Point Reyes Peninsula (U.S. Department of Interior 1995) with

representative specimens located: three miles W of Inverness; five miles NNE of the Point Reyes Lighthouse; six miles NE of Point Reyes; six miles SSE Tomales Bay. Ledum Marsh (aka "Ledum Swamp"), 5 miles northwest of the study site, is the closest known locale of occurrence.

Status on the study site: Not known to occur on the study site.

Ecological requirements: Howell (1920d) listed the habitat of this population as bunch grass marshes on the uplands of Point Reyes. Krutzsch (1954) stated that Point Reyes Jumping Mice occur in moist areas that are safe from continuous inundation. Farther north, Pacific Jumping Mouse is characteristic of the Pacific coastal coniferous forests. They seem to prefer riparian alder communities and treeless openings with tall, dense herbaceous growth of grasses and forbs (Maser et al., 1981). Wet, marshy sites are often said to be preferred, although Pacific Jumping Mice also occur occasionally in closed forests with little understory, in dry meadows, and more often in thickets of deciduous, woody vegetation along streams and seepage areas.

Summary of findings: Small mammal trapping did not detect this species on the study site [Appendix C].

Tricolored Blackbird *Agelius tricolor*

Status: California bird species of special concern, priority 1 ("BSSC1")..

Local distribution and abundance: The tricolored blackbird is confined almost entirely to California, where more than 99% of the population resides; 90% of all breeding adults occur in the Central Valley (Hamilton 2000). Recent statewide censuses have shown dramatic declines in tricolored blackbird populations from their former abundance (Beedy and Hamilton 1999). Along the California coast, the species breeds locally from Humboldt south to San Diego County, including Marin. Most local breeding records are from moist pasturelands in the vicinity of Tomales and the Point Reyes Peninsula (Shuford 1993). Wintering tricolored blackbirds often congregate in huge, mixed-species blackbird flocks that forage together in grasslands and agricultural fields with low-growing vegetation and may roost at night in nearby cattail marshes. Locally, large flocks gather in winter on ranchlands and feedlots on outer Point Reyes Peninsula and coastal Marin County.

Ecological requirements: Tricoloreds are nomadic breeders, meaning they shift nesting sites every year depending on local conditions. The species has three basic requirements for selecting breeding sites: open accessible water; a protected nesting substrate, including either flooded or thorny or spiny vegetation; and, a suitable foraging space providing adequate insect prey within a few kilometers of the nesting colony (Beedy and Hamilton 1999).

Status on the study site: As at other dairies in the area, tricoloreds congregate in large, mixed-species flocks with other blackbirds (Red-winged and Brewer's) and European starlings. These flocks, often numbering several thousand birds, frequent the grain piles at the Giacomini Ranch and often forage on moist pasture lands on the site.

Summary of findings: No tricoloreds were found breeding on the study site, nor are past breeding records known. In fall and winter, tricoloreds occur regularly in large flocks at the Giacomini Ranch (Appendix D) and roost at nearby Olema Marsh. Because of the availability of pastureland in the Tomales Bay watershed, particularly along the east shore, as well as extensive wintering habitat on outer Point Reyes, future changes in the vegetative structure or landuse practices at Giacomini wetlands are not expected to reduce local numbers, but may cause a shift in winter distribution locally.

Grasshopper Sparrow *Ammodramus savannarum perpallidus*

Status: California bird species of special concern (year round), priority 2 ("BSSC2" *in* CDFG 2002a). Not included on previous lists.

Local distribution and abundance: Due to the loss of habitat through the effects of agriculture and urbanization, the Grasshopper Sparrow has been virtually eliminated from the floor of the Central Valley, thus dividing its California range into two disjunct areas: the coastal range and the foothills of the Sierra Nevada. Along California's humid coastal regions, the Grasshopper Sparrow is found in prairies and pastures. Such habitat is most common in Sonoma and Marin counties (Rudesill 1995, Shuford 1993). In Marin County, this species is is fairly common and widespread in "the low rolling hills of northern Point Reyes and east of Tomales Bay." (Shuford 1993).

Ecological Requirements: In California, Grasshopper Sparrows prefer grassland in which some native bunchgrasses persist and where a few scattered shrubs or tall herbs and

grasses offer elevated song perches (Unitt 2002). Though the species is found in unused agricultural fields or in stands of wild oats, mustard, and ripgut grass, numbers in these habitats are lower than in those where bunchgrasses are common (Unitt 2002). This preference for bunchgrasses over sod- forming grasses has been noted elsewhere in the Grasshopper Sparrow's range (Whitmore 1981). The long history of heavy exploitation of California's grasslands has led to severe degradation of this habitat. Vast areas have been completely converted to nonnative annual species, with a great loss of habitat value to the Grasshopper Sparrow. Grazing is a negative factor over most of the western Grasshopper Sparrow's range.

Status on the study site: Two singing adults were detected in the ruderal field west of Lagunitas Creek late in the breeding season survey period (8 June 2002-Appendix D). This occurrence was a surprise, because, although locally abundant (Shuford 1993), this species tends to occur on drier hillsides in the area and is rarely encountered on breeding territory at lowland sites. The occurrence of birds so late in the breeding cycle (and the earlier absence) suggests that they were post-breeding dispersants, perhaps displaced from disturbed grassland on the east shore of Tomales Bay by agricultural cultivation.

Summary of findings: Although detected on the site, the habitat here is atypical. Because of the species' relative abundance in the local area [e.g., 150 singing birds were found in the hills east of Tomales Bay in 1982 (Shuford 1993)], and only anomalous occurrence on the site, changes in land use practices and habitat characteristics will not affect the local population.

Short-eared Owl *Asio flammeus*

Status: California Bird Species of Special Concern, priority 2

Local distribution and abundance: This nomadic species wanders widely in response to microtine rodent population outbreaks and therefore occurs sporadically in coastal Marin County, most commonly during autumn months. Only one confirmed breeding record exists, and that from outer Point Reyes 'in an area where dunes, coastal swales, and grasslands intermix" (Shuford 1993). Elsewhere in California, short-eared owls breed in fresh, brackish, and salt marshes, lowland meadows, moist grasslands, and fallow fields (Grinnell and Miller 1944). Locally, autumn and winter roosts have been noted in damp

swales at Millerton Point on the east shore of Tomales Bay, in beach-grass dominated coastal dunes at Limantour Estero, Point Reyes National Seashore, and in lupine shrub dominated coastal strand on Kent Island, Bolinas Lagoon.

Ecological requirements: Short-eared owls are primarily rodent predators, cueing especially on *Microtus* locally (JE, pers. obs.). This species tends to nest and roost on the ground in relatively large aggregations when prey is abundant. Low but dense vegetative cover is necessary for concealment.

Status on the study site: This species was not detected on the study site during surveys, however in the past individuals have been noted foraging in the tidal marsh immediately north of the northernmost levee system that bounds the site (JE, RS pers. obs.). During 1999-2002, several birds were present at Millerton Point (~2.2 miles n. of the site) during fall and early winter, but did not remain into the breeding season. It is likely that visiting individuals forage widely over fields and tidal marshes in the area.

Summary of findings: Short-eared owls have not been recorded on the study site, but do occur occasionally on adjacent tidal marsh habitat and may forage over the site on occasion. Changes in habitat structure at the site will have only a peripheral effect on locally occurring short-eared owls, and to the extent that habitat is improved for *Microtus,* which is relatively common in adjacent tidal marsh as well as in the northwestern portion of the study area (Appendix C), owls will benefit.

American Bittern *Botarus lengtiginosus*

Status: California Bird Species of Species Concern. Formerly considered a "BSSC" level 3, however not included on the recent review of special status species (CDFG 2002).

Local distribution and abundance: American bittern is rare a breeder and winter resident in Marin County and at Point Reyes (Shuford 1993, Stallcup 2000), but because of its secretive habits and haunts, it may be more common than known. Although probably always relatively rare in coastal Marin County, abundance has certainly diminished with the historic loss of freshwater marshland and peripheral vegetation. Rarity is attributed to scarcity of large freshwater marshes (Shuford 1993).

Status on the study site: Not detected on study site, however a fairly regular visitor to the *Typha*-dominated Olema Marsh immediately south of Giacomini wetlands.

Summary of findings: Suitability of the Giacomini wetlands for bitterns will increase in proportion to the development of fresh and brackish marsh with emergent *Typha-Scirpus* vegetation.

Ferruginous Hawk *Buteo regalis*

Status: Formerly Federal Species of Concern. Included on CDFG's (1992) unprioritized list, i.e., formerly a species of special concern, however not reaching the threshold of ranking in the most recent list (CDFG 2002a). There appears to be no documented evidence of substantial declines in numbers of this hawk wintering in California. Expansion of urban development and of vineyards into former grasslands, though, has reduced some foraging areas for the species.

Local distribution and abundance: A rare but regular non-breeding visitor to coastal Marin (Stallcup 2000), becoming more common in drier interior pasturelands.

Status on the study site: Individuals have been observed on several occasions flying over and apparently foraging in the dry pasturelands on the study site. Occurrence of these wide-ranging buteos is likely incidental here.

Summary of findings: Given the preference for dry, open pasture and prairie, and its relative availability in Marin County including outer Point Reyes, any changes to the habitat structure at Giacomini wetlands will not affect local distribution or abundance of this species.

Lark Sparrow *Chondestes grammacus*

Status: California Species of Concern.

Local distribution and abundance: During countywide breeding bird surveys, lark sparrows were "widespread breeders in central Marin . . . [and] sparse or absent from the outer Point Reyes peninsula [and] in grasslands around Tomales Bay . . ." (Shuford 1993). Habitat preference includes relatively arid short-grass prairie and pastureland with a scattering of scrubs, boulders or outcroppings, and perhaps fence posts to provide song sentries and nesting opportunities.

Status on the study site: Two individuals, apparent transients, were present atop a blackberry bramble near the Giacomini Dairy on one census date early in the breeding

season. This was considered a rare occurrence, and no other individuals were detected during the course of the one year survey period.

Summary of findings: Given the preference for dry, open pasture, sparsely vegetated shrubland, and prairie, and the relative availability of such habitat in Marin County, any changes to the habitat structure at Giacomini wetlands is not expected to affect local distribution or abundance of this species.

Olive-sided Flycatcher *Contopus cooperi*

Status: California Species of Concern. Currently considered a Bird Species of Special Concern (breeding), Priority 2. (CDFG 2002). Not included on the original list (Remsen 1978). A decline in numbers in California (and other portions of USFWS Region 1) led to the inclusion of this species on the list of "Migratory Nongame Birds of Management Concen" (USFWS 1987).

Local distribution and abundance: An uncommon spring and summer breeding species, it is fairly widely distributed throughout Marin County in mature conifer forest and woodlots.

Status on the study site: Breeds in mixed evergreen forest on the east slope of Inverness Ridge, but does not breed on the study site. One individual detected in riparian canopy in the northwest corner of the site was probably a post-breeding dispersant from adjacent conifer forest on the east slope of Inverness Ridge or an early migrant.

Summary of findings: Any changes in the habitat structure at Giacomini wetlands will not affect the local distribution and abundance on this species.

Hermit Warbler *Dendroica occidentalis*

Status: California Species of Concern.

Local distribution and abundance:

Very localized and rather rare breeder in Marin County in mature moist conifer forest and mixed broadleaf-evergreen woodlands.

Status on the study site: No nesting habitat on the site. Noted twice (2 individuals on separate dates) in riparian vegetation in northeast corner of the study site during fall and winter (Appendix D). In the non-breeding season, this species tends to move with other

insectivores in mixed-species foraging flocks and is expected to occur sporadically in the riparian vegetation adjacent to forested habitats.
Summary of findings: Sporadic occurrence on the site. Local occurrence will not be affected by habitat changes unless riparian vegetation is reduced in extent.

White-tailed Kite *Elanus leucurus*
Status: California Species of Concern, CNNDB ranking of S3. This is currently considered a "fully protected" species in California. Despite the difficulty of tracking the trends of a species that fluctuates greatly from year to year, numbers of kites on Breeding Bird Survey routes in California were relatively stable over the period 1966-2000 (Sauer *et al*. 2001). Currently considered a "Species to Watch" by CDFG (2002).
Local distribution and abundance: A year round resident in coastal Marin County, abundance and distribution varies from year-to-year with fluctuations in populations of *Microtus*, the primary prey item. Fallow fields, coastal prairies, marshy grassland, and swale that support *Microtus* tend to attract kites. This species has nested near the mouth of Olema Creek annually for the past five years and intermittently at least since the mid-1970s (RS, pers. comm.). In 2002, kites nested at Millerton Point (~2.2 mi. north) and in a canyon just west of the study site. In response to a fluctuating food supply, kites are somewhat nomadic, so they may nest in one area for a year or several, and then disperse elsewhere.
Status on the study site: Fairly common at all seasons in the Giacomini wetlands, especially in the damp pastureland, ruderal fields, and tidally-influenced marsh land in the northwest corner. Birds that nest on the east slope of Inverness Ridge forage regularly along the lightly-grazed or fallow fields, levees, and tidal marsh habitat.
Summary of findings: Changes in habitat structure at the site will have only a peripheral effect on locally occurring kites, and to the extent that habitat is improved for *Microtus* (which is relatively common in adjacent tidal marsh as well as in the NW portion of the study area (Appendix C), kites, like short-eared owls, will benefit.

Pacific-slope Flycatcher *Empidonax difficilis*
Status: California Species of Concern.

Local distribution and abundance: Widespread spring and summer resident, nests in moist, relatively dense, and shaded broadleaf evergreen, mixed conifer, and riparian forests and thickets.
Status on the study site: One of the most common breeding passerines in the riparian association on the study site (Appendix D) and a common migrant during fall and early spring. This small insectivore thrives in riparian and coastal scrub habitat on and adjacent to the project area.
Summary of findings: Habitat changes that favor an increase in riparian cover will benefit this species.

Common Loon *Gavia immer*

Status: California Species of Concern; CNDDB rank S1; California Bird Species of Special Concern (Priority 1) because it has been extirpated from the state as a breeding species (CDFG 2002a).
Local distribution and abundance: Fairly common fall and winter visitor to deep water as well as coves and mouths of tributaries on Tomales Bay, especially north of Tomasini Point. A seven-year study indicates numbers of this species are increasing on Tomales Bay (Kelly 2001).
Status on the study site: None detected during the course of our avian field surveys, however, common loons have been observed sporadically in the estuarine reach of Lagunitas Creek, usually in winter and on rising tides.
Summary of findings: Lagunitas Creek is the only habitat on the study site likely to attract common loon; no changes in occurrence of this species are anticipated.

Saltmarsh Common Yellowthroat *Geothlypis trichas sinuosa*

Status: California Species of Concern; BSSC1 (CDFG 2002). Formerly, *sinuosa* was a candidate (Category 2) for federal listing as threatened or endangered (USFWS 1989, 1991) and a Bird Species of Special Concern (CDFG 1991). Earlier, listed as a CDFG special concern species (ranked: G5T2S2, or "demonstrably secure" with "1000-3000 individuals or 2000-10000 acres of occupied habitat.") The recent revision has elevated this taxon to a 1st category BSSC (CDFG 2002).

Local distribution and abundance: The breeding population is confined primarily to San Francisco Bay and outer coast marshes from Marin to Santa Cruz counties, however, the eastern (upstream) limit of distribution within San Francisco Bay is unclear. Specimens indicate some movement outside the breeding range, especially to the south. Post-breeding and winter distribution is not well understood, however it is assumed that the yellowthroats associated with *Salicornia*-dominated salt marshes in the San Francisco Bay area are *Geothlypis trichas sinuosa* (Foster 1977, Hobson 1985). Within Marin County, Olema and Bear Valley marshes support some of the greatest densities of yellowthroats (Evens *et al*. 1997).

Status on study site: An estimated five pairs of yellowthroats were found nesting in wetlands on the study site in 2002. Yellowthroats were clustered in the vicinity of the freshwater marsh-riparian zone on the west side of Lagunitas Creek, but also occurred to the south on the mainstem of Lagunitas Creek (and in Olema Marsh) and near the mouth of Tomasini Creek (Appendix D. Fig. 4).

Ecological requirements: Foster (1985) divided the breeding habitat of *sinuosa* into three broad types: woody swamp, brackish marsh and freshwater marsh. Subsequent studies describe yellowthroats in the San Francisco Bay area as a whole occupying about 60% brackish marsh, 20% riparian woodland/swamp, 10% freshwater marsh, 5% saltmarsh, and 5% upland (Hobson *et al*. 1986, Shuford 1993, and Terrill 1997). Nur *et al.* (1997) found that yellowthroats utilized marshes with a high percent cover of tules or rushes (*Scirpus* spp.), peppergrass (*Lepidium*), and common cattail (*Typha* spp.), yet low percent cover of pickleweed (*Salicornia*) and concluded that yellowthroats were most common where *Salicornia* was least prevalent. It is important to note that yellowthroat habitat occupies the borders between and around moist situations, and that a contiguity of wetland types enhances the value of the habitat. Yellowthroats are also adept at using small and relatively isolated patches of habitat where ground water is close to the surface; these patches include swales and seeps; however, they may nest occasionally in drier environments (Hobson *et al*. 1986). Local studies provide information into the ecological parameters of the local population. Kelly and Wood (1996) found diurnal, intraseasonal and intersexual differences in foraging behavior of *sinuosa* in Olema Marsh, adjacent to the project area. Evens *et a*l. (1997) captured an unexpected preponderance of males in

breeding habitat at Bear Valley marsh and speculated that females and birds of the year move downstream in the post-breeding season to utilize saltmarsh and peripheral habitat. Evens and Stallcup estimated an average density of 0.5 (se=0.19) territorial males/ha in nine breeding seasons in a 17.5 ha brackish to fresh mash habitat at Olema Marsh. A study of habitat disturbance (fire) within Point Reyes National Seashore found minimum yellowthroat densities of 1.86 territories/ha at undisturbed control sites and estimated 239-300 pairs of yellowthroats breeding at Point Reyes (Evens *et a*l. 1997).

Summary of findings

Point Reyes, Olema Marsh, and the vicinity of the study site may support one-third of the total population of this Category 1 taxon (Evens 2002). Breeding habitat is currently limited on the study site (Appendix D), however use of the site during the post-breeding season is relatively high and the potential is high for adjacent populations to expand breeding ranges onto the Giacomini wetlands with an increase in fresh and brackish marsh habitat and riparian associations.

Loggerhead Shrike *Lanius ludovicianus*

Status: California Species of Concern. Recently added to the BSSC list as a 3rd priority (CDFG 2002). Included on CDFG's (1992) unprioritized list, but not on Remsen's (1978) prioritized list. This species bears close watching as its numbers on Breeding Bird Survey routes in California have shown highly significant decline for the period 1966-1979 and a marginally significant decline for the period 1966-2000 (Sauer *et al.* 2001).

Local distribution and abundance: Rather uncommon visitor to the lowlands surrounding Tomales Bay, with limited breeding occurring only in drier valleys and mesas. In the non-breeding season more widely distributed, and individuals may wander coastward and even remain for extended periods. This species has declined noticeably in coastal California in recent years, reflecting an overall decline in the population.

Status on the study site: The species has been noted occasionally in fall and winter in the emergent tidal marsh habitat immediately north of the study site (pers. obs.). None was detected in the course of our avian surveys, however, single birds may occur on occasion.

Summary of findings: Lack of occurrence on the site, and the species tendency to avoid the fog belt and the immediate coast (Shuford 1993), suggest that local distribution and

abundance will be unaffected by any changes in habitat characteristics of the Giacomini wetlands.

California Black Rail *Laterallus jamaicensis coturniculus*

Status**:** California threatened species (CDFG 2002c).

Local distribution and abundance: Tidal marshlands of the San Francisco Bay region support the preponderance of the entire California Black Rail population (Evens et al. 1991). Small populations occur also on the outer coast tidal marshes (Bodega Bay, Tomales Bay, Bolinas Lagoon, and Morro Bay) and in freshwater marshes and swales associated with Sierra foothills, the Colorado River and the Salton Sea; however, it has been estimated that these sites support less than 10% of the total population and because of fragmentation and small sizes of these populations, they are susceptible to stochastic extinction (Evens *et al*. 1991). Breeding populations in Central and South San Francisco Bay and the coastal marshes of southern California are apparently extirpated. The historic and ongoing pressures of agriculture, salt production, and urbanization has reduced tidal marshlands of San Francisco Bay by an estimated 85% (Goals Project 1999), and there has been a concomitant reduction in Black Rail populations supported by that habitat (Evens et al. 1991).

Status on the study site: Early in the 1900s, black rails were apparently very common in the tidal marshes of Tomales Bay near Point Reyes Station (Grinnell and Miller 1944). This population suffered habitat loss and undoubtedly a great reduction in numbers following diking and draining of these marshlands in the mid-1940s with the development of the Giacomini pasturelands. More recently, ongoing studies have documented year-round black rail presence in the tidal marsh habitat immediately north of the study site at least since the early 1980s (Evens and Page 1986). A breeding population of seven pairs was estimated in the higher elevation tidal marsh in recent years (Evens et al. 1986; Evens and Nur, 2002). We have also detected breeding individuals in intermittent years at Olema and Bear Valley Marshes, immediately south of the site. In focused surveys for this reconnaissance study, we again found black rails present there, as well as within the study site [Append. D; Fig. 2]. Territorial black rails were calling on territories in May and June 2002 and were assumed breeding in the *Typha-Scirpus* marsh in the northwestern corner of the site.

Ecological requirements:

Black rails tend to occur in the larger undiked marshes, particularly those associated with the mouths of rivers of creeks (Evens et al. 1989). Relationships between rail presence and habitat variables in San Francisco Bay include vegetation height (>10 cm), presence of *Frankenia* (an indicator of high elevation marsh habitat), and absence of amphipods (indicators of lower elevation marsh). Thus, black rails occur in relatively high-elevation, tidally influenced marsh habitats. The condition of transitional vegetation along the upland edge adjacent to marshes is a factor in habitat suitability for rails (Evens and Page 1986). Other variables that help explain the patchy distribution of black rails in tidal marshes of the San Francisco Bay region include: patch size, patch distribution (contiguity), patch configuration (linear or broad), predator populations, hydrological cycles, and fluctuations in water level (Evens *et al.* 1989, Flores and Eddleman 1993, Evens *et al*. 1991; Evens and Nur *in press*):

1) Patch size: size may be positively correlated to increased density. Smaller marshes are less likely to support rails, and there is a non-significant but positive tendency for abundance and density to increase with marsh size, however, black rails can utilize very small patches, especially in areas where large patches are unavailable.

2) Contiguity: it is likely that the distributional relationship of each marsh to other marshes influences presence or absence as well as relative abundance of rails. Rails may occupy marshes with muted tidal flow if they were adjacent to a fully-tidal marsh and the substrate is well hydrated.

3) Marsh configuration: broader marshes tend to support rails (and in higher abundance) than linear marshes. Thus, rails are very sparsely distributed through the narrow strip marshes that fringe many of the larger watercourses in San Francisco Bay and tend to be concentrated in broader patches. This pattern is perhaps a manifestation of the same phenomenon displayed in the size relationship, i.e., a function of ratio of edge to 'center,' as well as the geophysical effect of elevational gradients being compressed in linear habitats (along tidal sloughs) and, therefore, less elevational gradient is available. In an intensive study of Sonoma Creek Marsh in 1987, distribution within a linear marsh mirrored microelevational changes, with rails occupying slightly higher ground.

4) Predator populations: Sites bound by levees or rip rap provide access and habitat to predators and, therefore, predation pressure may be increased at those sites, especially when peripheral vegetation does not provide refuge.
5) Hydrology: As described in an earlier study (Evens *et al*. 1991), within the San Francisco Bay region, tidal marshes that are subjected to fully tidal influence provide the best habitat for black rails. Within those marshes, particularly in younger sites or those sites that have suffered extensive hydrological modification by humans, the rails may be clustered near sources of fresh water influence, as indicated by *Scirpus* patches.
6) Water levels: Fluctuation of water levels is one of the habitat variables that determines presence or absence of black rails. Inundation above a certain depth may exclude habitat to black rails; however if inundation is periodic and short-lived (e.g. tidal), and there is upland refugia adjacent to the marsh, rails may persist at the site.
Summary of findings: A small (<10 breeding pair) and isolated coastal population of black rails resides in the tidal marshes north of the Giacomini wetlands, a remnant of a once more abundant population at the south end of Tomales Bay. Small numbers (1-2 individuals) also occur within the project site in brackish to fresh marshland. Restoration efforts could improve the availability of habitat for black rails locally, however, attention will have to be given to subtle habitat features.

Long-billed Curlew *Numenius americanus*
Status: California Species of Concern; also included on CDFG's (1992) unprioritized list but not on Remsen's (1978) prioritized list. Data are inadequate for trend assessment on Breeding Bird Survey routes in California (Sauer et al. 2001).
Local distribution and abundance: Uncommon but regular visitor to greater San Francisco Bay Area, including outer coast estuaries. Rare at Tomales Bay (0-3 per winter-Kelly 2001), though relatively common at Bolinas Lagoon and Bodega Bay. May occur any month of the year, however, does not breed locally.
Status on the study site: Very rare; one individual noted on tidal flats near mouth of Lagunitas Creek in the course of the year-long avian surveys.
Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Black-crowned Night-Heron *Nycticorax nycticorax*

Status: California Species of Concern. CNDDB Rank S3; statewide population vulnerable to extirpation or extinction.

Local distribution and abundance: Uncommon, but year-round resident. Nests near the town of Inverness and roosts regularly at any time of year in dense willow thickets overhanging Lagunitas Creek, Olema Marsh, or other water bodies.

Status on the study site: Small numbers (<10) roost regularly in northwestern corner and occasionally in willows along the mainstem of Lagunitas Creek. Also roosts irregularly in willows along Tomasini Creek at the base of the Point Reyes Mesa. It is possible that local night-herons are preying upon the populations of the exotic green crabs that have recently colonized the estuarine reaches of Tomasini and Lagunitas creeks (JE, pers. obs.)

Summary of findings: Local distribution and abundance of this species may be favored if riparian vegetation increases along watercourses within the Giacomini wetlands.

Selasphorous hummingbirds (2 species)

Rufous Hummingbird *Selasphorus rufus*

Allen's Hummingbird *Selasphorus sasin*

Status: Both are California Species of Concern.

Local distribution and abundance: Allen's hummingbird is a common breeding species in Marin County and occupies a variety of habitats—riparian, mixed evergreen, Douglas fir, redwood, bishop pine forests, and coastal scrub. Rufous hummingbird migrates through the coast range, but does not settle down to breed. The similarity of these two species, as well as their frenetic flight, makes field identification to species almost impossible.

Status on the study site: Allen's hummingbird is a common breeder in the project area, especially in blackberry brambles amidst riparian and coastal scrub habitats. Rufous hummingbird is probably a fairly common though seldom detected spring and fall transient.

Summary of findings: Allen's hummingbird will be favored if riparian vegetation increases along watercourses within the Giacomini wetlands; rufous hummingbird will not be affected by changes on the project site.

Red-breasted Sapsucker *Sphyrapicus ruber*

Status: California Species of Concern in USFWS Region 1.

Local distribution and abundance: Locally, this sapsucker nests very locally in mixed evergreen or riparian forests adjacent to Douglas fir forests (Shuford 1993). It is a rather rare nesting species in coastal Marin County, perhaps excluded by the more aggressive acorn woodpecker, which is rather common. Uncommon winter visitor, mostly to riparian thicket and broadleaf-evergreen forest.

Status on the study site: Noted in fall and winter in alder and willows on the western and southeastern boundaries of the study site.

Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Bewick's Wren *Thryomanes bewickii*

Status: California Species of Concern. On California Breeding Bird Surveys, numbers were relatively stable from 1968 to 1989, but trend downward from 1980 to 1989, hence the inclusion on the list of species of concern (USFWS unpubl. data).

Local distribution and abundance: Very common and widespread resident throughout Marin County and the Point Reyes Peninsula. Most common in coastal scrub and drier riparian associations.

Status on the study site: Fairly common on Point Reyes bluff coastal scrub-riparian habitat and in blackberry brambles amidst riparian forests around perimeter of study site. Absent from cultivated or grazed areas.

Summary of findings: A common resident on site, expected to benefit from an increase in vegetative cover of shrubs and riparian understory.

Northwestern Pond Turtle *Clemmys marmorata mormorata*

Status: CDFG California Special Concern species (CDGF 2002c).

Local distribution and abundance: In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders. Numbers have declined drastically through much of range. Populations north of San Francisco Bay may

have fared better than to the south, but trends similar to those observed in southern California have been noted in most populations examined within this region (D. Holland, pers. comm. in http://www.dfg.ca.gov/hcpb/species).

Status on the study site: Fairly common in drainage channels and slack- or slow-moving aquatic habitat as well as along the shore of Lagunitas Creek where emergent vegetation (*Scirpus californicus*) trims the shoreline. Adult turtles were found in brackish water up to 7 ppt.

Ecological requirements (after CDFG's Habitat Conservation Planning Branch species acct. by D. Holland). Pond turtles require some slack- or slow-water aquatic habitat where basking sites are available. Hatchlings require shallow water habitat with relatively dense submerged or short emergent vegetation in which to forage. Pond turtles also require an upland nesting site in the vicinity of the aquatic site with the proper thermal and hydric environment for incubation of the eggs. Nests are typically in a substrate with a high clay or silt fraction and located on a slope that is unshaded and tend to be south-facing. The nesting site can be up to 400 m from the aquatic site, but the majority of nests located are within 200 m. However, at localities with less gradient, soil moisture gradients and soil type may cause nesting sites to be located at a significantly greater distance than where the majority are located. Most nests are on slopes < 25 percent. Western pond turtle populations appear to show an age (size) structure biased toward adults, indicating low recruitment rates. Many localities that harbor turtles populations seem to be affected because the nesting habitat is being impacted or altered during the incubation interval on an annual basis by some type of agriculture (e.g. activity of livestock). These impacts probably create annual nesting failures, leading to the increasingly adult-biased populations. Additionally, some introduced exotic aquatic predators or competitors likely extract a significant toll on turtle populations. Bullfrogs, which do occur at the Giacomini Wetlands (Appendix A), prey on hatchling turtles and may be responsible for significant mortality, because bullfrogs occupy shallow-water habitats in which the youngest age groups of turtles occur. Also, increases in local mesopredator populations—raccoon, skunk, fox—due to local human subsidy or translocations may have contributed to increased predation on nests or post-hatching stages. Vehicular traffic may also contribute to mortality.

The most significant gaps in current understanding of the ecology of these turtles is variation in nesting location that accompanies variation in habitat, movement responses to habitat change, the pattern of movements in the absence of change, and recolonization ability in structurally different habitats. Current lack of knowledge of the first of these four has led to the recent recommendation that at least 500 m from the aquatic site known to harbor western pond turtles are needed to adequately protect nesting habitat (Rathbun et al. 1992 in http://www.dfg.ca.gov/hcpb/species).

Most critical for existing populations is protection of suitable nesting habitat associated with the sites where those populations exist, and reduction of mortality in the younger age (size) groups of turtles.

Summary of findings: Pond turtles are relatively common in Giacomini wetlands. Opportunities for improving habitat values, particularly nesting habitat around the periphery of the site (e.g. State Park property adjacent to the northeastern corner of the site and Point Reyes mesa bluff), are available.

Pacific lamprey *Lampetra tridentata*

Status: California Species of Concern

Local distribution and abundance: See Table 1b.

Status on the study site: Apparently present in Lagunitas Creek (TBA 1995) and one of the "additional species" caught in the study area (Appendix G; Table 2)

Status on the study site: see Table 1B.

Summary of findings: Any habitat modification that benefits anadromous fish should have a concomitant positive effect on this species.

Longfin smelt *Spirinchus thaleichthys*

Status: California Species of Concern.

Local distribution and abundance: see Table 1B

Status on the study site: see Table 1B.

Summary of findings: Any habitat modification that benefits anadromous fish should have a positive effect on this species.

III-c. California Species of Concern (7 species)

California Species of Concern" (CSC) status applies to animals not listed under the federal Endangered Species Act or the California Endangered Species Act, but which nonetheless are 1) declining at a rate that could result in listing, or 2) historically occurred in low numbers, and known threats to their persistence currently exist. This designation is intended to result in special consideration for these animals by the California Department of Fish and Game, land managers, consulting biologists, and others and is intended to focus attention on the species to help avert the need for costly listing under federal and state endangered species laws and the cumbersome recovery efforts that might ultimately be required. This designation also is intended to stimulate collection of additional information on the biology, distribution, and status of poorly known at-risk species and to focus research and management attention on them.
http://www.dfg.ca.gov/hcpb/species/ssc/ssc.shtml

Point Reyes Mountain Beaver *Aplodontia rufa phaea*

Status: California Special Concern Species; Federal Status: None.

The subspecies of mountain beaver found at Point Reyes is endemic to the area.

Local Distribution and Abundance: The Point Reyes mountain beaver inhabits an area of approximately 110 square miles in the Point Reyes area of Marin County, however much of the region within its general range is unsuited to mountain beavers, and the actual inhabited area is only a fraction of its range (Camp 1918). Grinnell (1933) noted that it was found on hillsides in seepage areas overgrown with sword ferns and thimbleberries and that all localities of known occurrence were below 1000 ft in elevation. Camp (1918) found colonies on a north-facing bluff among treeless hills west of Inverness. Museum and literature records (Taylor 1918, Godin 1964, Grinnell 1933) indicate earlier distribution roughly from the town of Inverness west to the edge of Drake's Estero (BAER 1995).

Ecological Requirements: Mountain beavers are secretive residents of thickets where they excavate extensive tunnels beneath dense vegetation. The genus *Aplodontia* contains the most primitive living rodents anywhere in the world, and they have a primitive kidney which is inefficient at retaining water, therefore, moisture of microclimate and

availability of freshwater are key habitat variables. Mountain beavers are strict herbivores and eat just about any type of succulent vegetation available, including plants that are often inedible to other species such as nettle, bracken fern, and salal. Plants are also gathered and dried ("haystacking") near the burrow system, probably for food storage and nesting material (Steele 1989).

Status on study site: The riparian/brush vegetation on the eastern edge of the study site was searched for the mountain beaver's distinctive burrow systems. None was found, and this is the only suitable habitat on the study site.

Summary of Findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Southwestern River Otter *Lutra canadensis sonora*

Status: California Special Concern Species; CNDDB Rank S1 (critically imperiled).
Federal Status: None.

Local distribution and abundance: Historically quite common, nearly extirpated in the early to mid-1900s, but recently recolonizing the waterways of western Marin County. An increase in river otters in Tomales Bay and Lagunitas Creek was first noted in the early 1990s and has continued through 2002. Speculation that this population has its origins from Walker Creek is supported by anecdotal evidence and sightings from various areas within Tomales Bay between Walker and Lagunitas creeks.

Status on the study site: Fairly common and wide-ranging along the main stem of Lagunitas Creek throughout the length of the study area as well as near the north end of Fish Hatchery Creek, where a burrow and potential breeding site was found in the course of this study. Another burrow near White House Pool was noted, and family groups of up to eight individuals have been seen frequently at these two sites. Individuals were also observed in the drainage channels in the eastern pastures in 2001 (L. Parsons, pers. comm.), however, to date, no evidence of use has been found in Tomasini Creek, on the eastern edge of the site. (Appendix G; Fig. 2)

Summary of findings: River otters seem to have established a breeding population along the lower reaches of Lagunitas Creek. Ecological requirements should be considered during restoration planning.

Burrowing Owl *Athene cunicularia*

Status: Bird Species of Special Concern, Category 1 (CDFG 2002a).

Local distribution and abundance: This species was formerly a common, even locally abundant, permanent resident throughout much of California, but a decline noticeable by the 1940's (Grinnell and Miller 1944) has continued through to the present time. The decline has been almost universal throughout California (Remsen 1978, CDFG 2002b). Historically, this species was a year-round resident in Marin County, but like elsewhere, there has been a decline over the last several decades. By the early 1990s, only one known nesting site existed in the county (Shuford 1993). There are no known breeding records for Point Reyes and vicinity, but the species occurs primarily as a migrant and occasionally remains through winter on the outer coast. The virtual absence of ground squirrels in the coastal portions of the county limit habitat availability to these owls.

Status on the study site: Apparently detected on the site during the restoration feasibility study in 1993 (PWA 1993), however none has been recorded subsequently, and the species was not observed in the course of the 2000-2001 surveys.

Summary of findings: Limited occurrence in the area suggests that future habitat changes on the site will not affect this species. There is seemingly appropriate breeding habitat on State Park lands adjacent to the site (northeast corner), and artificial nesting boxes (given the absence of ground squirrels) could be placed there to encourage nesting.

California Swainson's Thrush *Catharus ustulatus oedicus*

Status: Currently included as a Bird Species of Special Concern, Category 2 (CDFG 2002a).

Local distribution and abundance: The California Swainson's thrush is endemic to California, breeding on the west slope of the Sierra Nevada range west and south along the coast for the entire length of the state (Phillips 1991, AOU 1998). This subspecies is most abundant in coastal streams in central and northern California (Sauer *et al*. 2000). In coastal environments, Swainson's thrush breeds in riparian habitats that are cool, moist, and shady, preferring willow-alder (*Salix-Alnus*) riparian areas (sea level to 150 m) or in moist coastal scrub/riparian associations. In Marin County, the limit of the inland

breeding distribution paralleled that of the summer coastal fog belt (Shuford 1993). This species is a common summer resident and breeder at Point Reyes National Seashore (Stallcup 2000). In one local study (PRBO unpubl. data), an estimated 18 breeding territories occupied a 900 m stretch of creek in 2001 (study plot = 4.22 ha).

Status on the study site: Very common breeder in riparian corridors and moist riparian-coastal scrub associations. Frequents blackberry brambles that occur as understory or adjacent to riparian forest, especially in the post-breeding period (June-September). Numbers increase during migratory periods.

Ecological requirements: This subspecies' breeding season affinity for riparian areas apparently differs from other subspecies (primarily riparian vs. primarily coniferous; Evans *et al*. 2000). The presence of water, a dense plant understory, and thick canopy cover are critical habitat elements. In coastal Marin County, canopy cover for 64 nests averaged 71 percent; nest presence and nest success were both significantly positively correlated with closed-canopy cover (PRBO unpubl. data, Gardali et al. 1999, Holmes et al. 1999). Nests occur typically below 2 m in California (PRBO unpubl. data, Evans *et al.* 2000). Abundant fruit-producing understory plant species (e.g., *Rubus* spp.) seem to be important components of the habitat and may contribute to survival of juveniles (Gardali, in prep.). The continued loss and degradation of riparian habitat is likely the primary threat to the California Swainson's thrush. Any process that diminishes understory vegetation over a prolonged period (e.g., grazing, invasive plant species) and causes wet meadows or streams to dry up (over-grazing, water diversion) may render an area unsuitable for breeding.

Summary of findings: One of the most common riparian associates on the study site. An increase in riparian understory cover will increase availability and favorableness of breeding habitat for this taxon.

Yellow Warbler *Dendroica petechia brewsteri*

Status: Currently considered a Bird Species of Special Concern (breeding), Priority 2 (CDFG 2002a). Included on both previous lists (Remsen 1978, CDFG 1992).

Local distribution and abundance: *D.p. brewsteri* breeds from coastal Washington

and Oregon, through California west of the Cascades and Sierra Nevada (Browning 1994). Breeding populations are sparse along the central coast in Marin County (Shuford 1993, PRBO unpubl. data). Among several intensively surveyed Marin County riparian locations, few to no individuals were detected during the breeding season, and only one nest was found (PRBO unpubl. data).

Status on the study site: Within Marin County, yellow warblers are most prevalent in the Olema Valley (Shuford 1993) and in willow habitat that extends down Olema Creek and Bear Valley Creek to the confluence with Lagunitas Creek (Evens and Stallcup 1996). For many years they have been found at Olema Marsh adjacent to the study site (Evens and Stallcup 1984-93). In the breeding bird study in 2002, we detected yellow warblers singing on territories at several locations along Olema Creek and in the riparian-marsh association in the northeast corner (Appendix D; Figure 3).

Ecological requirements: Yellow warblers display an overall affinity for riparian vegetation in close proximity to water (Lowther *et al*. 1999). Studies from several California locations demonstrated the importance of willow cover as nesting substrate and as a predictor of high yellow warbler abundance (King *et al.* 2001, Nur *et al.* 1996, Alexander 1999, PRBO unpubl. data). They respond quickly to changes in habitat management such as riparian-grazing cattle removal; the problem may lie with the loss of more structurally diverse riparian systems (Heath *in* CDFG 2002a). Among the pertinent management suggestions for yellow warbler populations is the goal "to protect and create dynamic riparian systems that provide the mechanisms (e.g. seasonal flooding) to create early successional, as well as more structurally complex vegetative components" (Taylor and Littlefield 1986, Krueper *et al.* in prep.).

Summary of findings: The project area is an important local stronghold, and likely a population source, for breeding yellow warblers in Marin County. Any increase in willow habitat extent and complexity on the site will benefit the local breeding population.

Yellow-breasted Chat *Icteria virens*

Status**:** Bird Species of Special Concern, Priority 3 (CDFG 2002a).

Local distribution and abundance: While still widely distributed overall, the species is now rare or absent from areas formerly supporting breeding populations (e.g. parts of southern and central California, San Joaquin and lower Sacramento Valleys, Modoc Plateau). The current breeding range is estimated to be about 35 percent reduced from its historic extent. Although still relatively common in most other counties north of San Francisco Bay, chats are considered rare in any season in Marin County, and only two pairs were reported for the entire county during the breeding bird atlas project in the early 1990s (CDFG 2002a, Shuford 1993).
Status on the study site: a rare summer breeding species; present in some years in the southeastern corner of the study site in dense willow streamside thickets.
Ecological requirements: Nesting habitat is usually found along the narrow border of streams, creeks, sloughs and rivers and seldom occupies extensive tracts in any given area; thus, it may always be limited in availability (CDFG 2002a). Yellow-breasted chats prefer early successional riparian habitats with a well-developed shrub layer and an open canopy for nesting (Eckerle and Thompson 2001). Vegetation structure more than age appears to be the important factor in nest site selection. Blackberry (*Rubus spp*.) brambles, wild grape (*Vitis spp*.), and willow are frequently selected as nesting strata, as are other plant species that form dense thickets and tangles (Grinnell and Miller 1944). Chat dependence on understory and shrubby riparian vegetation for nesting makes it vulnerable to habitat loss associated with flood control maintenance involving the removal of vegetation along active river channels, as well as urban development, invasive plants, and agricultural grazing of riparian habitats. The species is sensitive to grazing and may be a good indicator of the effects of grazing on riparian birds (Sedgwick and Knopf 1987).
Summary of Findings: Any increase in willow habitat extent and canopy complexity within riparian areas will benefit this locally rare, but potentially increasing, species.

Tomales Roach *Lavinia symmetricus ssp.* (*=Hesperoleucus symmetricus*)
Status: Species of Special Concern; Federal Status: None
Local Distribution and Abundance: Most populations of California roach are threatened to some degree because they tend to be located in small streams vulnerable to human

disturbance (especially diversions) and introduced predatory fishes (Brown *et al.* 1992). The Tomales roach has a restricted distribution in Marin County streams which occur largely on heavily-grazed private lands; thus, siltation, bank erosion, and loss of riparian cover are constant problems. Most of the streams in the Tomales drainage have been heavily modified by dams and by erosion due to livestock grazing. Because the populations are now widely scattered, local extinction may occur with little probability of natural recolonization.

Status in Study Area: Tomales roach was the most abundant freshwater fish caught by Pearson (2000) in Lagunitas Creek on the study site. Numbers have apparently increased with the elimination of the Giacomini summer dam.

Ecological requirements: Tomales roaches are small (usually <10 cm SL) omnivores that feed primarily on filamentous algae but ingest lesser quantities of crustaceans and aquatic insects (Greenfield and Deckert 1973, Moyle 1976). Growth is seasonal, with rapid growth during the early summer. Reproduction occurs from March to June, but may be extended through late July (Moyle 1976). During the spawning season, schools of fish move into shallow areas with moderate flow and gravel/rubble substrate (Moyle 1976). Females deposit adhesive eggs in the substrate interstices and attendant males fertilize the eggs. Typically, a female produces 250-900 eggs and the eggs hatch within two to three days. The fry remain in the substrate interstices until they are free-swimming.

This roach is generally found in small, warm intermittent streams, and dense populations are frequently found in isolated pools in the lower reaches of some coastal streams (Moyle 1976). Roach are tolerant of relatively high temperatures (30-35 C) and low oxygen levels (1-2 ppm) (Taylor *et al.* 1982). However, they are habitat generalists, also being found in cold, well-aerated clear "trout" streams (Taylor *et al.* 1982), in human-modified habitats (Moyle 1976, Moyle and Daniels 1982), and in the main channels of rivers.

Summary of Findings: Tomales roach may benefit from watershed management practices that improve instream and riparian habitat conditions.

III-d. "SPECIES TO WATCH" (9 species)

"Species to watch" is a category created for avian species that have been: (1) documented as occurring on (or in the vicinity of) the study site; (2) previously considered special status species, and (3) are currently under review by California Department of Fish and Game (2002). Several species that fulfill the aforementioned criteria (e.g. white-tailed kite, loggerhead shrike) are included under "Federal Species of Concern" (above), because of their status at the federal level. The state Watch Lists were developed using the Partners in Flight (PIF) data and prioritization process. The state lists are an additional tool designed to help conserve local bird populations. More information is available at: http://www.audubon.org/bird/watch/state2/ca.html.

Sharp-shinned Hawk *Accipiter striatus*

Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, third priority. Data are inadequate for trend assessment on breeding bird survey routes in California (Sauer *et al.* 2001).

Local abundance and distribution: Rare breeder on Inverness Ridge, but common migrant and winter visitor to the Tomales Bay watershed.

Status on the site: Fairly common transient and winter visitor.

Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Cooper's Hawk *Accipiter cooperi*

Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, third priority. Breeding populations have increased in California and expanded into urban areas (California county breeding bird atlas data). Data are inadequate for trend assessment on BBS routes in California (Sauer *et al.* 2001).

Local abundance and distribution: Fairly common transient. Most common in fall; rare breeder in coniferous and mixed evergreen forests of Inverness and Bolinas ridges and Mount Tamalpais.

Status on the site: Fairly common transient and winter visitor.

Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands

Golden Eagle *Aquila chrysaetos*

Status Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, third priority; currently considered a "fully protected" species in California. Numbers of golden eagles on BBS routes in California have been relatively stable over the period 1966-2000 (Sauer *et al*. 2001).

Local abundance and distribution: Nests mostly in the northern interior portions of Marin County (Shuford 1993), but has nested at Point Reyes (Stallcup 2000). Uncommon migrant over coastal terraces and valleys, especially during fall.

Status on the site: Occasionally noted as a "flyover" on the site, usually in fall and usually immature birds.

Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Black Swift *Cypseloides niger*

Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, third priority. Although the species is a rare and local breeder in California, there currently does not appear to be any evidence of substantial population declines or threats to the species.

Local abundance and distribution: Rare (and rarely detected) migrant.

Status on the site: Not detected during the course of the 2001-2002 reconnaissance, however has been noted flying overhead in previous years (JE, RS pers, obs); a rare autumn migrant.

Summaryof findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

Merlin *Falco columbarius*

Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, first priority. Merlins have increased as migrants and wintering birds in California in

recent decades (Golden Gate Raptor Observatory, unpubl. data).
Local abundance and distribution: Uncommon, but regular winter visitor to estuaries and coastal embayments where shorebirds forage and roost.
Status on the site: One to two individuals were present in late autumn through winter, often observed hunting over adjacent tidal marsh, ruderal field, and flooded pasture land.
Summary of findings: Local distribution and abundance of this species will be affected only as changes in habitat characteristics of the Giacomini wetlands affect distribution of small shorebird species that merlins hunt.

California Gull *Larus californicus*
Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, third priority. The main threat to the state's breeding population was eliminated by a state water board order in 1994, which will maintain lake levels at Mono Lake that will protect the state's largest colony from ground predators (Shuford and Ryan 2000).
Local abundance and distribution: Fairly common non-breeding visitor to Tomales Bay and vicinity.
Status on the site: Occasional and incidental visitor to dairy, open water, and irrigated fields.
Summary of findings: Local distribution and abundance of this species will be affected only marginally, if at all, by changes in habitat characteristics of the Giacomini wetlands

Osprey *Pandion haliaetus*
Status: Included on CDFG's (1992) unprioritized list and Remsen's (1978) prioritized list, second priority. Breeding populations have increased in California in recent decades (Gould and Jurek 1988, Sauer *et al*. 2001).
Local abundance and distribution: Marin County hosts one of the largest concentrations of osprey in California, with approximately 70 nests present in recent years—20 around Tomales Bay and 50 or so around Kent Lake in the upper Lagunitas Creek watershed. Reproductive success indicates a relatively stable population after a period of rapid growth from the mid-1980s to the mid 1990s (Evens, 2001).

Status on the site: Forages in Tomales Bay, Lagunitas Creek, and Olema Marsh commonly, February-September. Uncommon winter visitor and flyover.
Summary of findings: Osprey will be affected only to the extent that local shallow water fish populations are affected by restoration efforts.

Double-crested Cormorant *Phalacrocorax auritus*
Status: California Special Concern Species, S3. Included on CDFG's (1992) unprioritized list and as second priority species of concern in Remsen (1978).
Local abundance and distribution: A fairly common breeder on offshore islands and rocks (e.g., Southeast Farallon Islands) and uncommonly at Marin County reservoirs (e.g Stafford Lake). Coastal breeding populations have increased since at least the early 1980s (Carter *et al.* 1992). Recently, a colony became established in Tomales Bay on Hog Island with 12 nests in 2001 and 56 nests in 2002 (J. Kelly, pers. comm.). Cormorant flocks, predominantly "double-crests," are relatively common in Tomales Bay year-round with flocks of several hundred to over one thousand birds present in winter (Kelly and Tappen 1998).
Status on the site: Regular and common visitor to Lagunitas Creek, in small numbers at all seasons. Roosting flocks of up to several hundred birds often occupy the tidal flats at the mouth of Lagunitas Creek.
Summary of findings: Local distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands.

White-faced Ibis *Plegadis chihi*
Status: Included on CDFG's (1992) unprioritized list and in Remsen's (1978) prioritized list as highest priority. Both breeding and wintering populations have increased in California since the 1980s (Shuford *et al.* 1996, Earnst *et al.* 1998). Rookery sites are included on the federal species of concern list (FSC) (CDFG 2002c)
Local abundance and distribution: An unusual, even rare, visitor to western Marin County and the Point Reyes Peninsula. Usually occurs in summer or fall in shallow ponds, irrigated pastures, and marshlands. This species is increasing in abundance and expanding its range in California (Shuford et al. 1996).

Status on the site: Present in June 2001 (150+ individuals) and May 2002 (50 individuals) in moist pasture near the confluence of Tomasini Creek and Giacomini Wetlands. These flocks were present for very brief periods and were likely wandering from Central Valley breeding locations. Very rare and unpredictable occurrence here.
Summary of findings: Sporadic and brief occurrence locally suggests that distribution and abundance of this species will not be affected by changes in habitat characteristics of the Giacomini wetlands

III-e. Unlisted species of local concern or conservation importance

Pacific harbor seal *Phoca vitulina richardii*
Status: Fully protected under the Marine Mammal Protection Act.
Local distribution and abundance: Nearly one quarter of California's population resides in coastal Marin County (S. Allen, pers. comm.). Point Reyes, in general, and Tomales Bay, in particular, provide important breeding and haul-out sites for harbor seals and is a population center for this species.
Status on the study site: Occasional wanderer up the estuarine reach of Lagunitas Creek; does not pup or haul-out on the site.
Summary of findings: Local distribution and abundance of this species will not be affected directly by changes in habitat characteristics of the Giacomini wetlands, however, harbor seals will benefit indirectly as fish populations increase.

III-f. Candidate species (proposed or denied)

San Francisco Forktail Damselfly *Ischnura gemina*
Status: prosed as a Federal Species of Concern, but denied federal protection
Local distribution and abundance: see Table II-B.
Status on the study site: see Table II-B., Figure IIIA.
Summary of findings: Occurrence of this species on the upland boundary of tidal marsh adjacent to the study site suggests that an increase in such habitat conditions will have a positive effect on the species.

Green Sturgeon *Acipenser medirostris*

Status: On January 12, 2001, the National Marine Fisheries Service (NMFS) received a petition requesting a listing of either a threatened or an endangered species under the ESA. On January 23, 2003, NMFS determined that the species is comprised of two distinct population segments (DPSs) that qualify as species under the ESA, but that neither DPS warrents listing as a threatened or endangered species.

Local Distribution and Abundance: Eight species of sturgeon occur in North America, and four species (as well as one population of the white sturgeon) are listed as endangered or threatened. Sturgeon is the largest and possibly the oldest fish found in freshwater. The green sturgeon is a large, olive green, bony-plated, prehistoric-looking fish, with a shovel-like snout and vacuum cleaner-like mouth used to siphon food from the mud. Green sturgeon can reach 7.5 feet in length and weigh up to 350 pounds. This large anadromous fish ranges from Alaska to Mexico in marine waters and feeds in estuaries and bays from San Francisco Bay to British Columbia. The green sturgeon spawns in fresh water in the mainstem of large rivers. The only remaining spawning populations are in the Sacramento and Klamath River basins in California and possibly in the Rogue River in Oregon - rivers that have been extensively dammed, diverted, and polluted. These rivers have flow regimes affected by water projects, limiting suitable spawning conditions for green sturgeon. Increasing urban and agricultural demand for water threatens the future spawning success for the entire species. Sturgeons in general are highly vulnerable to habitat alteration and over-fishing because of their specialized habitat requirements, the long time it takes them to reach breeding maturity, and their sporadic reproductive success. The southernmost green sturgeon populations occur in California, a region experiencing dramatic declines of its anadromous fishes due to dams, water withdrawals, and habitat alteration. A number of presumed spawning populations of green sturgeon have been lost since the 1960s and 1970s - from the Eel River, South Fork Trinity River, and San Joaquin River. It is currently estimated that each of the three known or suspected spawning populations of green sturgeon contain only a few hundred mature females.

Status on Study Area: Green Sturgeon are recorded from Tomales Bay (Blunt 1980, Tomales Bay Association 1995) and, like the white sturgeon, enter Lagunitas Creek to forage. The locally occurring population belongs to the "Southern Green Sturgeon DPS" (NMFS 2003).

Summary of Findings: The major factors likely to be negatively affecting green sturgeon abundance are (1) overfishing, (2) modification of spawning habitat, (3) entrainment, and (4) toxic substances. Although not related directly to these problems, tidal marsh restoration may benefit this species by improving water quality and by creating high quality foraging habitat.

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Appendix A.

Final Report

Red-legged Frog Surveys at Giacomini Wetlands Point Reyes National Seashore

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and

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Introduction

The California red-legged frog (*Rana aurora draytonii*) was once an abundant frog throughout much of California and is widely believed to have inspired Mark Twain's fabled story "The Celebrated Jumping Frog of Calaveras County." Now this frog is completely extirpated from the floor of the Central Valley (Fisher and Shaffer, 1996) and nearly gone in both the Sierra Nevada foothills and in the southern quarter of its range. In a few parts of the central Coast Range, there are still large, vigorous populations, some of which probably rival what was present 200 years ago (Fellers, *in press*).

Some of the largest populations are at Point Reyes National Seashore (Marin County) where there are more than 120 breeding sites with a total adult population of several thousand frogs. Most of the breeding sites are artificial stock ponds constructed on lands that have been grazed by cattle for 150 years. There are good populations elsewhere in the San Francisco Bay area (especially Alameda and Contra Costa Counties) and in the coastal drainages from San Mateo County (just south of San Francisco) south to Santa Barbara County. One of the largest single populations consists of an estimated 350 adult frogs at Pescadero Marsh (San Mateo County) (Fellers, *in press*).

The California red-legged frog was Federally listed as a Threatened species on June 24, 1996. The listing was necessary because the frog is absent from more than 70 percent of its original range and is threatened within its remaining range by a wide variety of human activities including urban encroachment, construction of reservoirs and water diversion, contaminants, agriculture, and livestock grazing (Draft Recovery Plan, January 2000). The role of non-native bullfrogs is unclear. While bullfrogs have frequently been called a threat, or even a primary cause of the declines, there is almost no direct evidence that this is the case. Most reports of bullfrog impacts (e.g., Moyle, 1973) have been based merely on a correlation between the presence of bullfrogs and the lack of red-legged frogs. It is at least as likely that non-native

fish (e.g., bass, sunfish, catfish, mosquitofish) play a significant role in the decline of native ranid frogs (Hayes and Jennings, 1986).

California red-legged frogs need ponds and/or pools for breeding (December through March). At Point Reyes NS, stock ponds are the most commonly used breeding sites. There is much less information on non-breeding habitat requirements. While some frogs occupy breeding ponds all year, data from radiotagged red-legged frogs at Point Reyes and elsewhere suggest that riparian areas provide critically important habitat for many frogs, especially those that breed in non-permanent ponds or pools. It is likely that the riparian habitat is essential for the continued survival of red-legged frogs, particularly in dry years when breeding ponds are more likely to dry up.

A short-term study of California red-legged frogs at the Giacomini wetlands (Golden Gate National Recreation Area) was initiated in the fall of 2001. The study was undertaken as part of a planning process to evaluate the feasibility of restoring the wetlands to their natural estuarine state. The findings from our work, along with data from previous surveys, are intended to aid in decisions concerning habitat loss and preservation that may result from geomorphic alterations of the area.

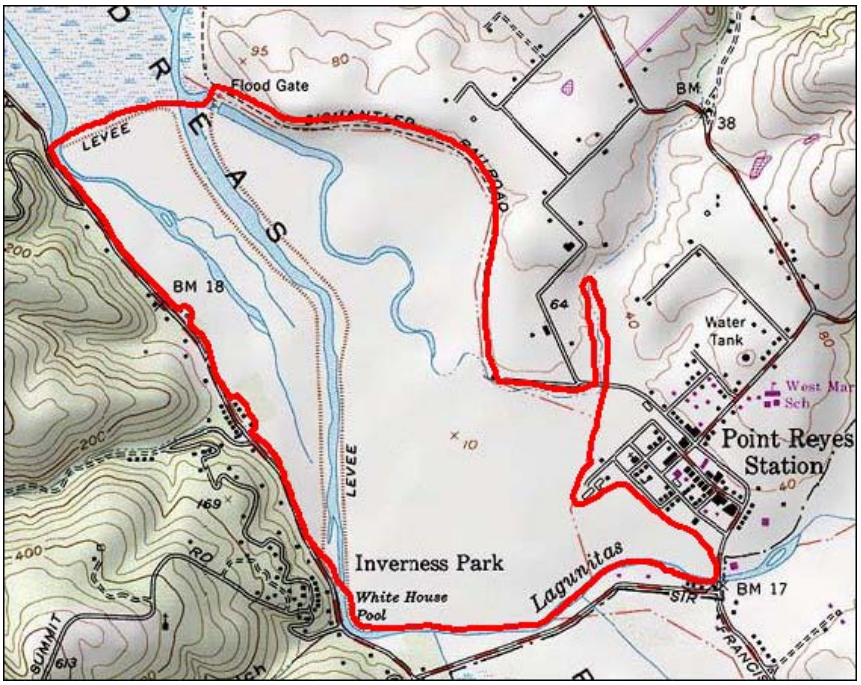
Methods

Habitat Assessment

Reconnaissance was conducted during November 2001 to assess the extent of potential red-legged frog breeding and non-breeding habitat on the Giacomini property. The boundary of the property is outlined in Figure 1.

All areas that were holding water or appeared to have the potential to hold water were considered potential red-legged frog habitat (with the exclusion of the active waste pond and the adjacent, ephemeral ditches) and were subsequently surveyed for red-legged frogs. Site designations were established

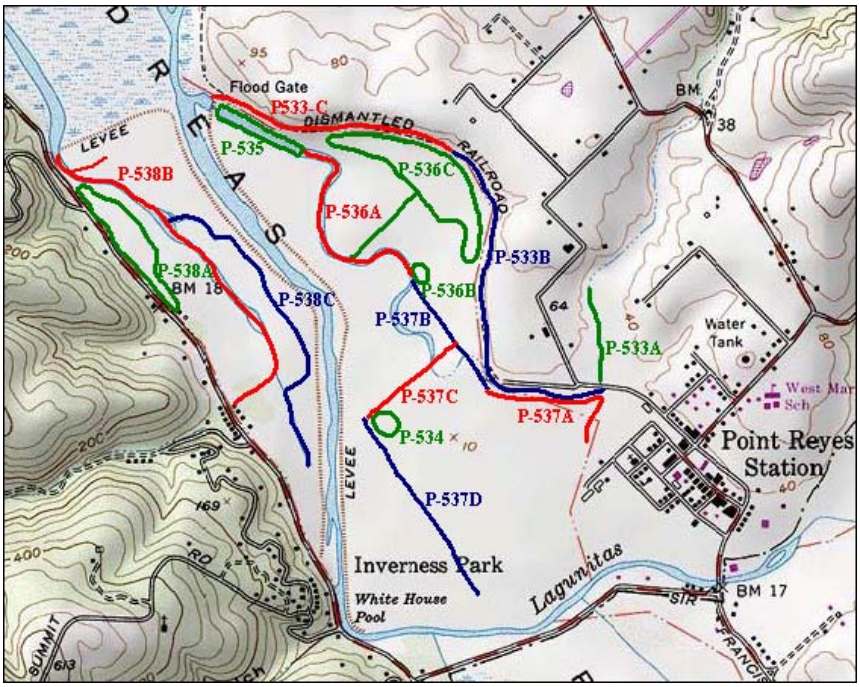
Figure 1. Giacomini Ranch Boundary.



by dividing the areas into habitat units (ditches, streams, ponds, and wetlands) and then further subdivided into sites that could be surveyed in a single visit. Fifteen survey sites were delineated (Fig. 2). This included three sites on the west side of Lagunitas Creek (the wetland along the east side of Sir Francis Drake Blvd., Fish Hatchery Creek, and the ditch draining into Fish Hatchery Creek from the east) and 12 sites on the east side (three ponds, four segments of drainage ditches, three segments of Tomasini Creek, the old stream channel of Tomasini Creek, and one wetland). Surveys were performed following the protocol of Fellers and Freel (1995): A Protocol for Surveying Aquatic Amphibians. Nocturnal surveys were augmented by using spotlighting techniques described by Corben and Fellers (2001).

Surveys for adult frogs were conducted throughout the breeding season so as to maximize the number of adult frogs detected. Similarly, egg surveys were timed to coincide exactly with egg laying at other nearby sites within the

Figure 2. Survey Sites.



Olema Valley. Tadpole surveys were initiated a few weeks after egg hatching. Tadpole surveys at earlier dates are unlikely to detect frogs since the tadpoles are not likely to be captured and/or identified. Dates for all surveys are given in Table 2. Note that some of our surveys fall well outside dates that have been suggested in protocols developed by FWS and others. We felt it was preferable to conduct surveys during the time we know was optimal, rather than following guidelines intended to cover the range of activity across the entire species range. Also, the various draft FWS protocols were designed to merely detect presence, not to estimate population size. Our work was much more extensive and greatly exceeded the normal expectations of other protocols. By timing our surveys to local phenology, the surveys were appropriate for both detecting frogs and for providing data on population size.

All biologist conducting surveys for red-legged frogs (Greg Guscio, Patrick Kleeman, and Gary Fellers) were highly qualified field ecologists with extensive experience with frogs.

Daylight surveys

Daylight surveys were conducted by systematically searching all sites for red-legged frogs, egg masses, and/or larvae (Fellers and Freel, 1995). This entailed walking slowly through the site while visually scanning banks, rocks, logs, pond, stream bottoms (water clarity permitting), and the surface of floating vegetation. Surveys included stopping intermittently to look ahead with binoculars, increasing the likelihood of detecting frogs that might otherwise have been startled prior to detection. Starting in late March, surveys included frequent dip netting for tadpoles.

All sites were surveyed at least once before the onset of breeding. Known breeding sites in Olema Valley (e.g., Cemetery Pond, Coast Guard Pond, and Abbott's Lagoon Trail Pond) were also monitored on a regular basis to determine the start of the red-legged frog breeding season at Point Reyes NS. Once egg laying had begun at any site within the Olema Valley, surveys of the Giacomini wetlands were performed on a regular basis. Data on the presence and abundance of other amphibians were recorded, along with information on reptiles, fish, and potential predators. Daylight surveys were not performed in rainy conditions, as disturbance of the surface of the water by raindrops greatly reduces visibility into the water column.

Nocturnal Surveys

Nocturnal surveys of each site were conducted by walking through the site, stopping approximately every 5 m. At each stop, a 30-Watt sealed beam

light (358 Lux at 5 meters) and binoculars were used to look for the eye shine of red-legged frogs (Corben and Fellers, 2001). The binoculars were placed on the light, and the two were moved in tandem to scan nearby habitat (up to about 30 meters away). Unidentified eye shines were investigated by slowly approaching the animal until a positive identification could be made. If a positive identification was not possible, the frog was recorded as an unidentified species. Data on the presence and abundance of other amphibians were recorded along with information on reptiles, fish, and potential predators. Nocturnal surveys were not performed if the visibility was less than 100 meters due to fog or rain, or if the temperature dropped below 5° Celsius.

Salinity and conductivity were measured periodically at many of the sites using a YSI-85 conductivity meter.

Results

Locations where red-legged frogs and western pond turtles (*Clemmys marmorata)* were found are depicted in Figure 3. The results of both daylight and nocturnal surveys are summarized in Table 1 and detailed in Tables 2 and 3.

East Side of Lagunitas Creek

Red-legged frogs were found (but were not abundant) on the east side of Lagunitas Creek. The maximum number of red-legged frogs found during a single survey was three at the east end of the rectangular pond (P-535). A single red-legged frog was found at the new duck pond (P-534) on two separate occasions. An additional red-legged frog was found in Tomasini Creek on the

northern edge of the property (P-533B). Neither eggs nor tadpoles were found on the east side of the property. It seems quite unlikely that red-legged frogs breed in this area.

Western pond turtles were regularly seen along the old stream channel of Tomasini Creek site (P-536A), as well as in some of the ditches (P-537B, P-537C, and P-537D), and in the wetland (P-536C). A single western pond turtle was seen in Tomasini Creek (P-533B).

Six small adult bullfrogs (*Rana catesbeiana*) were found in Tomasini Creek on the north side of the wetlands (P-533B and P-533C) on March 27, 2002. Forty-six bullfrog tadpoles were found in Tomasini Creek at the culvert between sites P-533A and P-533B, on April 17, 2002.

Salinities on the east side of Lagunitas Creek ranged from 0.7 ppt in Tomasini Creek (about 20m upstream from the levee, P-533C) to 17.8 ppt at the northwest end of site P535 (both measurements taken on February 6, 2002).

West Side of Lagunitas Creek

Red-legged frogs were found to be most numerous and actively breeding in the wetland parallel to Sir Francis Drake Blvd. (site P-538A). The maximum number of red-legged frogs found in a single survey was 21, and the estimated total number of egg masses was 37. This number was arrived at by combining the number of fresh egg masses in different parts of the marsh on different days. It is a rather conservative estimate since egg masses can be difficult to detect, and the habitat is complex and difficult to survey.

Red-legged frogs and eggs were also found in Fish Hatchery Creek (P-538B). The maximum number of red-legged frogs found in a single survey was 18, and the estimated total number of egg masses was nine.

No frogs or eggs were found in the ditch draining into Fish Hatchery Creek (P-538C), but four western pond turtles were seen at this site.

No bullfrogs were found west of Lagunitas Creek.

Black-crowned night herons were seen foraging at sites P-538A and P-538B during nocturnal surveys.

Salinities on the west side of Lagunitas Creek ranged from 0.1 ppt along the roadside (site P-538A) on February 11, 2002 to 18.3 ppt in the small ditch connected to Fish Hatchery Creek near the levee (site P-538B) on February 13, 2002. The salinity near egg masses found in these sites ranged for 0.1 ppt to 0.8 ppt, well within the know tolerances of red-legged frogs.

Figure 3. Locations of Frogs and Turtles.

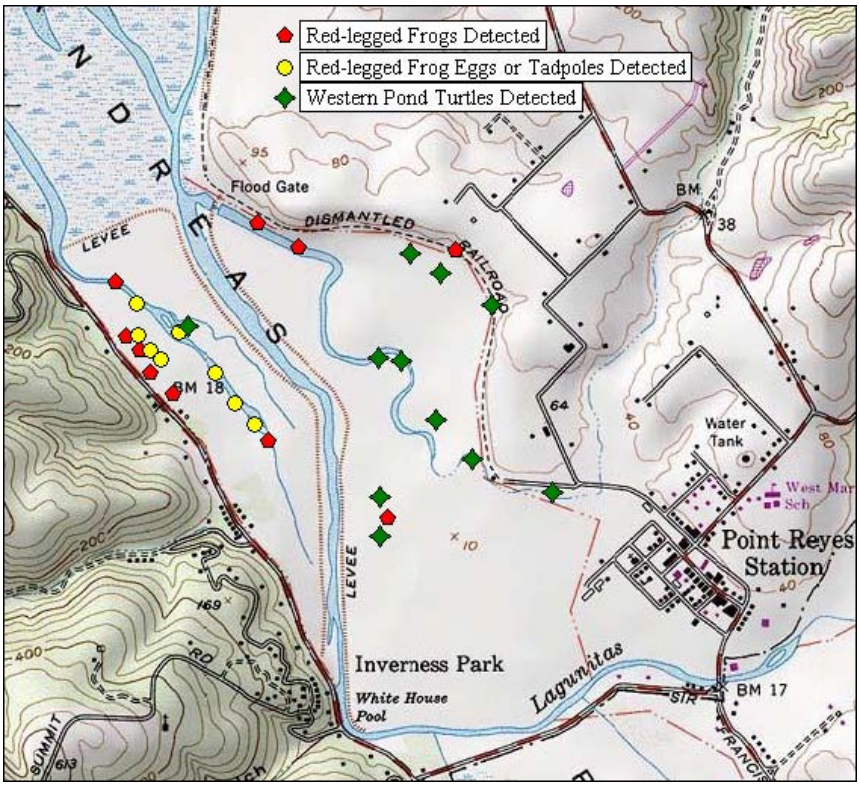


Table 1. Summary of Red-legged Frog Surveys.

SURVEY AREA	TOTAL # OF DAYLIGHT SURVEYS	TOTAL # OF NOCTURNAL SURVEYS	MAXIMUM # OF FROGS FOUND IN A SINGLE VISIT	MAXIMUM # OF EGG MASSES FOUND IN A SINGLE VISIT	ESTIMATED TOTAL # OF EGG MASSES
East Side of Lagunitas Creek	37	20	3	0	0
West Side of Lagunitas Creek	17	10	21	32	46

Table 2. Results of Red-legged Frog Surveys East of Lagunitas Creek.

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
Tomasini Creek												
P-533A	17-Apr-02	N	GG	2205	15	12	9	<5	clear	no	no	-
P-533B	4-Dec-01	N	GG	1800	80	9	6	<5	partly cloudy	1 adult	no	-
	22-Jan-02	D	GG	1115	23	8	11	5-20	partly cloudy	no	1 adult	-
	25-Jan-02	D	GG	1131	35	8	13	<5	partly cloudy	no	no	-
	27-Mar-02	N	GG	1945	61	14	11	<5	partly cloudy	no	no	-
	17-Apr-02	N	GG	2230	21	12	9	5-20	clear	no	no	-
P-533C	25-Jan-02	D	GG	1210	26	8	13	<5	partly cloudy	no	no	-
	6-Feb-02	-	GG	1600	-	11.5	-	-	-	-	-	0.7
	27-Mar-02	N	GG	2052	35	14	11	<5	partly cloudy	no	no	-
New Duck Pond	20-Nov-01	N	GG, GF	1910	30	-	16	<5	overcast	1 adult	no	-
P-534	10-Jan-02	D	GG	1525	33	15	17	<5	partly cloudy	no	no	-
	23-Jan-02	D	GG	1107	43	8	14	<5	clear	no	no	-
	5-Feb-02	D	GG	1220	45	13	15	<5	partly cloudy	no	no	4.2
	21-Mar-02	N	GG	2004	30	17	12	<5	overcast	1 adult	no	-
	22-Mar-02	-	GG	1115	-	14	-	-	-	no	no	4.6

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
Rectangular Pond P-535	10-Dec-01	N	GG	1950	20	8	8	<5	clear	no	no	-
	11-Jan-02	D	GG	1140	24	14	17	5-20	partly cloudy	no	no	-
	25-Jan-02	D	GG	1250	30	8	13	5-20	mostly cloudy	no	no	-
	6-Feb-02	D	GG	1535	19	12	15	<5	overcast	no	no	3.9 to 17.8
	27-Mar-02	N	GG	2135	7	12	7	<5	partly cloudy	3 adults	no	-
	1-Apr-02	D	GG	1517	30	21	16	5-20	partly cloudy	no	2 adults	5.2 to 16.4
	1-Apr-02	N	GG	1945	54	20	10	<5	clear	no	no	-
Old Channel Tomasini Creek P-536A	10-Dec-01	N	GG	1820	90	8	8	<5	clear	no	no	-
	19-Dec-01	D	GG	1458	38	12	12	5-20	overcast	no	no	-
	11-Jan-02	D	GG	1107	31	13	17	5-20	partly cloudy	no	7 adults	-
	24-Jan-02	D	GG	1531	35	9	14	<5	partly cloudy	no	2 adults	-
	6-Feb-02	D	GG	1432	25	12	15	5-20	overcast	no	5 adults	1.2 to 2.8
	8-Mar-02	D	GG	1507	20	11	14	5-20	partly cloudy	no	5 adults	-
	28-Mar-02	N	GG	2021	34	15	10	<5	partly cloudy	no	no	-
	1-Apr-02	D	GG	1450	23	18	16	5-20	partly cloudy	no	1 adult	3.1
Old Duck Pond P-536B	23-Jan-02	D	GG	1210	21	10	13	<5	clear	no	no	-
	6-Feb-02	D	GG	1137	27	12	14	<5	mostly cloudy	no	no	1.1
	20-Mar-02	N	GG	1857	14	16	11	<5	partly cloudy	no	no	-
	21-Mar-02	D	GG	1216	15	20	16	5-20	mostly cloudy	no	no	-

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
Wetland	25-Jan-02	D	GG	1325	31	9	13	5-20	mostly cloudy	no	no	-
P-536C	5-Feb-02	D	GG	1450	55	12	15	5-20	clear	no	3 adults	2.8 to 14.5
	8-Mar-02	D	GG	1530	65	11	13	5-20	partly cloudy	no	7 adults	-
Drainage Ditches												
P-537A	22-Jan-02	D	GG	1200	14	9	11	5-20	partly cloudy	no	no	-
P-537B	20-Nov-01	N	GG, GF	1750	80	18	16	<5	overcast	no	no	-
	19-Dec-01	D	GG	1128	31	11	12	5-20	overcast	no	no	-
	11-Jan-02	D	GG	1045	35	13	17	5-20	partly cloudy	no	1 adult	-
	22-Jan-02	D	GG	1230	32	9	10	5-20	partly cloudy	no	no	-
	1-Feb-02	D	GG	1010	38	6	11	<5	partly cloudy	no	no	-
	8-Mar-02	D	GG	1444	21	11	14	5-20	partly cloudy	no	6 adults	-
	20-Mar-02	N	GG	1920	25	14	11	<5	partly cloudy	no	no	-
	21-Mar-02	D	GG	1147	32	11	16	5-20	mostly cloudy	no	6 adults	-
P-537C	20-Nov-01	N	GG, GF	1840	30	18	16	<5	overcast	no	no	-
	27-Nov-01	N	GG	1930	20	8	0	<5	clear	no	no	-
	11-Jan-02	D	GG	1457	16	13	15	<5	partly cloudy	no	1 adult	-
	22-Jan-02	D	GG	1604	14	8	8	5-20	partly cloudy	no	no	-
	1-Feb-02	D	GG	1305	16	12	15	<5	partly cloudy	no	2 adults	-

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
P-537C (cont.)	21-Mar-02	D	GG	1610	32	17	15	5-20	mostly cloudy	no	1 adult	-
	21-Mar-02	N	GG	1907	25	15	12	<5	overcast	no	no	-
	22-Mar-02	-	GG	1110	-	13	-	-	-	no	no	2.3 to 4.1
P-537D	27-Nov-01	N	GG	1800	75	8	3	<5	clear	no	no	-
	11-Jan-02	D	GG	1525	55	13	15	<5	partly cloudy	no	2 adults	-
	22-Jan-02	D	GG	1327	29	8	8	5-20	partly cloudy	no	2 adults	-
	1-Feb-02	D	GG	1331	23	12	15	<5	partly cloudy	no	2 adults	-
	21-Mar-02	D	GG	1635	35	17	15	5-20	mostly cloudy	no	4 adults	-
	21-Mar-02	N	GG	1935	24	15	12	<5	overcast	no	no	-
	22-Mar-02	-	GG	1120	-	12	-	-	-	no	no	1.3 to 7.6

* GF = Gary Fellers, GG = Greg Guscio, PK = Pat Kleeman

Table 3. Results of Red-legged Frog Surveys West of Lagunitas Creek.

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
Marsh P-538A	11-Dec-01	D	GG	1333	81	7	11	<5	overcast	no	no	-
	12-Dec-01	N	GG	1755	85	9	8	<5	partly cloudy	10 adults	no	-
	20-Dec-01	D	GG	1120	41	11	12	5-20	overcast	no	no	-
	31-Dec-01	D	GG	1205	109	13	14	<5	overcast	no	no	-
	2-Jan-02	N	GG	1804	99	13	12	<5	partly cloudy	8 adults	no	-
	12-Jan-02	D	GG	1415	92	14	14	<5	clear	9 egg masses	no	-
	14-Jan-02	D	GG	1310	128	14	13	<5	clear	26 egg masses	no	-
	15-Jan-02	N	GG, GF	1810	115	9	4	<5	clear	18 adults 3 subadults	no	-
	24-Jan-02	D	GG, PK	1045	100	8	11	<5	partly cloudy	32 egg masses	no	-
	7-Feb-02	N	GG, PK, GF	1830	60	13	11	<5	rain	9 adults 8 subadults 1 egg mass	no	0.1 to 0.8
	11-Feb-02	D	GG	1250	140	-	-	<5	partly cloudy	27 egg masses	no	0.1 to 0.3
	13-Mar-02	D	GG	1350	47	18	12	<5	partly cloudy	7 larvae 9 egg masses	no	-
	25-Mar-02	N	GG	1920	73	14	8	<5	partly cloudy	6 adults	no	-
Fish Hatchery Cr. P-538B	13-Dec-01	N	GG	1801	22	9	8	<5	rain	no	no	-
	18-Dec-01	N	GG	1810	87	12	7	<5	partly cloudy	2 adults	no	-
	15-Jan-02	D	GG	1115	93	10	12	5-20	clear	2 egg masses	no	-
	15-Jan-02	D	GG	1430	71	10	12	5-20	clear	1 egg mass	no	-
	15-Jan-02	N	GG, GF	2000	10	10	4	<5	clear	4 adults	no	-
	28-Jan-02	D	GG	1407	63	8	7	<5	mostly cloudy	3 egg masses	no	-

SITE	DATE	DAY/ NIGHT	OBSERVER (S)*	START TIME (24hr)	TOTAL TIME	WATER TEMP (°C)	AIR TEMP (°C)	WIND (mph)	WEATHER	RAAU DETECTED	CLMA DETECTED	SALINITY (ppt)
P-538B (cont.)	7-Feb-02	N	GG, GF	1915	15	12	11	<5	rain	14 adults 4 sub-adults	no	0.3 to 18.9
	13-Feb-02	D	GG	1443	68	11	14	<5	overcast	9 egg masses	no	0.1 to 18.3
	14-Feb-02	D	GG	1501	36	15	13	<5	partly cloudy	no	no	0.1
	20-Feb-02	N	GG	1920	43	15	13	<5	overcast	15 adults 1 subadults	no	-
	19-Mar-02	D	GG	1050	125	15	16	<5	partly cloudy	37 larvae	no	0.1 to 1.2
Ditch	31-Jan-02	D	GG	1209	56	13	13	<5	partly cloudy	no	no	-
P-538C	4-Mar-02	D	GG	1354	52	13	16	5-20	partly cloudy	no	4 adults	-
	25-Mar-02	D	GG	1635	55	15	14	5-20	partly cloudy	no	no	-

* GF = Gary Fellers, GG = Greg Guscio, PK = Pat Kleeman

Discussion

The entire Giacomini wetland project area falls within the Point Reyes Critical Habitat Unit (Unit 12) as defined by the U.S. Fish and Wildlife Service. This unit "consists of watersheds within and adjacent to Bolinas Lagoon, Point Reyes, and Tomales Bay in Marin and Sonoma counties" and "contains one of the largest known populations of California red-legged frogs" (Federal Register, 2001).

Historical records of red-legged frogs provided by the California Natural Diversity Data Base indicate that red-legged frogs were present in the vicinity of the Giacomini wetlands since at least 1922 (Fig. 4). Surveys conducted by USGS-WERC biologists since 1993 provide additional data on use of nearby areas by red-legged frogs (Fig. 5).

Our study during the fall, winter, and spring of 2001-2002 showed that red-legged frogs within the Giacomini wetlands are not evenly distributed. While a few frogs were found in most areas, the main concentration was in the freshwater marsh on the west side of Fish Hatchery Creek (Fig. 3, site P-538A) and, to a lesser extent, in Fish Hatchery Creek itself (P-538B).

On the east side of the Giacomini property, red-legged frogs were sparsely distributed and unlikely to breed. We have a high level of confidence in frog surveys conducted on the east side of Lagunitas Creek since the emergent vegetation was less dense, resulting in better visibility.

On the west side of the property (sites P-538A and P-538B), the numbers of frogs observed give a less accurate representation of the total population. Frogs were quite difficult to see at these sites (both at night and during the day) due to the dense vegetation. We saw no more than 21 frogs during any one survey, while the numbers of egg masses found indicate a much greater abundance. If we make the assumption that the minimum number of adult frogs at the site is twice the number of egg masses found (one male and one female per egg mass), there were about 100 adult frogs occupying the wetlands

Figure 4. California Red-legged Frogs and Western Pond Turtles Historical Sightings in Vicinity of the Giacomini Wetlands.

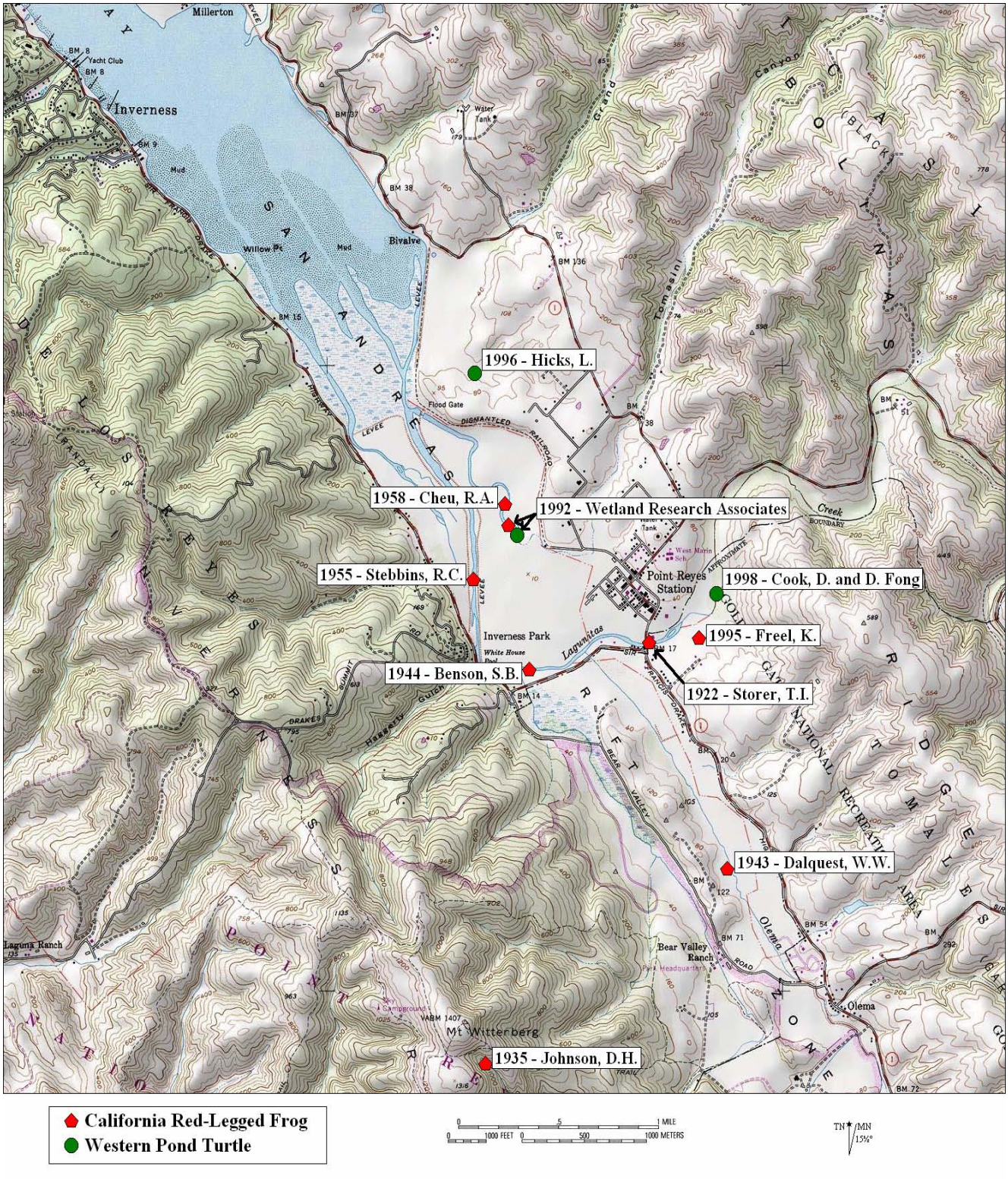
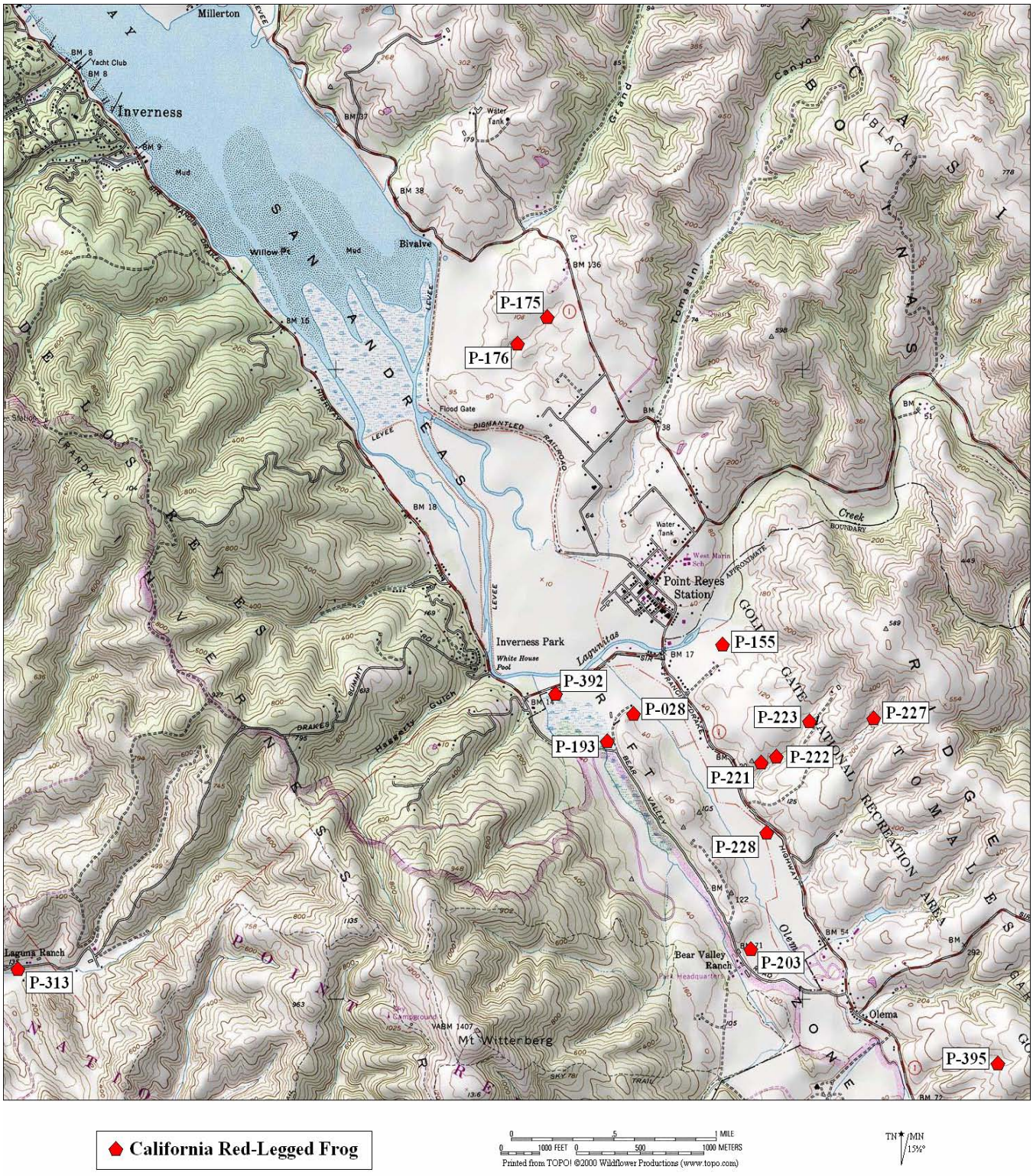


Figure 5. California Red-legged Frogs Documented By USGS-WERC.



west of Lagunitas Creek. If we include subadult frogs, the total population is quite large, even for the Point Reyes area where red-legged frogs are relatively abundant.

The most recent survey of the marsh (P-538A) showed a considerable decline in the number of frogs present compared with the breeding season. Without the use of radiotransmitters, it is not possible to determine whether the frogs are year round residents in the marsh. Frogs could move up the hillside to the west and utilize the shaded riparian corridors and springs. No surveys west of Sir Frances Drake Blvd. were conducted since the land is private property.

Red-legged frogs occasionally occupy sites that are somewhat saline. Salinity can influence suitability of habitat for red-legged frogs. Larvae and adults can tolerate salinity levels as high as 7.0 ppt, while eggs require salinities of less than 4.5 ppt (Jennings and Hayes, 1989). We never measured salinities (in the vicinity of red-legged frogs) that exceed what red-legged frogs are believed to tolerate. If levees (such as the one on the east side of Fish Hatchery Creek) are removed or altered as part of the restoration, saltwater might intrude further into the marsh and negatively impact the frogs. Whether this is likely would need to be addressed by a hydrologist with experience in estuarine restorations.

We did not observe any predation on red-legged frogs. We did find bullfrogs, great egret, great blue heron, black-crowned night heron, grebes, belted kingfisher barn owl, river otter, and muskrat in the study area. All of these (except the bullfrog) are native predators that are known to feed on frogs or tadpoles, though data on red-legged frogs is largely lacking. None of these predators appeared to be present in unusually high numbers, and their presence and diversity of the native species are both expected and welcome. The few bullfrogs we saw are unlikely to have any impact on red-legged frogs.

Summary

During the breeding season, red-legged frogs were abundant in the freshwater marsh on the west side of Fish Hatchery Creek. We also found significant numbers of egg masses and tadpoles. Clearly this area is ecologically significant and should be protected from alteration or saltwater intrusion. What is less clear is what non-breeding habitat is being used by frogs that breed in the marsh. They might be using some of the deeper pools along the east side of Sir Francis Drake Blvd., or they might be moving across the road to springs or riparian corridors.

Red-legged frogs were only rarely found elsewhere on the Giacomini property. Areas such as the duck pond, Tomasini Creek, or the old Tomasini Creek channel do not provide significant red-legged frog habitat. Western pond turtles (which were once proposed for Federal listing) do use some of these areas, however.

If the wetlands inhabited by red-legged frogs are protected during restoration activities, only minor mitigation would seem to be required for the loss of those few frogs on other parts of the Giacomini property. Activities that might lead to a change in the habitat structure, water table, or salinity of the marsh would need to be addressed in any restoration planning documents, and fully mitigated as directed by the FWS.

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California Freshwater Shrimp (*Syncaris pacifica*) and Tidewater Goby (*Eucyclogobius newberryi*) Surveys, Giacomini Ranch, Marin Co.

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Prepared for the

Division of Resource Management
Point Reyes National Seashore
National Park Service

INTRODUCTION

The Giacomini Ranch site is located at the mouth of Lagunitas Creek near the town of Inverness in Marin County, California. The location is the site of a future tidal wetland restoration project by the National Park Service. Baseline biological data are required to evaluate restoration alternatives. The waters within the project area may support federally and state-listed threatened and endangered species. Among these species are California freshwater shrimp and tidewater goby, both of which are federally listed endangered species.

The California freshwater shrimp (*Syncaris pacifica*) is listed by the U.S. Fish and Wildlife Service as endangered (55 FR 43884) and is the only extant member of the genus. The shrimp is endemic to 17 coastal streams in Marin, Sonoma, and Napa counties north of San Francisco Bay, California.

The shrimp is found in low elevation (<116 meters), low gradient (generally <1 percent), perennial freshwater streams where banks are structurally diverse with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation. Existing populations are threatened by introduced fish, deterioration or loss of habitat because of water diversions, impoundments, livestock and dairy activities, agricultural activities and developments, flood control activities, gravel mining, timber harvesting, migration barriers, and water pollution.

Within Point Reyes National Seashore and Golden Gate National Recreation Area (hereafter referred to as “Parks”), the shrimp is found within the Lagunitas Creek watershed. The shrimp was first observed and collected in Lagunitas Creek in 1877 (Hedgpeth 1975). The current, known range of the shrimp within Lagunitas Creek extends from Shafter Bridge in Samuel P. Taylor Park to roughly 1.6 km below the confluence with Nicasio Creek (Serpa 1991, Hedgpeth 1975). Near the project area, the shrimp has been found in lower Olema Creek (Fong 1999).

The tidewater goby (*Eucyclogobius newberryi*) is a small benthic fish (<50 mm standard length) found in coastal waters in California from San Diego to Del Norte counties. It is most commonly found in slightly brackish waters (0-10 parts per thousand), although experimental studies have shown the goby to tolerate hypersaline conditions for short periods (Swift et al., 1989). It is estimated that the goby has disappeared from nearly 50 percent of the coastal lagoons since 1900 (U.S. Fish and Wildlife Service, 1994). Various factors have led to the decline of the goby including the inadvertent introduction of non-native fish and habitat degradation. These historic losses and current threats to existing populations led the U.S. Fish and Wildlife Service in 1994 to list the goby as endangered under the Endangered Species Act. Historic records indicate that the tidewater goby was last observed in 1953 in Lagunitas Creek (also Papermill Creek) within the project vicinity (Swift et al., 1989).

STUDY OBJECTIVES

Surveys were initiated to determine potential habitat suitability and the presence/not found status of tidewater goby and freshwater shrimp within the project area. Goby sampling data were also intended to serve as baseline fisheries data for long-term fisheries monitoring.

PERMITS

Sampling activities were conducted in accordance with conditions specified in the Parks' Section 10(a)(1)(A) of the Endangered Species Act permit from the U.S. Fish and Wildlife Service (subpermit no. GGNRA-2, expiration December 31, 2000 and renewal (#TE-036499) submitted to USFWS in November 2000).

METHODS

Shrimp sampling was not conducted at sites were surface water salinities exceeded 15 parts per thousand (ppt) or at sites where overhanging vegetation, aquatic vegetation, or undercut banks were absent. Hedgpeth (1968) found that captive shrimp in salinities less that 16-17 ppt appeared to feed and molt normally over the 13-day experiment. The sampling methods followed procedures described by Serpa (1991) and permitted by the U.S. Fish and Wildlife Service.

The shrimp inventory was conducted using a single pass through suitable habitats. Long-handled dip nets (1/8th inch mesh) were used to sweep riparian vegetation overhanging into waterbodies as well as undercut banks and aquatic vegetation. Nets were frequently emptied into a shallow pan and sorted for shrimp or other unusual invertebrates. On mainstem Lagunitas Creek, sampling was conducted from an inflatable kayak along the right bank of the channel. Sample site locations are provided in Figure 1.

At each fish sampling site, a beach seine was dragged perpendicular to the shore for approximately 3-8 m. The seine had a mesh size of 1/8th inch with a chain mud line. Sampled areas ranged between 2-30 m^2. A large tarp was placed underneath the seine to minimize loss of fish into the surrounding environment. Fish were placed into aerated 5-gallon buckets for subsequent measurements. All collected fish species were identified and counted. Up to 10 fish per species per site were chosen for total length measurements. All fish were released upon completion of measurements at the capture site. Sample site locations were determined with a GPS receiver (Garmin III+) (Figure 2)

Qualitative sampling for gobies was conducted at Tomasini Creek on April 12, 2002. A beach seine with 1/4 inch mesh was used (50 x 6 feet).

General Habitat Information

During shrimp sampling activities, water quality data were collected using a YSI Model 85 meter (salinity, temperature, dissolved oxygen, and specific

conductance). Water quality data were generally collected at the surface and bottom of the water column at each site. Survey distance and location were obtained using a GPS receiver (Figure 3). Color photos were taken of general habitat conditions. General information regarding amount of overhanging cover, undercut banks, and aquatic vegetation were also obtained to evaluate habitat quality for shrimp (Table 1).

Serpa (1996) utilized a qualitative rating system to evaluate habitat suitability of streams for shrimp. This rating system evaluates features known to be important to shrimp, including water depth, presence or absence of undercut banks, and the quality and quantity of tree roots and herbaceous vegetation hanging into the water (Serpa 1996). We ranked each sampling reach according to this system. The rating system is as follows:

Poor Habitat

1. Water usually less than six inches deep, but could be much deeper if there is a sheer bank of earth or rock; and
2. Very little or no roots, twigs, branches, or vegetation hanging into the water.

Fair Habitat

1. Water usually more than six inches deep, but could be shallower if the habitat was otherwise very well developed; and
2. At least one of the following features present: some herbaceous vegetation, hair-like fine roots, coarse roots (>0.5 cm diameter), twigs or branches in the water, or an undercut bank extending inward away from the stream for more than six inches.

Good Habitat

1. Water one to four feet deep; and
2. Usually at least two of the following features need to be present: hair-like fine roots, coarse roots (>0.5 cm diameter), blackberries, dogwood or ferns with roots, undercut banks (>six inches) or abundant herbaceous vegetation. A well developed section of fine roots, or blackberries with adventitious roots, would qualify for good habitat by itself, even without the complementary presence of one of the other features noted.

Excellent Habitat

1. Water one to three feet deep; and
2. Usually at least two of the following features are required to be present, better developed than above: hair-like fine roots, coarse roots (>0.5 cm diameter), blackberries dogwood or ferns with roots in water, grass on the water, undercut banks >six inches. Only one of the above would be needed if it was exceptionally well developed.

Excessive current or silt would reduce habitat ranking by one rank.

During fish sampling activities, water quality data, similar to that obtained for shrimp sampling, were collected using a YSI Model 85 meter. General information regarding substrate condition, vegetative cover, and sample site dimensions were collected. Tables 3 and 4 summarizes the water quality and habitat information at each sample site, respectively.

Sampling Dates

Shrimp sampling activities occurred on September 24 and 27, 2001. Tidewater goby sampling activities occurred on September 12 and 25, 2001.

RESULTS AND DISCUSSION

Shrimp

All surveyed habitats within the project area were generally rated as either "fair" or "poor" sites for shrimp (Table 1). Many of the required habitat components were either absent or not available on a consistent basis. For example, all surveyed sites along mainstem Lagunitas Creek within the project area were scored "poor"-- despite the presence of abundant willow riparian habitat (White House #2-4,). Because this area is tidally influenced, willow branches would only be submerged under a high tide. Also, the aquatic vegetation present in these reaches (e.g., tules) does not provide the complex cover and attachment sites needed by shrimp. Several areas near Tomales Bay (Fish Hatchery and Tomasini Creeks) had surface salinities in excess of 15 ppt and were not surveyed.

The surveyed ditches within the project area were rated as "fair" for shrimp despite the absence of undercut banks and overhanging vegetation, because all surveyed sites had abundant herbaceous aquatic vegetation or floating mats of grass.

No California freshwater shrimp were captured during activities. However, during fish sampling activities a single brackish water shrimp (*Palaemon macrodactylus*) was captured in mainstem Lagunitas Creek, above Whitehouse Pool. This species was accidentally introduced into San Francisco Bay from Asia (Carlton and Kuris 1975). Hedgpeth (1968) expressed concern about this species because of its ability to adapt to a wide range of salinities, unlike aytid shrimps.

The presence of the introduced mosquitofish in the freshwater ditches likely precludes the presence of freshwater shrimp. No co-existence was found between mosquitofish and atyid shrimp in Hawaiian streams, presumably due to predation on newly hatched atyid larvae (Cited by Williams 1977).

Taxa collected during shrimp sampling activities are listed in Table 2. Along the banks of Lagunitas Creek, an unidentified sphaeromatid isopod was abundant in areas with tules and cattails. The collected taxa within the Giacomini Ranch project area, such as dragonfly larvae and belostomatids, are all taxa associated with slow-moving, permanent water. Further characterizations of water quality conditions based on invertebrates would require a more rigorous invertebrate sampling program and identification of collected taxa to genus or species level.

Fish Sampling

The list of collected taxa is provided in Table 5. Raw data of taxa and total lengths are included in Appendix I. A total of ten identified fish species were collected, including two non-native species -- yellowfin goby and mosquitofish. Three macrocrustacean taxa were collected. All three are considered to be introduced.

The fish and macrocrustacean assemblage can be divided into those found in brackish sloughs/main channels (all Lagunitas Creek stations, Fish Hatchery 1-2, and Tomasini Creek) and freshwater irrigation ditches (Fish Hatchery 3 and Ditch 1B). Fish densities ranged from 0.4 to 9.3 individuals per square meter (Table 6). Freshwater sampling sites contained only two non-native taxa- mosquitofish (*Gambusia affinis*) and crayfish (possibly *Procambarus*). Mosquitofish have wide physiological tolerances and are wide spectrum omnivores that feed on a variety of invertebrates and algae (McGinnis 1984). Red swamp crayfish (*Procambarus clarki*) can tolerate warm, stagnant waters with low dissolved oxygen and salinities as high as 30 parts per thousand (Herbold *et al.* 1992).

Arrow goby (*Clevendia ios*) and topsmelt (*Atherinops affinis*) were the most frequently observed taxa in the brackish water areas. The fish community composition in the brackish slough/main channel habitats were similar to the fish community in the estuarine Crissy Field marsh in San Francisco Bay sampled earlier in the summer. The arrow goby is the most abundant native goby in San Francisco Bay and is common on mudflats inhabited by burrowing invertebrates (Goals Project 2000). Topsmelt within the San Francisco Bay utilize vegetated mudflats for breeding, spawning, and as nursery areas for juveniles (Goals Project 2000). A major proportion of sampled topsmelt within the Giacomini Ranch project area were juveniles (published literature range of lengths for juveniles is 18-120 mm). In their review of topsmelt literature, the Goals Project (2000) note that early life stages of topsmelt are sensitive to the effects of pollution.

Juvenile longjaw mudsuckers (*Gillichthys mirabilis*) were captured at Tomasini Creek. They were initially misidentified in the field but voucher specimens were collected because of their slight morphological differences from the more abundant arrow gobies. Identification was done by Tom Laidig, National Marine Fisheries Service (Southwest Fisheries Science Center, Santa Cruz).

Two adult tidewater gobies were collected during the April 12, 2002 sampling activities at Tomasini Creek (near Station Tomasini WQ#34) (Figure 5). Their identifications (from digital photographs) were verified by Ramona Swenson and Camm Swift. No tidewater gobies were collected in this general area in September 2001. Water quality conditions had changed markedly since prior sampling activities in September in this area. Because of significant freshwater influence, bottom salinities were 0.3 ppt (20.1^{o}C) in April 2002. Tidewater gobies were not captured from any other area outside of Tomasini Creek.

No tidewater gobies were collected by the U.S. Geological Survey-Biological Resources Division in 1996 along the mainstem Lagunitas Creek (Charlie Chamberlain, unpub. data, 1996). They surveyed the tidally influenced portion of mainstem Lagunitas Creek from below White House pool to the Giacomini summer dam. Only arrow and yellowfin gobies (as well as other non-goby taxa) were collected in 1996 (Table 7).

Injury and Mortality

No mortalities or injuries to listed species occurred during sampling activities. A total of 19 topsmelt, one arrow goby, and one unknown juvenile fish were accidentally killed during sampling activities. These mortalities were saved as voucher specimens in addition to the brackish water shrimp and crab.

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Table 1: Shrimp Habitat Data for Giacomini Ranch, Marin Co., September 2001

STATION ID	Length (m)	Riffle (% Len)	Pool (% Len)	Shore Depth (m)	%Overhang Len	Type	%Undercut Len	%Emergent Len	Type	%Aquatic Len	Type	Habitat Rating*
Upper Fish Hatchery 1-2	630.0	10	90	~0	0		0	N.D.		N.D.		Poor
White House 1	WH1-4	0	100	1	0		0	100	tules	0		Poor
White House 2	880.0	0	100	1.75	50	willows at hi tide	0	50	tules	0		Poor
White House 3		0	100	1.25	20	willows at hi tide	0	80	tules	0		Poor
White House 4		0	100	0.75	>80	willows at hi tide	0	N.D.		N.D.		Poor
Ditch1B (below bridge to pump)	350.0	0	100	0.4	5	grass/Juncus	0			15	*Hydrocotyle, Polygonum*	Fair
Ditch 1A	110.0	0	100	~0	5	willows	0	20	cattails	80	*Hydrocotyle*	Fair
Cross-Ditch	70.0	0	100	1	0		0	0		75	*Hydrocotyle*, floating grass	Fair

* Based on criteria established by Serpa (1996).

Table 2: Taxa collected during shrimp sampling activities, Giacomini Ranch, Marin Co., September 2001

STATION ID	Taxa
Upper Fish Hatchery 1-2	threespine stickleback, dragonfly larvae, damselfly larvae, belostomatid bug, amphipod, snails, dytiscid beetle, mesoveliid bug, gerrid bug, corixid bug, case caddisfly
White House 1	sphaeromatid isopod
White House 2	sphaeromatid isopod
White House 3	sphaeromatid isopod
White House 4	sphaeromatid isopod
Ditch1B (below bridge to pump)	mosquitofish, crayfish (possibly *Procambarus*), dragonfly larvae, dytiscid beetle, corixid bugs,
Ditch 1A	mosquitofish, crayfish (possibly *Procambarus*), snails, corixid bugs, amphipods
Cross-Ditch	mosquitofish, crayfish (possibly *Procambarus*), snails, dragonfly larvae, dytiscid beetle, corixid bugs, amphipods, belostomatid bug

Table 3: Water Quality Data for Giacomini Ranch, Marin Co., September 2001

Station ID	Sample Date	Time (PST)	DO (%)	DO (mg/l)	T (oC)	Spec.Cond (mS/cm)	Spec.Cond (uS/cm)	Salinity (ppt)	Water Depth (m)	UTM_E (WGS84_ 10 S)	UTM_N (WGS84_ 10 S)
Fish Hatchery 1	September 12, 2001	1043	62.5	5.43	16.4			32.3	0	514734	4214517
Fish Hatchery 2	September 12, 2001	1200	61	4.78	18	48.12		31.4	0	514862	4214454
Fish Hatchery 3	September 12, 2001	1335	46.4	3.91	17.8	32.66		20.5	0	515046	4214369
Lagunitas 1	September 12, 2001	1415	87	7.5	18.4	23.7		14.4	0	515608	4214027
Lagunitas 2	September 12, 2001	1500	89.1	7.67	18.8	22.11		13.4	0	515683	4213778
Lagunitas 3	September 12, 2001	1536	86.4	7.38	18.5	25.06		15.3	0	515694	4213471
Upper Fish Hatchery 1	September 24, 2001	1150	94.3	9.58	14.6		341.1	0.2	0	515421	4213611
Upper Fish Hatchery 2	September 24, 2001	1250	40	3.82	17.8		383.0	0.2	0	515299	4214115
Ditch 1B WQ36	September 25, 2001	1300	43.9	3.96	20.1		488.7	0.2	0.5	516269	4213688
Lagunitas Above White House Pool	September 25, 2001	1350	78.9	6.69	19.3	23.52		14.3	0.95		
Lagunitas Above White House Pool	September 25, 2001	1350	79.7	7.05	20.1	8.03		4.5	0	516065	4212816
Lagunitas Below Giacomini Dam	September 25, 2001	1430	93.9	8.23	20.8	6.35		3.5	0.35	516407	4212870
Tomasini wq30	September 25, 2001	morning	57.6	4.34	20.9	45.05		29.2		515662	4214591
Tomasini wq31	September 25, 2001	morning	39.9	3.18	19.7	36.53		23.2		515826	4214594
Tomasini wq32	September 25, 2001	morning	10.1	0.77	20	45.03		29.2		515972	4214580
Tomasini wq33	September 25, 2001	morning	57.3	4.35	20.5	44.79		29.0		516126	4214512
Tomasini wq34	September 25, 2001	1130	36.5	2.77	20.7	43.95		28.4	0.55	516225	4214215
Tomasini wq35	September 25, 2001		2.6	0.2	21.1	44.05		28.5		516180	4214097
40	September 27, 2001	1100	81.1	6.95	19.2	20.77		12.5	0	515819	4212859
41	September 27, 2001	1100	90.3	7.66	18.1	29.02		18.0	1		
42	September 27, 2001	1127	81.8	7.03	19.3	20.08		12.0	0	515929	4212851
43	September 27, 2001	1127	75.5	6.34	18.2	31.12		19.4	1.75		
44	September 27, 2001	1142	77.5	6.69	19.2	19.02		11.3	0	516107	4212844
45	September 27, 2001	1142	77.6	6.64	18.3	25.93		15.9	1.25		
46	September 27, 2001	1205	84.3	7.43	19.1	14.41		8.4	0	516467	4212898
47	September 27, 2001	1205	69.3	5.96	19.1	20.75		12.5	0.75		
48	September 27, 2001	1216	88.4	7.9	18.9	11.93		6.8	0	516618	4213019
49	September 27, 2001	1216	78	6.71	19.1	20.55		12.3			
Ditch 1A(WQ50)	September 27, 2001	1325	62.4	5.74	19.4		414.9	0.2	0	516374	4213676
Cross-Ditch	September 27, 2001	afternoon	38	3.83	20.9		510.0	0.2	0	516156	4213880
Tomasini @Duck Club	September 27, 2001	afternoon	25.1	2.19	17	20.64		12.4	0	516262	4213734
Ditch1B (WQ29)	September 27, 2001	1340	40.4	3.85	17.5		482.1	0.2	0	516268	4213688

Table 4: Fish Habitat Data for Giacomini Ranch, Marin Co., September 2001

Date	STATION ID	Width (m)	Length (m)	Area (sq. m)	Max depth (m)	Min depth (m)	Ave. Vol (cu. m)	Dom. substrate	Subdom. Substrate	SAV	EAV	Algae
12-Sep-01	Fish Hatchery 1	4.1	6.5	26.7	0.32	0.15	6.3	Muck		0	0	0
12-Sep-01	Fish Hatchery 2	4.1	5.0	20.5	0.45	0.35	8.2	Muck		0	0	1
12-Sep-01	Fish Hatchery 3	4.1	2.5	10.0	0.45	0.22	3.4	Muck	Mud	0	1	0
12-Sep-01	Lagunitas 1	4.1	5.8	23.8	0.87	0	10.3	Mud	Gravel	0	0	1
12-Sep-01	Lagunitas 2	4.0	7.8	31.2	0.50	0	7.8	Mud	Gravel	0	0	2
12-Sep-01	Lagunitas 3	4.1	7.9	32.4	0.41	0.2	9.9	Gravel		0	0	1
25-Sep-01	Lagunitas Creek- above WH pool	4.1	5.7	23.4	0.95	0.7	19.3	Mud	Gravel	0	1	0
25-Sep-01	Lagunitas Creek- below Giacomini dam	4.1	8.0	32.8	0.35	0	5.7	Gravel	Mud	0	1	0
25-Sep-01	Tomasini wq34	4.2	7.6	31.3	0.55	0.05	9.4	Muck	Mud	0	0	0
25-Sep-01	Ditch 1B wq36	1.0	1.5	1.5	0.50	0.45	0.7	Muck		1	0	0
25-Sep-01	Ditch 1B	2.0	2.0	4.0	0.80			Mud	Muck	1	0	0

Table 5: Taxa List of Fish and Macrocrustaceans Found in Sampled Habitats of Giacomini Ranch, September 2001 And April 2002.

Fish	Macrocrustaceans
Acanthogobius flavimanus (yellowfin goby-Introd.)	*Carcinus maenus (green crab*-Introd.)
Atherinops affinis (topsmelt)	Crayfish (possibly *Procambarus*-Introd.)
Clevendia ios (arrow goby)	*Palaeomon macrodactylus* (-Introd.)
Cottus asper (prickly sculpin)	
Eucyclogboius newberryi (tidewater goby)	
Gasterosteus aculeatus (threespine stickleback)	
Gillichthys mirabilis (longjaw mudsucker)	
Leptocottus armatus (Pacific staghorn sculpin)	
Syngnathus leptorhynchus (bay pipefish)	
Unidentifieds (goby, larval fish)	

Table 6: Fish and Macrocrustacean Density Estimates for Sampled Habitats of Giacomini Ranch, September 2001.

STATION ID	Vertebrate Density (#/sq. m.)	Macrocrust. Density (#/sq. m.)
Fish Hatchery 1	4.0	0
Fish Hatchery 2	0.8	0
Fish Hatchery 3	1.1	0
Lagunitas 1	1.6	0
Lagunitas 2	2.4	0
Lagunitas 3	4.4	0
Lagunitas Creek- above WH pool	0.4	<0.1
Lagunitas Creek- below Giacomini dam	2.0	0
Tomasini wq34	3.8	<0.1
Ditch 1B wq36	9.3	2
Ditch 1B	0.8	0

Table 7: Fish Taxa Collected within tthe portion of Lagunitas Creek in the Giacomini Wetland Restoration Project Area by USGS-BRD (Chamberlain, unpub. data, 1996) , August 1996

Scientific Name	Common Name
Acipenser transmontanus	White sturgeon
Acanthogobius flavimanus	Yellowfin goby
Atherinops affinis	Topsmelt
Catostomus occidentalis	Sacramento sucker
Clevendia ios	Arrow goby
Cymatogaster aggregata	Shiner surfperch
Gambusia affinis	Mosquitofish
Gasterosteus aculeatus	Threespine stickleback
Lavinia exilicauda	Hitch
Leptocottus armatus	Pacific staghorn sculpin
Syngnathus leptorhynchus	Bay pipefish

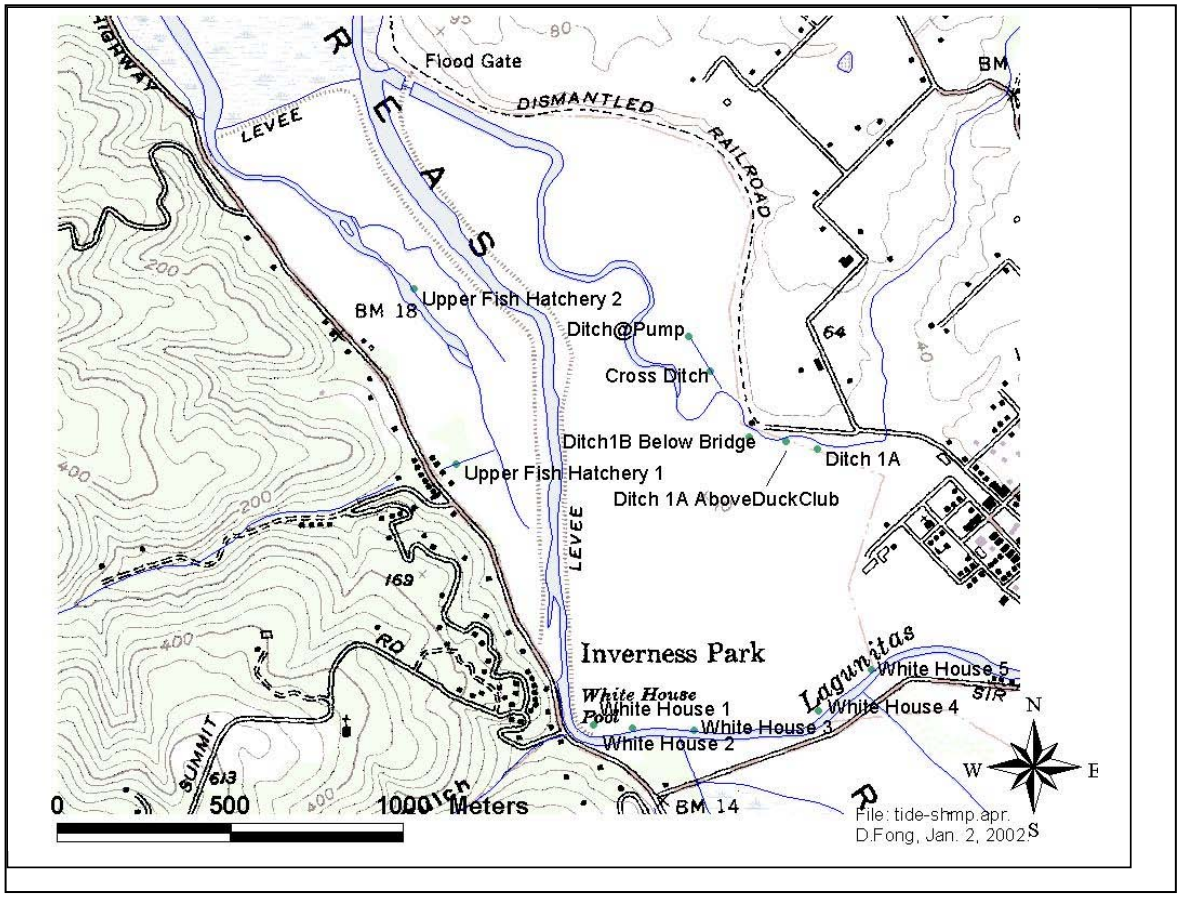

Figure 1: California Freshwater Shrimp Sampling Locations at Giacomini Ranch, Sept. 2001.

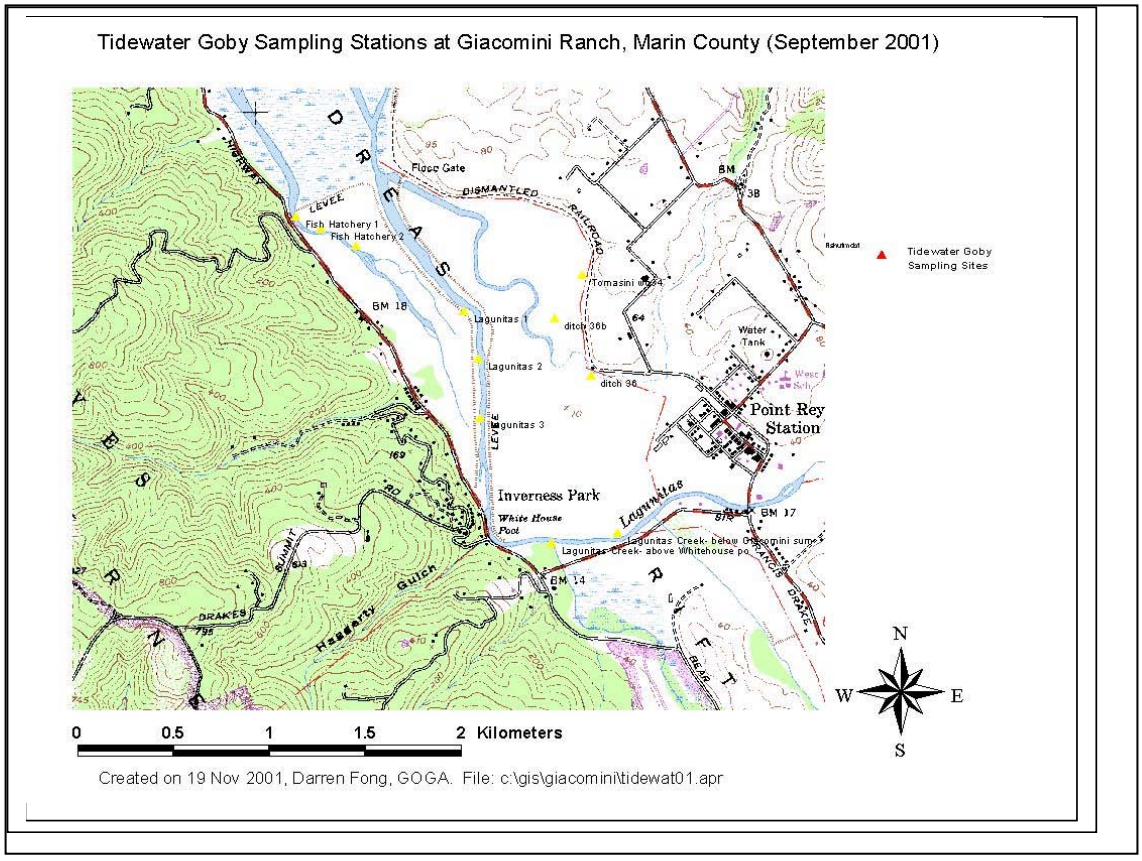

Figure 2: Tidewater Goby Sampling Locations at Giacomini Ranch, Sept. 2001

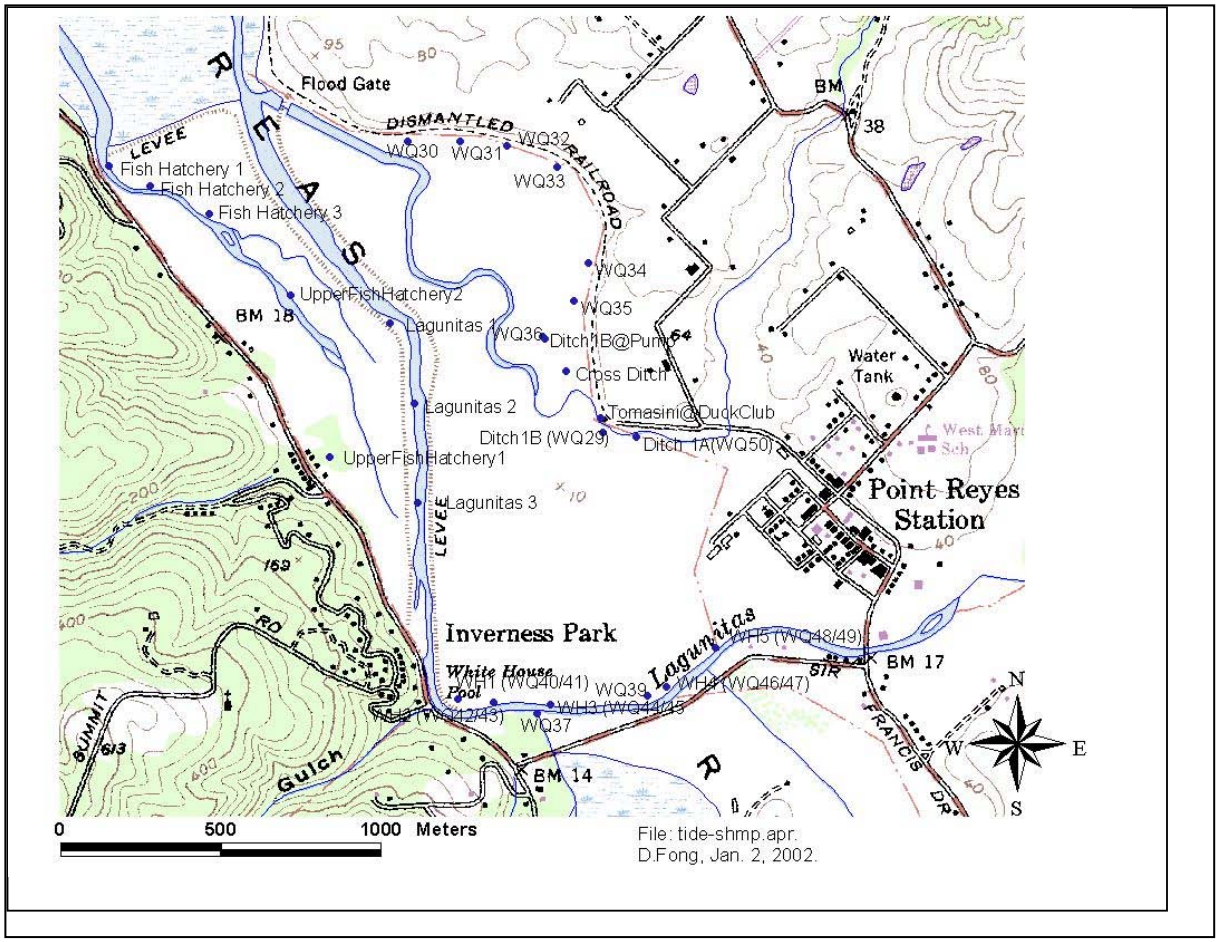

Figure 3: Water Quality Sampling Locations at Giacomini Ranch, Sept. 2001

Fish Hatchery 1. Saltgrass in foreground, overhanging willow background

Lagunitas Creek, White House 1. Tules on right bank

Lagunitas Creek, White House 2. Tule and willow riparian on right bank

Lagunitas Creek, White House 4. Willow riparian on right bank

Cross-ditch. *Hydrocotyle* sp. and floating grasses in ditch

Ditch 1b. Grasses and *Juncus* sp. along shoreline with some *Polygonum* sp. in water.

Tomasini Creek above Duck Club bridge.

Figure 4: Stream and riparian condition at fish and shrimp sampling locations, Giacomini Ranch, Marin Coo., CA., September 2001.

Figure 5: Tidewater goby collected at Tomasini Creek (WQ#34) April 12, 2002.

Appendix I- Raw Fish Sampling Data for Giacomini Ranch, Marin Co., September 2001

STATION	SPECIES	Count	Total (mm)	Len	STATION	SPECIES	Count	Total (mm)	Len
FH 1	topsmelt	1	60		FH 2	threespine stickleback	1	25	
FH 1	topsmelt	1	60		FH 2	threespine stickleback	1	29	
FH 1	topsmelt	1	64		FH 3	mosquitofish	1	29	
FH 1	topsmelt	1	53		FH 3	threespine stickleback	1	48	
FH 1	topsmelt	1	61		FH 3	threespine stickleback	1	28	
FH 1	topsmelt	1	48		FH 3	threespine stickleback	1	18	
FH 1	topsmelt	1	55		FH 3	threespine stickleback	1	24	
FH 1	topsmelt	1			FH 3	mosquitofish	1	16	
FH 1	topsmelt	1	62		FH 3	mosquitofish	1	33	
FH 1	topsmelt	1	58		FH 3	mosquitofish	1	10	
FH 1	topsmelt	1	51		FH 3	mosquitofish	1	32	
FH 1	topsmelt	1	64		FH 3	arrow goby	1	21	
FH 1	topsmelt	1	50		FH 3	arrow goby	1		
FH 1	topsmelt	1	61		LAG 1	arrow goby	1	41	
FH 1	topsmelt	68			LAG 1	arrow goby	1	30	
FH 1	arrow goby	1	35		LAG 1	arrow goby	1	33	
FH 1	arrow goby	1	29		LAG 1	arrow goby	1	29	
FH 1	arrow goby	1	38		LAG 1	arrow goby	1	24	
FH 1	arrow goby	1	30		LAG 1	arrow goby	1	25	
FH 1	arrow goby	1	29		LAG 1	arrow goby	1	27	
FH 1	arrow goby	1	33		LAG 1	arrow goby	1	35	
FH 1	arrow goby	1	36		LAG 1	arrow goby	1	30	
FH 1	arrow goby	1	33		LAG 1	arrow goby	1	33	
FH 1	arrow goby	1	32		LAG 1	arrow goby	1	19	
FH 1	arrow goby	1	35		LAG 1	arrow goby	1	23	
FH 1	threespine stickleback	1			LAG 1	arrow goby	12		
FH 1	arrow goby	1	42		LAG 1	arrow goby	15		
FH 1	arrow goby	1	40		LAG 2	arrow goby	1	31	
FH 1	arrow goby	11			LAG 2	arrow goby	1	31	
FH 2	threespine stickleback	1	29		LAG 2	arrow goby	1	27	
FH 2	threespine stickleback	1	25		LAG 2	arrow goby	1	29	
FH 2	threespine stickleback	1	26		LAG 2	arrow goby	1	21	
FH 2	arrow goby	1	30		LAG 2	arrow goby	1	30	
FH 2	arrow goby	1	27		LAG 2	arrow goby	1	22	
FH 2	arrow goby	1	29		LAG 2	arrow goby	1	28	
FH 2	arrow goby	1	37		LAG 2	arrow goby	1	23	
FH 2	arrow goby	1	35		LAG 2	arrow goby	1	16	
FH 2	arrow goby	1	31		LAG 2	arrow goby	1	26	
FH 2	threespine stickleback	1	18		LAG 2	topsmelt	1	24	
FH 2	threespine stickleback	1	26		LAG 2	topsmelt	1	15	
FH 2	topsmelt	2	10		LAG 2	topsmelt	1	18	
FH 2	threespine	1	30		LAG 2	topsmelt	1	30	
FH 2	stickleback threespine stickleback	1	33		LAG 2	topsmelt	1	15	

Appendix I- Raw Fish Sampling Data for Giacomini Ranch, Marin Co., September 2001

STATION	SPECIES	Count	Total (mm)	Len
LAG 2	topsmelt	1	42	
LAG 2	topsmelt	1	39	
LAG 2	arrow goby	39		
LAG 2	topsmelt	1	36	
LAG 2	arrow goby	18		
LAG 3	topsmelt	1	41	
LAG 3	topsmelt	1	30	
LAG 3	topsmelt	1	26	
LAG 3	topsmelt	1	36	
LAG 3	topsmelt	1	32	
LAG 3	topsmelt	1	21	
LAG 3	topsmelt	1	20	
LAG 3	topsmelt	1	23	
LAG 3	topsmelt	1	28	
LAG 3	topsmelt	1	29	
LAG 3	topsmelt	1	19	
LAG 3	topsmelt	1	18	
LAG 3	topsmelt	1	21	
LAG 3	topsmelt	1	29	
LAG 3	topsmelt	1	16	
LAG 3	topsmelt	1	21	
LAG 3	topsmelt	95		
LAG 3	bay pipefish	1	146	
LAG 3	bay pipefish	1	119	
LAG 3	bay pipefish	1	61	
LAG 3	bay pipefish	1	68	
LAG 3	bay pipefish	1	82	
LAG 3	bay pipefish	1	53	
LAG 3	arrow goby	1	39	
LAG 3	arrow goby	1	39	
LAG 3	arrow goby	1	31	
LAG 3	arrow goby	1	27	
LAG 3	arrow goby	1	42	
LAG 3	arrow goby	1	34	
LAG 3	arrow goby	1	23	
LAG 3	unk juv	1		
LAG 3	topsmelt	7		
LAG 3	staghorn sculpin	1	110	
LAG 3	unk juv	1	19	
LAG 3	bay pipefish	1	51	
LAG 3	bay pipefish	1	40	
LAG 3	arrow goby	1	31	
LAG 3	arrow goby	1	26	
LAG 3	yellowfin goby	3		
LAG 3	bay pipefish	1	53	
TOM-wq34	Carcinus maenas	1		
TOM-wq34	topsmelt	1	50	
TOM-wq34	mosquitofish?		27	
TOM-wq34	topsmelt	1	49	
TOM-wq34	topsmelt	1	34	
TOM-wq34	topsmelt	1	39	
TOM-wq34	topsmelt	1	45	
TOM-wq34	threespine stickleback	1	25	
TOM-wq34	mosquitofish?	1	20	
TOM-wq34	topsmelt	1	51	
TOM-wq34	threespine stickleback	1	21	
TOM-wq34	topsmelt	1	41	
TOM-wq34	topsmelt	1	47	
TOM-wq34	topsmelt	1	35	
TOM-wq34	topsmelt	1	45	
TOM-wq34	topsmelt	1	41	
TOM-wq34	topsmelt	1	38	
TOM-wq34	topsmelt	1	31	
TOM-wq34	topsmelt	1	42	
TOM-wq34	topsmelt	1	37	
TOM-wq34	topsmelt	71		
TOM-wq34	threespine stickleback	1	28	
TOM-wq34	threespine stickleback	1	32	
TOM-wq34	Longjaw mudsucker	1	37	
TOM-wq34	arrow goby	1	31	
TOM-wq34	arrow goby	1	30	
TOM-wq34	arrow goby	1	32	
TOM-wq34	threespine stickleback	1	27	
TOM-wq34	threespine stickleback	1	29	
TOM-wq34	threespine stickleback	1	31	
TOM-wq34	threespine stickleback	1	29	
TOM-wq34	threespine stickleback	1	25	
TOM-wq34	threespine stickleback	1	30	
TOM-wq34	threespine stickleback	1	30	

Appendix I- Raw Fish Sampling Data for Giacomini Ranch, Marin Co., September 2001

STATION	SPECIES	Count	Total (mm)	Len
TOM-wq34	threespine stickleback	1	23	
TOM-wq34	arrow goby	1	34	
TOM-wq34	Longjaw mudsucker	1	40	
TOM-wq34	arrow goby	1	38	
TOM-wq34	arrow goby	1	33	
TOM-wq34	arrow goby	1	32	
TOM-wq34	arrow goby	1	32	
TOM-wq34	arrow goby	1	34	
TOM-wq34	arrow goby	1	33	
TOM-wq34	arrow goby	1	34	
TOM-wq34	arrow goby	1	29	
TOM-wq34	arrow goby	1	32	
TOM-wq34	prickly sculpin	1	55	
TOM-wq34	prickly sculpin	1	115	
TOM-wq34	arrow goby	1		
TOM-wq34	arrow goby	1		
Ditch 1B	mosquitofish	1	24	
Ditch 1B	mosquitofish	1	25	
Ditch 1B	mosquitofish	1	22	
Ditch 1B wq36	juv. crayfish	3		
Ditch 1B wq36	mosquitofish	14		
LAG-AWH	arrow goby	1	31	
LAG-AWH	arrow goby	1	34	
LAG-AWH	arrow goby	1	34	
LAG-AWH	arrow goby	1	35	
LAG-AWH	arrow goby	1	20	
LAG-AWH	arrow goby	1	18	
LAG-AWH	topsmelt	1	45	
LAG-AWH	yellowfin goby	1	45	
LAG-AWH	prickly sculpin	1	61	
LAG-AWH	prickly sculpin	1	69	
LAG-AWH	Palaemon macrodactylus	1		
LAG-BGD	topsmelt	1	21	
LAG-BGD	topsmelt	1	22	
LAG-BGD	topsmelt	1	25	
LAG-BGD	topsmelt	1	40	
LAG-BGD	topsmelt	1	20	
LAG-BGD	arrow goby	1	29	
LAG-BGD	arrow goby	1	30	

STATION	SPECIES	Count	Total (mm)	Len
LAG-BGD	arrow goby	1	30	
LAG-BGD	arrow goby	1	34	
LAG-BGD	unk gob	1	18	
LAG-BGD	topsmelt	1	22	
LAG-BGD	topsmelt	1	25	
LAG-BGD	arrow goby	1	34	
LAG-BGD	arrow goby	1	34	
LAG-BGD	arrow goby	1	37	
LAG-BGD	arrow goby	1	29	
LAG-BGD	arrow goby	1	33	
LAG-BGD	arrow goby	1	35	
LAG-BGD	arrow goby	1	26	
LAG-BGD	arrow goby	1	29	
LAG-BGD	arrow goby	1	26	
LAG-BGD	unk gob	2	18	
LAG-BGD	threespine stickleback	1	26	
LAG-BGD	unk gob	2		
LAG-BGD	unk gob	4	16	
LAG-BGD	yellowfin goby	1	52	
LAG-BGD	arrow goby	33		

KEY:

LAG-AWH- Lagunitas Creek- above White House Pool
LAG-BGD- Lagunitas Creek- below Giacomini summer dam
TOM- Tomasini Creek
FH- Fish Hatchery Creek

Appendix C-1.

An Evaluation of Fish Resources on the Giacomini Wetlands Restoration Site.

William Carmen, PhD.

Summary

At least 32 fish species may be found on the Giacomini ranch project site, including six special status species (Table II-A and II-B; *see* Section III for species accounts). The portion of Lagunitas Creek that runs through the site supports at least 23 species of fish, including federally-threatened steelhead, coho and chinook salmon, the CDFG Species of Special Concern Tomales roach, as well as the federally endangered California freshwater shrimp. The federally endangered tidewater goby had been thought extirpated from Lagunitas Creek, but was found during this study in the channelized portion of Tomasini Creek. Tomasini and Fish Hatchery creeks hold remnant runs of steelhead. The irrigation ditches on the Giacomini Ranch provide habitat for a small assemblage of ecologically tolerant fish species such as mosquitofish and threespine stickleback. Tidal marsh habitats in Tomales Bay, outside of the Ranch proper, support a diverse community of marine and estuarine fish (Tomales Bay Association 1995).

Currently, the 563 acre Giacomini ranch provides marginal fish habitat except for Lagunitas Creek. Historically, the ranch was an expanse of tidal marsh and intertidal mudflat bisected by Lagunitas Creek. Two smaller creeks—Tomasini on the east and Fish Hatchery on the west—flowed into a network of tidal sloughs. In the 1940s, levees were constructed along Lagunitas Creek and at the margin of the tidal marsh on the southern end of Tomales Bay. The enclosed area was converted to pasture. Tomasini Creek was diverted and channelized to flow along the eastern edge of the ranch. Fish Hatchery Creek still follows more or less along its original course, but has built up considerable sediments and become quite shallow as it passes through pasture. Both creeks have water control structures placed at their termini at the north levee. A summer dam on Lagunitas Creek (erected in the years 1940-1997) was a barrier to fish movement

and eliminated brackish water habitat from the creek ecosystem during the summer months.

These land use changes on the ranch and the construction of the dams and other land management practices in the watershed, led to the decline of habitat quality and fish use of the project area. Coho and steelhead populations have declined significantly, however Lagunitas Creek still holds one of the more important coho salmon runs in California (Smith 1986). Tidewater goby (and possibly California freshwater shrimp) were eliminated, or their populations greatly reduced, on the portion of Lagunitas Creek that was converted to agricultural uses. Populations of Tomales roach apparently have increased since the Giacomini summer dam was eliminated (Pearson 2000, P. Moyle, pers comm.).

If the study site (or portions thereof) are restored to historic conditions, it should provide improved habitat for fish species in general, and for special status fish in particular. Juvenile salmon often use estuarine wetlands as they migrate to the ocean, although overall use and residence times differ among populations. Removal of the water control structures would improve access for salmonids to Tomasini and Fish Hatchery creeks. Restoration would also provide food and habitat for *Neomysis*, an important prey for salmon and other fish in Lagunitas Creek (Bratovich and Kelly 1988). Habitat values could be significantly improved for tidewater goby, Tomales roach and possibly California freshwater shrimp. Removal of the levees and/or rerouting Tomasini Creek may adversely impact the remnant Tidewater goby populations during the construction and post construction period until habitat values are restored.

Changes on the Ranch and Watershed.

There have been significant habitat changes in southern Tomales Bay and on the Giacomini study site in particular (see PWA *et al.* 1993 in "An Evaluation of the Feasibility of Wetland Restoration on the Giacomini Ranch"). From a fisheries perspective, the most important changes have been:

- Diking of Lagunitas Creek and conversion of tidal marsh to pasture.
- Construction of major dams in the watershed.
- Increased sediment load from grazing, logging, and road construction in the watershed.
- Erection of the Giacomini summer dam (eliminated in 1997).
- Rerouting and channelization of Tomasini Creek, and, to an extent, Fish Hatchery Creek.
- Placing water control structures impeding fish movement to Tomasini and Fish Hatchery creeks.

The effects of these activities have led to a dramatic decrease in fish habitat availability and quality. In the upper reaches of Lagunitas Creek, dam construction, increased siltation, and reduction in freshwater flows that act to scour fine sediments from spawning beds have significantly reduced numbers and available habitat for coho and steelhead spawning in Lagunitas Creek. Lower reaches were also affected by the conversion of tidal marsh to agricultural pasture by diking off more than 500 acres at mouth of creek. This conversion also resulted in changes in sediment delivery, keeping sediments in the creek that otherwise would fan out into the tidal marsh. Tidal flooding is a characteristic of estuarine marshes and is important in exchange of nutrients, sediments, organic material and biota between the marsh and the rest of the estuary. The tidal marsh-creek interface is habitat for many estuarine and anadromous fish that utilize the marsh for foraging, nursery and refugial habitat.

The diking of the creek resulted in the shallowing of the creek bed and the deposition of heavy sediments at the mouth of the creek. The heavy sediment load subsequently changed the elevational gradient at the creek mouth and promoted the accretion of salt marsh north of the levee system. Concurrently, extensive mudflat shallows developed at the south end of the bay, largely eliminating deep tidal channels. Additionally, altered freshwater flows resulted in significant changes in the hydrodynamics in the southern end of Tomales Bay (PWA *et al.* 1993). During summer, the southern end of the bay becomes hypersaline, while in winter it can be entirely fresh (Hollibaugh *et al.* 1988).

Tomasini and Fish Hatchery creeks were isolated by water control structures that limit fish passage; additionally, the Tomasini Creek drainage was modified by construction of an internal levee along its western bank which confined its flow to the eastern boundary of the study site. A large tidal slough that historically connected Tomasini Creek with Lagunitas Creek (USCS 1863) was isolated from tidal influence and converted to a drain water sump for the ranch's irrigation system.

The Giacomini summer dam was a gravel dam approximately 10 ft high that spanned Lagunitas Creek; it was erected in May of each year from the mid-1940s through 1997. The pond formed by the dam extended almost one mile upstream to a point well upstream of the Highway 1 Bridge. This large warm water impoundment, atypical of coastal streams, provided habitat for nonnative species that adversely impacted native species. It also eliminated the prism of brackish water that would naturally move up and down the lower reaches of the creek, depending on freshwater input and tidal cycle. With the seasonal dam in place, freshwater was impounded above the dam and there was an abrupt shift to saline water below the dam. These impacts from the Giacomini summer dam, together with the elimination of a tidal marsh/creek interface, may have resulted in the extirpation of tidewater goby from Lagunitas Creek. The seasonal dam also probably led to the diminution of the Tomales roach and perhaps California freshwater shrimp populations.

Land use changes on the ranch, coupled with the significant impacts to upstream portions of the watershed, have contributed to the declines in local salmonid populations. The Lagunitas Creek watershed once supported a substantial run of steelhead (estimated very roughly at over 200,000 young (< 3 inches; Schofield 1899). Historic coho annual escapement was estimated at between 3,000 and 5000; current escapement is fewer than 500 coho, which, nevertheless, represents a major portion of the run left in California (Smith 1986).

Lagunitas Creek

Lagunitias Creek has a watershed of 267 km^2 with major tributaries of Olema Creek, Nicasio, San Geronomo, Devils' Gulch and Deadman Gulch. Five major dams and reservoirs have been constructed in the watershed. Steam flow is typical of coastal streams—high winter flows, low summer flows—with water levels rising and falling with precipitation. Compared to historic conditions, water flows now show a higher seasonal variance—reduced flows in summer and higher flows during winter storm events (PWA *et al.* 1993). Late spring, summer and fall flows are now completely controlled by the network of dams in the watershed.

Channelization on the ranch portion of the creek has resulted in greater accumulation of sediments at the creek mouth and channel. Lagunitas Creek was once navigable at high tide up to what is now the Green Bridge at Highway 1. Levees and dikes built along the banks of lower Lagunitas Creek in the mid-1940s eliminated tidal marsh habitat and separated the creek from the network of tidal slough and freshwater habitats important for many fish species such as tidewater goby. Since then, heavy sediment deposition from the creek at the mouth has created tidal marsh outboard of north levees. The very saline conditions in late summer and the quite fresh conditions in winter at southern end of Tomales Bay contributes to a highly seasonal assemblage of fish species in the downstream portion of the Creek.

Fish seining studies by Bratovich *et al.* (1984) and Pearson (2000) found 23 and 17 species fish species, respectively, in the lower reach of Lagunitas Creek (from the mouth to Green Bridge at Highway 1). The majority of the total catch in these studies were marine species caught in the downstream reaches of the Creek. For example, Pearson caught 3334 individuals of 17 species in 105 seining attempts, primarily in June-August 1999. Of these, marine species—Pacific herring, topsmelt, surf smelt, and shiner perch—made up 89% of the total catch. Other marine species found in these studies included northern anchovy, plain midshipmen, bay pipefish, shiner perch, prickly sculpin and starry flounder (Table 1). Resident estuarine species caught included topsmelt, threespine stickleback, yellowfin and cheekspot goby, and staghorn sculpin. Excluding

marine species, California (aka "Tomales") roach (a CDFG Species of Special Concern) was the most abundant species caught in Pearson's study (2000), comprising 21% (723/3334) of the total catch.

Seven of the 23 species caught by Bratovich *et al.* (1984) were non-native species associated with the pooled, freshwater habitat created by the Giacomini seasonal dam. The dam, erected in the summer months, provided pooled freshwater habitat that favored such species as largemouth bass, bluegill, and black crappie that prey on native fish. The presence of these non-native fish, and the loss of brackish prism—both attributable to the dam—may have contributed to the extirpation of tidewater goby in Lagunitas Creek. Predation by non-native fish is cited as a reason for the overall decline in tidewater goby populations (Moyle 1976). The Giacomini dam eliminated the prism of brackish water (i.e., in summer months, above the dam the water is entirely fresh, whereas below the dam it was tidal and highly saline). Wang (1982) concluded that the absence of tidewater goby in Lagunitas creek was due to high summer salinities and inability of gobies to move upstream past the dam. Historic records indicate that the tidewater goby was last observed in the project vicinity in Lagunitas Creek in 1953 (Swift *et al.* 1989). Focused surveys by U.S. Geological Survey-Biological Resources Division in 1996 (Charlie Chamberlain, unpub. data, 1996), Pearson (2000), and Fong (Appendix B) failed to find any tidewater goby in Lagunitas Creek.

Pearson (2000) suggests that the increased numbers of Tomales roach in her sampling in 1999 compared to that by Bratovich *et al.* (1984) in 1982 (723 vs. 178, respectively) may reflect the benefits from the removal of the summer dam in allowing movement upstream to fresh water in the summer and the elimination of predatory fish.

Pearson (2000) reportedly caught three federally endangered California freshwater shrimp in the area of the former summer dam and suggests that the shrimp may have benefited by the dams removal for the same reasons as the Tomales roach. In the year after the dam was eliminated, the only non-native fish species Pearson found were

yellowfin goby and American shad, neither of which is associated with warm water impoundment habitat created by dams.

Steelhead, coho and chinook are found in Lagunitas Creek and spawn in the watershed (see species accounts, Section III). The current escapement of fewer than 500 coho from the Lagunitas Creek watershed, although representing only an estimated 10 to 20 percent of historic numbers, comprises a major portion of the run left in California (Smith 1986). The steelhead population in the Lagunitas watershed has also declined, although numbers are more difficult to estimate than those for coho. Schofield (1899) estimated that the Lagunitas Creek watershed once supported a substantial run of steelhead of over 200,000 young (< 3 inches). Chinook smolts were captured in seines at Site 5 in March 2002 (Appendix C-2). Chinook spawn irregularly in Lagunitas Creek, primarily when high population numbers coincide with a high rainfall. Chinook smolts typically return to the ocean their first year rather than staying in their natal streams for one to several years as do steelhead and coho. Chinook typically occur in the Sacramento-San Joaquin River system and large coastal streams from the Russian River north. No natural sustaining runs were known from coastal Marin County streams. However, it is possible that chinook may have always spawned infrequently in small numbers in the Lagunitas watershed. Chinook fry were planted in Marin County streams in late 1800s.

Other surveys of Lagunitas Creek have found a few additional species, including white sturgeon, arrow goby, mosquitofish, and Pacific lamprey (Table 2). White sturgeon (endangered in Idaho and Montana, but not in California-USFWS 2002) do not spawn in Lagunitas Creek, but do forage in the Tomales Bay estuary. Green sturgeon (under review for federal listing as endangered or threatened) are found in the Tomales Bay estuary and may also forage in Lagunitas Creek.

Tomasini Creek

Tomasini Creek has been contained by a levee along its western bank and diverted to flow along the eastern perimeter of the ranch. It formerly flowed into a large tidal slough that now is an isolated drainage channel with a large pond at its northern end. There is a

water control structure on the northern levee that partially mutes water exchange between Tomales Bay (via the Lagunitas Creek delta) and Tomasini Creek..

The channel from the northern levee to the duck club area is approximately 1-1.5 meters deep and 2-3 meters wide. The creek has willows and emergent vegetation its upper reaches on the ranch, and is relatively unvegetated on its lower reaches. The creek has a soft mud bottom. Water quality measurements show high seasonal fluctuations with very little to no freshwater flows in summer (Appendix B.).

In March and April, 2002, tidewater goby were caught at Site 7 (Appendix C-2, Figure 1) downstream from the duck club. Tidewater goby have been extirpated from Lagunitas Creek but have managed to survive under the marginal conditions in the channelized portion of Tomasini Creek. Water quality measurements indicate that these fish may move up and down the creek in order to stay in appropriate salinity ranges. For example, we caught tidewater goby in fresh water (salinity of <0.2 ppt) in March and April at Site 7. However, salinity at this Site in September 2001 was 28 ppt, and no tidewater goby were caught at that time (Appendix B). Tomasini Creek has extremely low (or no) freshwater flows in late summer, and the opportunity to move upstream to avoid high salinities may be limited. However, tidewater gobies are capable of living in saline water ranging from 0 to over 50 ppt salinity and at temperatures of 8-23° C (Swift *et al.* 1989), but suitable water conditions for nesting have been reported as 5-10 ppt salinities and 18-22 C temperatures (Federal Register 1992). Gobies sometimes can persist under anoxic conditions that eliminate other fish species. Severe salinity changes and extreme tidal or flow fluctuations have a detrimental effect on the survival of tidewater gobies, resulting in population declines (Irwin and Soltz 1984).

Other fish caught in Tomasini Creek were staghorn and prickly sculpin, threespine stickleback, and longjaw mudsucker.

We were unable to e-fish Tomasini Creek due to the presence of the tidewater goby. Hence, we were unable to determine whether salmonid smolts may be found in the

sections of creek on the study site. The channelization of the creek, the water control structure at the north end of the ranch, and the water diversion upstream all act as barriers to fish migration and lowered habitat values for steelhead.

Fish Hatchery Creek

Fish Hatchery Creek has a 1.0-square-mile, relatively undisturbed wooded watershed. Historically, the creek flowed into a large tidal slough but has been diverted and bermed to flow across pasture and through a water control structure at the north levee. Sediments carried from the watershed have resulted in an extremely shallow reach in the portion of the creek that flows across the study site. There is very little riparian cover beyond a very short stand adjacent to the roadway as the creek enters the ranch property and where it exits near the north levee. Historic observations indicate that steelhead were fairly abundant in Fish Hatchery Creek in the late 1800s. Schofield (1899) made a very rough estimate of 10,000 "young" (<3inches) steelhead in Fish Hatchery Creek in 1899. Our reconnaissance observations indicate that steelhead still occur in the creek (Appendix C-2); however, there have been no systematic surveys. Our attempt to electro-fish for steelhead smolts in May was curtailed when a red-legged frog was observed in the creek. The water control structure at the north end of the ranch and the very shallow, open reach of the creek through open pasture act as barriers to fish migration and lower habitat values for steelhead.

In March, no fish were captured in seines and or minnow traps in the lower section of the Creek in the pool just upstream from the north levee (Site 4, Figure 1 in Appendix C-2). In the short upstream reach that was e-fished (Site 8; Appendix C-2), seven threespine stickleback were captured.

Agricultural Drainage Channels

There are several old tidal channels and sloughs that now act as drainage ditches in the ranch pastures. For example, Tomasini Creek formerly flowed into the large channel that has a large ponded area near the north levee. Ranch operations have excavated numerous other small irrigation and drainage ditches that support a small assemblage of fish. In

addition, western pond turtles use these channels, as do red-legged frogs, however use by the latter species is minimal.

Irrigation ditches were sampled by trapping and dip-netting on four occasions between February and May, 2002 (Appendix C-2). Fong also dipnetted these channels (Appendix B). Threespine stickleback, mosquitofish, and longjaw mudsuckers were caught in these samples. No Tomales roach were found. Large numbers of juvenile crawdads were caught in the channel that parallels Tomasini Creek, near the duck club.

These drainage channels are periodically cleared of sediments and emergent vegetation in routine dairy operations. Some channels become completely covered in duckweed. Water quality measurements indicate a wide variety of conditions in these ditches, and because of the periodic maintenance, they probably experience wide variations annually and seasonally. For example, on March 17, 2002, dissolved oxygen levels varied between 9.0 and 0.7 mg/l in ditches in adjoining pastures.

Tidal Sloughs

Tidal slough habitat was eliminated when the tidal marsh and intertidal flats were converted to pasture to create the ranch. Tidal marsh habitat has accreted outboard of the north levee due to the large volume of sediments delivered by Lagunitas Creek (PWA *et al.* 1993). The southern end of Tomales Bay supports a diverse community of marine and estuarine fish species (Tomales Bay Association 1995). Numerous marine and estuarine fish use tidal marsh as foraging, refugial and nursery habitat; hence, tidal marsh restoration would benefit many of these species.

Green crab (*Carcinus maenas*), an invasive non-native species, was observed in September and October 2001 in the tidal sloughs outboard of the north levee and in the lower reach of Tomasini Creek. No green crabs were caught, however, in the modified minnow traps placed at the fish sampling sites in March (Appendix C-2), and none was observed during the March-May fish sampling period. It could be that the green crabs move into the area during the time when waters on and near the ranch are most saline.

The green crab is native to the Atlantic coasts of Europe and northern Africa where it occupies protected rocky shores, sand flats, and tidal marshes. In 1989-1990, the green crab was discovered in San Francisco Bay, and has since spread as far north as Washington and south to Morro Bay. The green crab is a voracious predator that feeds on many types of organisms, particularly bivalve mollusks, polychaetes, and small crustaceans. In Bodega Harbor, records show a significant reduction in clam and native shore crab population abundance since the arrival of green crabs in 1993 (Grosholz et al. 2000). Besides its threat as a predator, the green crab may carry a parasite, the acanthocephalan worm, which can infect local shore birds (CDFG 2001).

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Table C1-1. Fish collected by seining in the Lagunitas Creek estuary. (Data from 1983: Bratovich and Kelley in 1984; data from 1999: Pearson 2000). †

Family	Scientific Name	Common Name	1983	1999	Non-native (x)
Clupeidae	*Clupea pallasi*	Pacific herring	1	2020	
	Alosa sapidissima	American shad	0	7	x
Engraulidae	*Engraulis mordax*	Northern anchovy	358	3	
Salmonidae	*Oncorhynchus kisutch*	Coho salmon	46	13	
	Oncorhynchus mykiss	Steelhead trout	103	22	
Osmeridae	*Hypomesus pretiosus*	Surf smelt	34	2	
	Hypomesus transpaciflcus	Delta smelt*	843	0	
Batrachoididae	*Porichthys notatus*	Plainfin midshipman	0	0	
Atherinidae	*Atheri nops affinis*	Topsmelt	0	305	
Cyprinidae	*Cyprinus carpio*	Carp	186	0	
	Lavinia symmetricus	California roach	178	723	
	Lavinia exilicauda	Hitch	8	0	
	Notemigonus crysoleucas	Golden shiner	25	0	
Catostomidae	*Catostomus occidentalis*	Sacramento sucker	23	7	
Ictaluridae	*Ictalurus punctalis*	Channel catfish	2	0	x
Gasterosteidae	*Gasterosteus aculeatus*	Threespine stickleback	1124	51	
Syngnathidae	*Syngnathus griseolineatus*	Bay pipefish	2	48	
Percichthyidae	*Morone saxatilis*	Striped bass	3	0	x
Centrarchidae	*Lepomis macrochirus*	Bluegill	1	0	x
	Micropterus salmoides	Largemouth bass	1	0	x
	Pomoxis nigromaculatus	Black crappie	1	0	x
Embiotocidae	*Cymatogaster aggregata*	Shiner perch	15	15	
Gobiidae	*Acanthogobius flavimanus*	Yellowfin goby	17	4	x
	Ilypnus gilberti	Cheekspot goby	0	15	
Cottidae	*Cottus asper*	Prickly sculpin	33	58	
	Leptocottus armatus	Pacific staghom sculpin	118	39	
Pleuronectidae	*Platichthys stellatus*	Starry flounder	12	2	
TOTAL FISH =			3133	3334	

* Does not occur in area—misidentified.

† NOTE: Numbers of fish may include sampling biases and may not represent equivalent efforts; therefore, comparisons among years may not represent actual changes in population numbers.

Table C1-2. Additional aquatic species caught on the study site

Chinook	*Oncorhynchus tshawytscha*	Carmen & White (Appdx. C-2)
Tidewater Goby	*Eucyclogobius newberryi*	Carmen & White (Appdx. C-2)
Arrow Goby	*Clevendia ios*	Fong (Appdx. B)
Longjaw Mudsucker	*Gillichthys mirabilis*	Fong (Appdx. B)
Mosquitofish	*Gambusia affinis*	Carmen & White (Appdx. C-2)
White Sturgeon	*Acipenser transmontanus*	Chamberlain *in* Fong (Appdx. B)
Pacific Lamprey	*Lampetra tridentata*	Bratovich and Kelly 1988
California Freshwater Shrimp	*Syncaris pacifica*	Pearson 2000

Appendix C-2

Fish Surveys at Giacomini Wetlands Restoration Site, 2002.

Prepared by:
William Carmen and Sean White

Summary

Fish were trapped and seined at nine sites in the study area: seven locations in tidal, ditch, and creek sites on the Giacomini ranch in March; and two locations on Lagunitas Creek in August, 2002 (Figure 1). In addition, numerous irrigation ditches on the ranch were trapped and hand netted. The purposes of these surveys were: (1) to determine the occurrence of special status fish species on the project area; and, (2) to provide a baseline estimate of the relative abundance of fish for monitoring purposes. The March sampling was designed to determine fish occurrence during the winter, high-flow period; the August sampling was designed to determine the summer, low-flow period. In March, we caught eight species of fish (Table 1). One of these, the federally-endangered tidewater goby, was caught in the channelized portion of Tomasini Creek. In addition, smolts of the federally-threatened chinook salmon were seined in Lagunitas Creek. Additional sampling of Lagunitas Creek was conducted on August 16, 2002, to examine fish abundance during a low-flow period. Six species of fish were caught in the August survey, predominately estuarine fish reflecting the higher salinity levels. No special status species—such as Tomales roach—were found in the irrigation ditches on the ranch.

Methods

Nine sampling sites were selected in consultation with Lorraine Parsons, Darren Fong, Brannon Ketcham, and Jules Evens. These sites represent the primary fish habitat types found on the study area (Figure 1):

Sites 1 and 2 are in tidal sloughs.

Site 3 and 7 are inboard of the tide control gate on the lower reaches of the modified, channelized Tomasini Creek.

Site 4 is inboard of a tide control gate in a large, shallow pool in the lower reach of Fish Hatchery Creek.

Site 5 and 6 are on Lagunitas Creek.

Sites 8 and 9 are on Fish Hatchery and Tomasini creeks, respectively.

Sampling of Sites 1-7 was conducted on March 17-19, 2002, representing the winter high-flow period. Sites 5 and 6 were resampled on August 16, 2002, representing the summer low-flow period. These sites were sampled with minnow traps and beach seines. At each site, two minnow traps and one modified minnow trap (for crabs) were placed the day before seining the site. The traps were baited with mackerel. These traps were collected the next day and data recorded. Each station was then seined twice, either with a 6 x 150 beach seine (Lagunitas Creek sites) or with a 6 x 50 ft. beach seine (other sites). Fish were identified and released in the field. The freshwater sites (Sites 7 –8) on Tomasini and Fish Hatchery creeks were to be sampled for salmonid smolts by electrofishing in late spring. However, after finding the endangered tidewater goby in Tomasini Creek, we decided against electro-fishing to avoid harming any individuals. On May 2, 2002, we started to electro-fish Fish Hatchery Creek, but we soon found a red-legged frog in the creek and stopped our sampling efforts. On four occasions (February-April) the irrigation ditches on the ranch were dip netted to determine the occurrence of Tomales roach, a California Department of Fish and Game Species of Special Concern. Finally, Site 7 was seined an additional time on April 12, 2002, to confirm our finding of tidewater goby on the March survey.

William Carmen and Sean White conducted fish sampling on all occasions. Darren Fong participated in an additional seining of Site 7 on April 12, 2002. Greg Brown provided and operated the electrofishing equipment on the May 2, 2002, sampling effort at Fish Hatchery Creek.

[FIGURE 1: Fish sampling locations]

Results

March 17-19: sampling of Sites 1-7.

We caught eight species of fish on the March surveys (Table 1). Five were species that commonly occur in estuarine habitats. All species were caught in very low numbers. For example, in two pulls of a 150 ft. seine across the width of Lagunitas Creek at Site 6 (just upstream from Whitehouse Pool), no fish were caught.

A total of 12 tidewater goby were caught on the channelized portion of Tomasini Creek (Site 7). Water quality measurements at the time indicate nearly fresh water (0.2 ppt) and high dissolved oxygen levels (10.5 mg/l). The area seined had steep banks (a levee on the west bank), emergent vegetation, and a soft mud substrate. Water depth was approximately one meter. This site was seined again on April 12, 2002 and two adult tidewater gobies were caught.

Table C2-1. Results of fish sampling (March 17-19).

Site	Water Quality			Fish from Traps	Fish from Seines
	Salinity (ppt)	Temperature (°C)	Dissolved O_2 (mg/l)		
1	2.9	13.7	12	0	NA- no appropriate sites
2	0.2	11.5	9.5	0	7 prickly sculpin
3	0.2	8.6	9.5	1 prickly sculpin	0
4	0.0	8.5	10.5	3 staghorn sculpin*	0
5	0.0	8.6	10.5	0	3 chinook (30,35,42 mm) 1 staghorn sculpin
6	0.0	8.6	10.5	0	0
7	0.2	8.4	9.7	0	2 staghorn sculpin 5 prickly sculpin 5 stickleback 12 tidewater goby

* Two sculpin were captured outboard of the water control structure.

August 16 Sampling of Sites 5 & 6.

Fish were seined at Lagunitas Sites 5 and 6 on August 16, 2002 by two pulls of 150 x 6 ft seine. We caught predominately estuarine fish that reflects the fairly high salinity at the sites (11.8 and 14.6 ppt, respectively). Top smelt were the most abundant fish in the sample by far (Table 2). No special status species were caught in the August sample.

Table 2: Results of fish sampling (August 16, 2001).

Site	Water Quality			Fish from Seines (2 pulls)	Length mean (range) (mm)
	Salinity (ppt)	Temperature (C^o)	Dissolved O_2 (mg/l)		
5	11.8	20	8.6	200 topsmelt	98 (52-180)
				3 shiner surfperch	60 (58-63)
				2 tule perch	79 (65-94)
				1 staghorn sculpin	125
				11 yellowfin goby	84 (72-95)
6	14.6	21	8.0	186 topsmelt	93 (48-165)
				1 shiner surfperch	42
				1 yellowfin goby	64
				1 -pipefish	165

Dip Netting of Irrigation Ditches:

Irrigation ditches were both trapped and dip-netted on four occasions between February and May 2002. We caught only two species of fish: Threespine stickleback and mosquitofish. No Tomales roach were found. Large numbers of juvenile crayfish were caught in the channel paralleling Tomasini Creek near the Duck Club.

These drainage channels are periodically cleared of sediments and emergent vegetation in routine dairy operation. Hence, some channels have extensive emergent vegetation, others may be completely covered in duckweed (*Hydrocotyle*), and others may be recently dredged and virtually devegetated. Water quality measurements indicate a wide variety of conditions in these ditches, and because of the periodic maintenance, probably wide variation annually and seasonally. For example, on March 17, 2002, dissolved oxygen levels varied between 9.0 and 0.7 mg/l in ditches in adjoining pastures; the latter had a complete covering of duckweed.

Electro-fishing Fish Hatchery Creek:

On May 2, 2002, we started to electro-fish Tomasini Creek. We had covered approximately 30 meters of the creek (Figure 1) when an adult red-legged frog jumped into the water. At this time, we stopped electro-fishing to avoid harming any frogs. In this 30-meter section of c reek, we caught seven threespine stickleback (46-57 mm). In September 2001, we dipnetted, caught, and released a juvenile steelhead from the upstream portion of Fish Hatchery Creek, just outside the project area, but within the study area.

Appendix D.

Gicomini Wetland Restoration Site

Breeding Bird Survey 2002

prepared for:

National Park Service

by

Jules Evens & Richard Stallcup
Avocet Research Associates
and
Viola Troniolo
Point Reyes Bird Observatory

01 August 2002

Appendix D. Figures and Tables

Introduction

As part of the biological assessment for the compliance phase of the Giacomini Wetland Restoration Project, we conducted bird surveys during the 2002 breeding season to provide a local assessment of the status of the breeding avifauna on and adjacent to the site. The primary goal was to document presence or absence of special status species and to determine their status (breeding, wintering, transient) at the site. The secondary goal was to describe the avian community during the nesting season and ascribe habitat affinities to the variety of birds currently using the Giacomini wetlands. Toward that end, monitoring methods were selected to conform with other avian monitoring efforts in the region, and permanent sampling stations were established. Future monitoring of the avian community will be able detect changing use patterns and trends as the habitat changes over time and to compare those trends among portions of the site and with other wetland sites.

Methods

Census methodology conformed to standardized breeding bird survey protocols (Ralph et al. 1993) and, in consultation with biologists Geoff Geupel and Viola Tionolo of the Point Reyes Bird Observatory (PRBO), were modified to suit the site. Seventeen census points were chosen to provide nearly complete coverage of the study area (Figure D-1; Table D-1) and to sample bird use of general habitat types (Table D-2). Point counts were conducted at each station so that we could detect presence or absence or all species, determine species richness, derive abundance indices, and describe habitat affinities for each species. To facilitate coverage and identify differences in bird use within portions of the site, stations were clustered into three different areas, as follows: Giacomini Marsh South (“GMSO”-stations 1-5]; Giacomini Marsh East (GMEA-stations 6 & 12-17]; and, Giacomini Marsh northwest (“GMNW”-stations 7-11].

Figure D-1. Locations of breeding bird survey points.

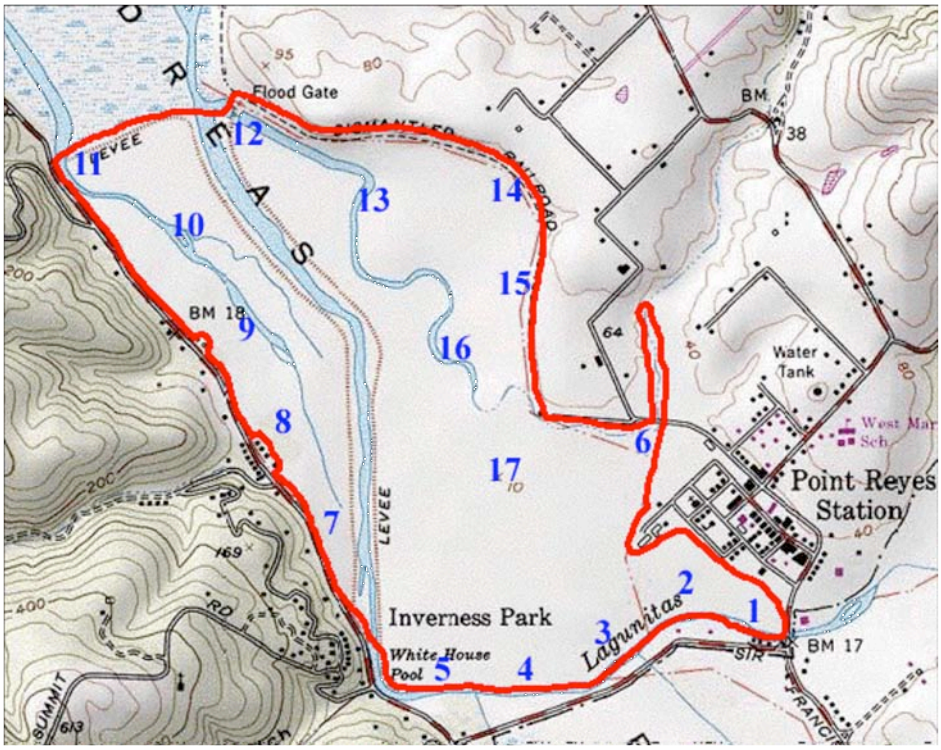

Table D-1. GPS coordinates for permanent survey stations

SURVEY PTS	EASTINGS UTM 10	NORTHINGS	SURVEY PTS.	EASTINGS UTM 10	NORTHINGS
1	0516963	4213011	10	0514941	4214355
2	0516808	4213104	11	0514654	4214530
3	0516541	4213007	12	0515197	4214671
4	0516203	4212845	13	0515584	4214527
5	0515974	4212816	14	0515895	4214518
6	0516590	4213722	15	0516152	4214340
7	0515557	4213400	16	0515937	4212835
8	0515348	4213733	17	0516064	4213526
9	0515179	4214153			

Habitat Types

Habitat types were defined in general categories that broadly define avian affinities, as follows:

Table D-2. General habitat types: description and estimated percent cover

HABITAT TYPE*	DESCRIPTION	%
Open water	Lagunitas Creek, ponds, and channels; non-vegetated areas with standing water or their shorelines.	<10
Riparian	Willow and alder dominated streamsides, seeps, and swales with well-developed shrub understory.	<10
Mixed evergreen forest	Bay-fir-tanoak-oak forest mosaic that borders site on its western boundary.	<1
Coastal scrub	Coyote brush-blackberry association along Point Reyes bluff and intermixed with riparian habitat.	~5
Marsh	Fresh, brackish and tidal marsh; Scripus-Typha-juncus-Salicornia etc.	15
Ruderal field and levee	Non-cultivated lowlands and levee slopes vegetated with non-native grasses, shrubs, and forbs (e.g fennel), and a mixture of marsh plants (e.g. Salicornia)	20
Cultivated field	Low-lying, well-drained fields intermittently irrigated, grazed, and plowed.	50
Dairy	Buildings, barnyard, feedlot and surrounding barren ground areas.	<5
Aerial	Airspace above site.	NA

Point Counts

"Extensive point counts" were conducted with stations a minimum of 250-m apart. (More than 99% of individuals are detected within 125 m of the observer—Ralph *et al.* 1993). All surveys were conducted between dawn and 0930 hrs. Each station was sampled four to six times at approximately 10-day intervals throughout the breeding season (April 01-June 15). One observer visited each station for a 10-minute period on each census. At each point, the observer (Jules Evens or Rich Stallcup) recorded each species detected separately and assigned each detection to a column on the data sheet to indicate whether

the bird(s) was ≤ 50-m from the observer, outside a 50-m circle around the observer, or flying overhead. All data was recorded on a "PRBO Point Count Data Form."

At the end of the survey period, data was summarized using Pointcnt v. 2.75 in Visual FoxPro 3.0. (Ballard 2002) to calculate total number of individuals detected, species richness, and derive a measure of diversity using a modification of the Shannon-Wiener index (Krebs 1989). This heterogeneity index was used to measure species diversity overall and among sub-regions of the study area. Species diversity measures ecological diversity based on the number of species detected within a given distance weighted by the number of individuals of each species (evenness of distribution of individuals among species). A high score indicates high ecological (species) diversity.

The 2002 data is available (V. Tionolo, PRBO) for further analysis if and when future surveys provide data for comparison. Point specific results are also available, however, for the purpose of this study we have pooled the data.

Results

Breeding avifauna

A summary of all detections shows that 4929 individual birds from 103 species were recorded in the study area during the 2002 breeding season (Table D-3). Of these 103 species, 75 (72.8%) had breeding territories within or partially within the study area, and 28 (27.2%) were non-breeders—either late winter residents (e.g. golden-crowned sparrow), spring migrants (e.g. lazuli bunting), or transients (e.g. Caspian tern). Considering all detections from all points, the species diversity ranked relatively high with a Shannon-Weiner index of 35.59.

Counting only those detections within 50-m of the observer (Table D-4), 76 species were detected, which included 59 breeding species (77.6% of total) and 17 non-breeding visitors (21.5% of total). Considering only those birds within 50-m, the Shannon-Weiner index was also relatively high at 38.9.

A comparison of total numbers, species richness, and species diversity among subareas is shown in the following table.

Table D-5. Comparison of results among sub-areas**.**

Area (all dist.)	Total individuals	Species richness	S-W Index
GMNW	2479	84	29.28
GMEA	717	65	33.11
GMSO	1733	79	25.10
Area (< 50-m dist.)			
GMNW	460	54	31.89
GMEA	264	42	27.37
GMSO	471	59	31.88

Each species was assigned a habitat type based on its primary affinity to determine the relative contribution of each habitat to species diversity.

Table D-6. Numbers and percents of species associated with a primary habitat type at all distances and within the 50-m radius.

Habitat type	Species #	%	Species #	%
	(all distances)		(≤50-m)	
Riparian	27	26.2	27	35.5
Mixed evergreen forest	16	15.5	9	11.8
Cultivated field	7	6.8	8	10.5
Coastal scrub	4	3.9	7	9.2
Ruderal field	11	10.7	7	9.2
Marsh	10	9.7	6	7.8
Open water	11	10.7	5	6.6
Aerial	10	9.7	5	6.6
Dairy	7	6.8	2	2.6
Total	103	100%	76	99.8

Special status species

Of the 23 special status species detected on the site during the breeding season, 11 breed on or have territories that include portions of the site; these species will be most affected by future changes in habitat.

Table D-7. Special status species with breeding territories within, or partially within, Giacomini wetlands.

Species	**Habitat affinity**
northern harrier	marsh-ruderal field
California black rail	marsh
sora	marsh
Allen's hummingbird	coastal scrub-riparian
belted kingfisher	open water (streambank)
pacific-slope flycatcher	riparian-mixed forest
rough-winged swallow	aerial [streambank]
Bewick's wren.	coastal scrub-riparian
Swainson's thrush	riparian-coastal scrub
common yellowthroat	marsh
yellow warbler	riparian

An additional seven special status species may nest within foraging range of the site and use the site during the breeding season.

Table D-9. Special status species that forage, but do not breed within the Giacomini wetlands.

Species	**Habitat affinity**
great egret	marsh-ruderal field
great blue heron	marsh-ruderal field
snowy egret	marsh-ruderal field
white-tailed kite,	ruderal field-marsh
Vaux's swift	aerial
olive-sided flycatcher	mixed forest
ash-throated flycatcher	riparian-coastal
purple martin	aerial

Four special status species occurred as transients, were detected only on one census, and are not expected to by philopatric.

Table D-9. Transient special status species.

Species	Habitat affinity
long- billed curlew	open water-marsh (shore)
hermit warbler	riparian-mixed forest
lark sparrow	ruderal field
grasshopper sparrow	ruderal field

Breeding sites or territorial song perches of several special status species known to breed in the project area are plotted on site maps (Figures D-2,3,4).

Discussion

These breeding bird surveys serve to complement more general surveys completed in earlier seasons (summer-fall 2001, Appendix D-2; winter 2001-2002, Appendix D-3) and provide a full-year record of bird use of the site. By establishing permanent stations for point counts and initiating standardized breeding bird census protocols, the results of these surveys provide a baseline against which the results of future surveys may be compared, changes in bird use of the site may be monitored, and trends detected.

The discrepancies between number of birds detected within 50-m of the observer and the number of birds detected within 50-m of the observer and the number of birds detected at all distances is accounted for by the fact that the larger detection area may include birds in adjacent habitats whereas most detections within 50-m include only birds in the project area. Therefore, if adjacent habitat is particularly rich, (e.g., stations 7-11, that are near mixed-evergreen habitat), the number of species detected will be greater. For purposes of population monitoring and trend analysis over time, the ≤50-m radius is most useful.

These surveys also document use of the site as breeding territory for 11 special status species and as foraging territory for another eight species. The diversity of habitats used by these special status species, as well as by all breeding species, indicates that the community benefits, in terms of diversity and heterogeneity, from the complement of habitat types existing on the site. Of particular value is the riparian-marsh association that supports more than half of special status species. The ruderal fields (much of which have remnant marsh characteristics, e.g. *Salicornia* and *Juncus*) also accommodate the community of special species. Indeed, the riparian-marsh-ruderal field complex, while accounting for less than one third of the area of the site, accounts for about three-quarters of special status species. Mixed evergreen forest also contributed a fair share to these species, however almost all of this habitat is adjacent to (in the 100 m buffer zone, mostly to the west) rather than in the project area

Although we did not analyze the point count data by individual points (yet), among the subareas, it is clear that several habitat patches of are particular value to breeding birds. These include: (1) the freshwater marsh-riparian association in the northwest corner of the site (GMNW: stations 8-11), (2) the riparian-ruderal field association in the southeast corner of the site (GMSO; stations 1-2), and (3) the riparian-coastal scrub association on the west-facing slope of the Point Reyes mesa bluff (vicinity of GMEA: stations 13-15). The cultivated fields, which occupy the majority of the site, are relatively depauperate in terms of supporting breeding birds in general and special status species in particular. Savannah sparrows are rather abundant in the cultivated fields, however, the southern portion of the site was mowed during the height of their nesting effort, thus excluding perhaps a third of their population. They were more successful in the ruderal-cultivated area to the northwest, however, and managed to fledge an abundant crop of chicks. The only special status species that was using cultivated field as primary habitat was grasshopper sparrow, a species that arrived late and apparently did not breed.

Focused surveys identified breeding locations for several species of concern: northern harrier, sora, virginia rail, belted kingfisher, rough-winged swallow, and yellowthroat.

Summary

Species richness at the site was relatively high with 103 species recorded in the project area during the 2002 breeding season. Of those species detected, about three-quarters had breeding territories within, or partially within, the study area. Diversity indices, which account for evenness of distribution among species, were also relatively high (SW-index = 35.4-38.9). These measures are a reflection of the heterogeneity of habitats on the site and surrounding areas, as well as a reflection of the diversity of the regional avifauna.

Twenty-three special status species were detected on the site during the breeding season; eleven of these breed on, or have territories that include, portions of the site. Of particular value to these eleven species is the riparian-marsh association. The wet ruderal fields, much of which have remnant marsh characteristics, also accommodate the community of special status species. Indeed, the riparian-marsh-ruderal field (or 'wet meadow") complex, while accounting for less than one-third of the area of the site, accounts for about three-quarters of special status avian species.

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Appendix E.

Winter bird use of the Giacomini Wetlands Restoration Site.

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During winter (01 Nov 2001 – 28 Feb 2002), 136 avian species were detected within the study area (Table E-1). Of these, 21 (15.4%) were species of special concern. Each species detected was assigned to one or several habitat types (Table E-2). Most species were associated with more than one habitat type (average 2.1). Each habitat type was assigned a value based on the number of associated species. Discounting flyovers and edge species (those detected outside the boundary of the study site) and ranking habitats as a percentage of overall species richness, each habitat contributed the following value to the site: riparian (21 percent), ruderal field (16.2), shallow ponds (11.5), tidal marsh (9.5), cultivated field (8.7), Lagunitas Creek (8.1), coastal scrub (8.8), cattail marsh (7.4), dairy and barnyard (6.4), and ditch (2.4). These values give only a rough estimate of each habitat's contribution to overall avian species diversity on the site, however, it is clear that riparian and ruderal field together attract about one third of the species to the site. If open water habitats (Lagunitas Creek, shallow ponds, and ditches) are lumped together, another one-quarter of the avifauna is accounted for. Tidal and cattail marshes together account for about 17 percent of species richness, and the dairy operation (dairy and cultivated field) accounts for about 16 percent of the total. Coastal scrub is fairly discrete habitat patch (and limited in extent on the site) and supports less than 10 percent of the winter bird diversity.

When considering special status species, the significance of these habitats is weighed more toward cattail (and tidal marsh). Of 21 special status species detected during the winter period, six (28.5%) are marsh-dependent species—northern harrier, yellow rail, black rail, Virginia rail, sora, and common yellowthroat—and all are year-round residents

that breed on the site. Most of the other special status species are attracted to open water habitats (white pelican, double-crested cormorant, great blue heron, snowy and great egret, osprey, belted kingfisher), and only the kingfisher breeds on the site. Others are either wide-ranging raptors (white-tail kite, Cooper's hawk, sharp-shinned hawk), transient waterfowl (Aleutian Canada goose) or riparian-coastal scrub associates (Bewick's wren). The other special status species is tri-colored blackbird, flocks of which are attracted to the feedlot on the ranch barnyard. Tri-colored's status is designated to protect nesting areas rather than wintering habitat, and this species does not breed on site.

The current wetland features of the site—the riparian/marsh/open water complex—contribute heavily to the avian diversity and accounts for about three-quarters of the species found on the site during winter. Of particular value in terms of special status species is the mosaic of emergent wetland habitat (tidal marsh, cat-tail marsh, damp ruderal field, and riparian) that hosts some of the rarest and most sensitive of these special status species (four rails and the yellowthroat). Additionally, although not detected on these surveys, the endangered California clapper rail has occurred in the adjacent tidal marsh during four of the last six winters. If the extent of tidal marsh increases in the future, the suitability of the habitat for this and the other marsh-dependent species is expected to improve.

Table E-1. Winter birds of Giacomini wetlands: November 2001 – February 2002

Species	lc	pond	ditch	r	scrub	cm	tm	rf	cf	dairy	of	edge
Red-throated loon	√											
Pied-billed Grebe	√											
Eared Grebe			√									
Western Grebe	√											
Clark's Grebe	√											
White Pelican	√											
Double-crested Cormorant	√	√									√	
Great Blue heron	√	√	√				√		√			
Black-.crowned Night-Heron				√		√						
Snowy Egret	√	√					√					
Great Egret	√	√	√				√	√	√		√	
Gr. White-fronted Goose		√						√				

Species	lc	pond	ditch	r	scrub	cm	tm	rf	cf	dairy	of	edge
Snow Goose		√						√				
Ross' goose								√	√			
Canada Goose (moffitti)		√					√	√	√			
"Aleutian" Canada Goose		√				√						
Wood Duck	√											
Green-winged Teal		√										
Cinnamon Teal		√				√		√				
Northern Shoveler		√						√	√			
Mallard		√	√			√	√	√				
Gadwall		√	√			√		√				
American Wigeon		√				√		√				
Eurasian Wigeon		√				√		√				
Northern Pintail		√				√		√				
Canvasback	√	√										
Greater Scaup	√											
Lesser Scaup	√		√									
Common goldeneye	√											
Bufflehead	√	√										
Common Merganser	√											
Ruddy Duck		√										
Turkey Vulture				√		√	√		√	√	√	√
Osprey	√										√	√
White-tailed Kite							√	√	√			
Northern Harrier	√	√				√	√	√	√			
Cooper's Hawk				√								
Sharp-shinned Hawk				√							√	
Red-shouldered Hawk				√				√	√			√
Red-tailed Hawk				√			√	√	√			√
American Kestrel							√	√	√		√	
Merlin		√			√		√	√				
Peregrine Falcon							√				√	
California Quail				√	√							
Yellow Rail				√			√					
Black Rail				√			√	√				
California Clapper Rail							nd					
Virginia Rail				√		√	√					√
Sora				√		√	√					
Common Moorhen						√					√	
American Coot	√					√						
Black-bellied Plover	√											
Killdeer	√	√						√	√			
Greater Yellowlegs	√	√					√					
Willet		√										
Spotted Sandpiper	√											
Western Sandpiper		√										
Least Sandpiper		√										

Species	lc	pond	ditch	r	scrub	cm	tm	rf	cf	dairy	of	edge
Dunlin		√										
dowitcher spp.		√										
Common Snipe		√						√				
Bonaparte's Gull										√		
Heermann's gull											√	
Mew Gull										√	√	
Ring-billed Gull		√								√		
California Gull		√									√	
Herring Gull		√								√		
Western Gull										√		
Glaucous-winged Gull		√									√	
Mourning Dove										√	√	
Band-tailed Pigeon				√						√		
Barn Owl			√				√	√				√
Great Horned Owl											√	
Anna’s Hummingbird					√							
Belted Kingfisher	√	√	√	√								
Acorn Woodpecker				√							√	
Nuttall’s Woodpecker				√	√							
Downy Woodpecker				√	√							
Hairy Woodpecker				√								
N. Flicker				√								
Hammond's Flycatcher				√				√				
Black Phoebe			√	√				√	√			√
Say's Phoebe				√		√		√	√			
Tree Swallow	√						√				√	
Violet-green Swallow											√	
Steller's Jay											√	√
Scrub Jay				√	√				√		√	
American Crow				√				√	√	√		
Common Raven				√					√	√	√	
Chestnut-backed Chickadee				√	√							
Oak titmouse				√				√				
Bushtit				√	√							
Brown Creeper				√								√
Bewick’s Wren				√	√			√				√
Marsh Wren				√		√	√					
Golden-crowned Kinglet				√								√
Ruby-crowned Kinglet				√	√							√
Western Bluebird				√				√	√		√	√
Hermit Thrush				√	√							
Varied Thrush				√								√
American Robin				√	√			√	√		√	√
Wrentit				√	√							
Northern Mockingbird				√								√
American Pipit				√					√	√		

Species	lc	pond	ditch	r	scrub	cm	tm	rf	cf	dairy	of	edge
Cedar Waxwing											√	√
Hutton' Vireo				√	√							
Cassin's Vireo				√								
Orange-crowned Warbler				√								
Yellow-rumped Warbler				√	√			√	√	√	√	√
Townsend's Warbler				√								
Common Yellowthroat				√	√	√	√					
Spotted Towhee				√	√							
California Towhee				√	√		√	√				√
Savannah Sparrow				√			√	√	√			
Fox Sparrow				√	√			√				
Song Sparrow				√	√	√	√	√				
Lincoln's Sparrow				√			√	√				
Swamp sparrow						√	√	√				
White-throated Sparrow				√				√				
Golden-crowned Sparrow				√	√	√	√	√				
White-crowned Sparrow				√	√	√	√	√				
Dark-eyed Junco				√	√			√		√		
Red-winged Blackbird				√		√			√	√	√	
Tricolored Blackbird									√	√	√	
Brewer's Blackbird								√	√	√		
Western Meadowlark				√				√	√			
Purple Finch*				√	√			√				
House Finch*				√	√			√				
Pine Siskin				√				√				
American Goldfinch				√	√			√				
INTRODUCED SPECIES				√				√				
Mute Swan												
Rock Dove										√	√	√
European Starling										√	√	√
House Sparrow										√	√	√

Observers: Jules Evens & Rich Stallcup

Habitat codes:

lc: Lagunitas Creek
pond: shallow ponds and flooded pastureland.
ditch: irrigation and drainage ditches
r: riparian
cs: coastal scrub
cm: cattail marsh (*Typha/Scirpus/Juncus* association)
tm: tidal marsh (*Salicornia/Grindelia/Distichlis* association)
rf: ruderal field (non-or lightly-grazed lowlands with marsh plants, grasses, and forbs intermixed)
dairy: barnyard and associated structures.
a: aerial (overfligts)
edge: mixed forest, residential & grassland

Appendix F.

Autumn bird use of Giacomini Wetlands: July 15 to November 1, 2001

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We conducted four area counts (Bibby et al. 1992) of the project area to determine presence and absence of bird species and their habitat associations during the autumn period. These comprehensive area counts were conducted on July 17, September 15, 25, and October 31, 2001. Additionally, we made more than ten random, partial visits to detect transients passing through the area. These random visits, usually for an hour or less, were concentrated in areas known for bird activity, or at overlooks where most of the study site could be surveyed with a telescope from one vantage point. All detections were compiled on a list of species, and each species was assigned to a habitat type based on where the bird was detected in the field. A list of all species detected and the habitat affinity of each is provided (Table F-1, below).

From July 15 through October 31, 2001, a period that spans the migratory pulse of most locally occuring species, we detected 144 species on or adjacent to the project area; 31 of these were special status species (Table F-1, bold faced). As in winter, approximately 40

to 50 percent of total species were associated with riparian thickets in the southeastern and northwestern corners of the site, areas that also received the most thorough coverage. Of the special status species, two-thirds (21 species; 67.7 percent) were associated primarily with vegetated wetland habitats (riparian-emergent marsh-wet ruderal fields), and most of the rest were either large waterbirds attracted to Lagunitas Creek (pelicans, cormorant, osprey) or wide-ranging raptors (cooper's hawk, sharp-shinned hawk) whose occurrence was largely incidental to the site. Other than overflying raptors, tricolored blackbird was the only special status species whose primary association on the site was not wetland habitat; as in winter, tricoloreds were attracted to grain piles in the dairy barnyard. Tricoloreds are listed to protect nesting colonies, none of which exists on the site.

Several rare species were noted, as is typical of the region; perhaps most unusual was a flock of three bobolink in the cattail marsh on the northeast portion of the study site, September 25th (RS). Other rare or unexpected species included: brown pelican on the dairy roof (July 24-JE); white-fronted goose (October 19-JE); common murre in Lagunitas Creek (October 31-RS); yellow-breasted chat (July 7-JE), and swamp sparrow (many records-RS,JE). Also, rather large flocks of wood duck (50±) were noted on Lagunitas Creek in late summer. Several other fall phenomena are worth notation:

• Young green-backed herons frequent the shoreline of Lagunitas Creek where willows overhang;

• Large flocks of migratory swallows forage low over the moist fields and marsh, especially early and late in the day;

• Recently fledged yellowthroats, probably from Olema marsh, forage commonly in willow and ruderal field in areas where the species does not breed.

In summary, the autumn survey data is not quantitative but is meant to augment the winter and breeding season findings in order to provide a fuller understanding of avian use of the site and to detect transients that may occur briefly, but to whom the site offers important habitat values.

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Appendix G-1

Evaluation of the Mammals of Giacomini Wetlands Restoration Site

William Carmen, Ph.D.

I. Overview

At least 50 mammal species may potentially be found within the Giacomini wetlands project area (Table G-1). These include nine special status species that may potentially use habitat found on the site (see main report Sec.II: Table IIa & IIb; and Section III for species accounts). Five special status bat species—pallid, Townsend's western big-eared, long-eared myotis, fringed myotis, yuma myotis— may use the study site as foraging habitat and several may roost in suitable trees and structures on the Giacomini ranch. No Point Reyes jumping mice (CDFG Special Concern Species) were caught in 200 trap-nights in potential habitat on the ranch, and none have been observed there. Point Reyes mountain beaver occur on the heavily-wooded slopes to the west of the ranch, but no burrows were found on the study site and there is little suitable habitat there for this species (see Special Status Species Accounts- Sec. II of the main report). Southwestern river otter (a CDFG Special Concern Species) was formerly extirpated from the Tomales Bay watershed but has recently been observed in the Bay and on the study site.

Currently, the 563 acre Giacomini Ranch provides relatively marginal habitat for mammals. Historically, the Ranch was an expanse of tidal marsh and mudflat bisected by Lagunitas Creek, with Tomasini and Fish Hatchery creeks entering a network of tidal sloughs. There was a natural transition from tidal and brackish marsh to creek/riparian to upland habitats. In the 1940s, levees were constructed along Lagunitas Creek and at the margin of the tidal marsh on the southern end of Tomales Bay and the enclosed area was converted to pasture. The current moist pastureland provides habitat for small rodents such as voles, but is generally poor-quality habitat for most native species. Tidal marsh habitats do not support mammals in the numbers or diversity of upland habitats, but

restoration of the site could provide a greater mix of habitat types that would benefit native species. In terms of special status species, tidal marsh restoration would benefit river otter by providing improved foraging habitat, elimination of the levees along Lagunitas Creek, and removal of the water control structures on Tomasini and Fish Hatchery creeks . Point Reyes jumping mice avoid heavily-grazed pasture, and restoration of riparian forest and natural, ungrazed meadow would provide more suitable habitat for this species. The several special status bats may also benefit from tidal marsh restoration, or be unaffected, but all structures of the site should be surveyed for active roosts before removal.

II. Habitat Types and Species Groups

The study site was divided into seven general habitat types to evaluate use of the site by mammals (PWA et al. 1993): tidal wetland, creek and open water, ponded freshwater, riparian, irrigated pasture, other pasture, and aerial. Fifty-two mammals that could potentially occur on the study site and the habitat types in which they occur are listed in Table G-1. Few of these mammal species are specifically associated with tidal marsh habitat (Table G-1). Those that may benefit most from restoration of the site include *Microtus*, muskrat, raccoon, river otter, and long-tailed weasel. Many other species would benefit from transitional habitats (wet meadow, uplands and riparian habitats) that would develop with the restoration of tidally-influenced wetlands on the study site. How coyote and red fox might respond to future habitat changes is an open question that should be addressed when considering restoration alternatives. Red fox, in particular, has proven to be an effective predator of tidal marsh nesting birds, and accounts, in part, for the decline in California clapper rail populations (Albertson and Evens 2000).

Bats:

Thirteen species of bats may forage over the wetlands, and several species may roost in trees or structures on the study site (Table G-1). Five of these are special status species—pallid, Townsend's western big-eared, long-eared myotis, fringed myotis, and yuma myotis. The main report lists the specific habitat and local occurrence of these bats in the project area (Table IIb). None are known to roost on the site specifically, but no

systematic surveys have been conducted. Certain of these species are known to roost and breed nearby, for example, Townsend's western big-eared bat is known to roost near Tocaloma, upstream in Lagunitas Creek, and to have a maternity roost 0.25 miles from the study site at Inverness Park (NDDB 2000; G. Fellers, pers. comm.).

Tidal marsh restoration is unlikely to significantly impact bat foraging habitat. Surveys should be conducted prior to removal of the dairy barn and other structures to determine whether any provide roosting habitat for the special status bat species.

Rodents and Insectivores

Five species of insectivores and 13 species of rodents may potentially occur on the study site (Table G-1). Of these, two are special status species: the Point Reyes mountain beaver and the Point Reyes jumping mouse. No mountain beaver burrows were found in a search through the riparian/brush vegetation on the eastern portion of the study site (Appendix G-2). Mountain beavers are fairly common on forested slopes west of the project area. Preferred habitat is upland forest with a thick understory of thimbleberry, blackberry, and sword ferns, usually on moist east- and north-facing slopes (Ingles 1965; *see* Main Report, Sec. III, p. 64).

Live trap transects (200 trap-nights) at six locations in seemingly suitable habitat failed to catch any jumping mouse (Appendix G-2). However, defining what is suitable habitat is problematic, as this species occurs in low densities and in a variety of habitat types. In addition, this species is difficult to trap because of its foraging habits and mode of movement (G. Fellers, pers. comm.). Preferred habitat is thought to be bunchgrass communities, treeless areas with dense grass/forb cover, and moist areas that are safe from continuous inundation. Cattle grazing has been indicated as adversely affecting habitat for Point Reyes jumping mouse (CDFG 2001, see Main Report, Sec. III, p. 46).

After restoration, some of the insectivores and rodents that currently occur in the pasturelands on the study site would be displaced except in transitional zones with higher elevation marsh and upland habitats. Tidal marsh does not typically support either the species diversity or density of small mammals as compared to upland habitats. On the other hand, the majority of the study site is currently heavily-grazed pasture that is periodically mowed or planted. Such practices provide very poor habitat values for small mammals. Restoration of tidal marsh habitat that would include creation of natural

transition habitats, high marsh, and freshwater meadows would benefit small mammal populations in the study site.

Carnivores

Fifteen species of carnivores may occur on or near the study site (Table G-1), including two special status species—southwestern river otter and Pacific harbor seal (Main Report, Sec. III, pgs. 65 and 75, respectively). Tomales Bay provides important breeding and haul-out sites for harbor seals. Harbor seals occasionally move up the estuarine reach of Lagunitas Creek but their occurrence is incidental and local distribution and abundance will not be affected by changes in habitat characteristics of the Giacomini wetlands.

River otters were historically quite common, but were nearly extirpated in the early to mid-1900s and have recently recolonized the waterways of western Marin County. An increase of river otters in Tomales Bay and Lagunitas Creek was first noted in the early 1990s (Fellers and DelOsso 1985, Evens 1993) and has continued through 2002 (J. Evens, pers. obs). River otters are fairly common and wide-ranging along the main stem of Lagunitas Creek throughout the length of the project area as well as near the north end of Fish Hatchery Creek, where a burrow and potential breeding site were found in the course of this study. Another burrow near White House Pool was noted and family groups of up to eight individuals have been seen frequently at these two sites (Figure G2-2). The only evidence of otter use found at Tomasini Creek (on the eastern edge of the site) was one set of tracks during winter. Restoration of tidal marsh and an increase in stream bank complexity should provide additional habitat for this species, however, den sites should be located prior to levee reconfiguaration, if planned, and ecological requirements of the species should be considered during restoration planning.

Other carnivores such as coyote, bobcat, mink, and long-tailed weasel should also benefit from the conversion of heavily-grazed pasture to wetland, wet meadow, and upland habitat on the study site.

Table G1-1. List of mammals occurring or potentially occurring at Giacomini Wetlands.
Habitat codes: tidal wetlands (TW); creeks & open water (CO); ponded freshwater (PF); riparian (R); pasture irrigated (PI); pasture other (PO); and aerial (A). (from PWA 1993).

		H	**A**	**B**	**I**	**T**	**A**	**T**
Common Name	Scientific Name	TW	CO	PF	RI	PI	PO	A
Virginia opossum	*Didelphis marsupialis virginiana*				x	x		
Vagrant shrew	*Sorex vagrans vagrans*			x	x	x		
Pacific shrew	*Sorex pacificus sonomae*				x	x		
Trowbridge's shrew	*Sorex trowbridgei montereyensis*					x		
Shrew-mole	*Neurotrichus gibbsi hyacinthinus*					x		
Broad-handed mole	*Scapanus latimanus caurinus*						x	
Little brown myotis	*Myotis lucifugus alascensis*							x
Long-eared myotis	*Myotis evotis*							x
California myotis	*Myotis californicus caurinus*							x
Silver-haired bat	*Lasionycteris noctivagrans*							x
Western pipistrelle	*Pipistrellus hesperus*							x
Big brown bat	*Eptesicus fuscus bemardimus*							x
Red bat	*Lasiurus borealis teliotis*							x
Hoary bat	*Lasiurus cinereus cinereus*							x
Townsend's big-eared bat	*Plecotus townsendii townsendii*							x
Pallid bat	*Antrozous pallidus pacificus*							x
Brush rabbit	*Sylvilagus bachmani ubericolor*				x	x	x	
Black-tailed jackrabbit	*Lepus califomicus califomicus*			x	x	x		
Mountain beaver	*Aplodontia rufa plaea*				x			
Sonoma chipmunk	*Eutamias sonomae alleni*				x			
California ground squirrel	*Spermophilus beecheyi douglasi*					x	x	
Western gray squirrel	*Sciurns griseus griseus*				x		x	
Valley pocket gopher	*Reithrodontomys megalotis longicaudis*					x	x	
Western harvest mouse	*Peromyscus maniculatus rubidus*			x	x	x		
Deer mouse	*Peromyscus maniculatus rubidus*				x	x	x	
Dusky-footed woodrat	*Neotoma fuscipes monochroura*			x				
California vole	*Microtus californicus eximus*				x	x		
Muskrat	*Ondatra zibethica*	x	x	x	x	x		
Norway rat	*Rattus norvegicus norvegicus*	x			x	x	x	
House mouse	*Mus musculus*				x	x	x	
Point Reyes jumping mouse	*Zapus trinotatus orarius*				x	x	x	
Coyote	*Canis latrans ochropus*	x	x	x	x	x	x	
Red fox	*Vulpes fulva*	x	x	x	x	x	x	
Gray fox	*Urocyon cinereoargenteus townsendi*				x	x	x	
Ringtail	*Bassariscus astutus raptor*				x			
Raccoon	*Procyon lotor psora*	x	x	x	x	x	x	
Long-tailed weasel	*Mustela frenata munda*	x	x	x	x	x	x	
Mink	*Mustela vison aestruarina*		x	x	x	x		

Table G1-1. List of mammals occurring or potentially occurring at Giacomini Wetlands.
Habitat codes: tidal wetlands (TW); creeks & open water (CO); ponded freshwater (PF); riparian (R); pasture irrigated (PI); pasture other (PO); and aerial (A). (from PWA 1993).

Common Name	Scientific Name	TW	CO	PF	RI	PI	PO	A
River otter	*Lutra canadensis sonorae*	x	x					
Badger	*Taxidea taxus neglecta*						x	
Spotted skunk	*Spilogale putorius phenax*				x	x	x	
Striped skunk	*Mephitis occidentalis*				x	x	x	
Mountain lion	*Felis concolor californicus*				x	x	x	
Bobcat	*Lynx rufus californicus*				x	x	x	
Feral cat	*Felis domesticus*				x	x	x	
Harbor seal	*Phoca vitulina*	x	x					
Fallow deer	*Dama dama dama*				x	x	x	
Mule deer	*Odocoileus hemionus columbianus*				x	x	x	

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Appendix G-2

Small Mammal Field Surveys at Giacomini Wetlands Restoration Site, 2002

Prepared by William Carmen, Ph.D.

I. Summary

Sherman-type live traps were placed in five locations on the study site at Giacomini Ranch. One trap line was placed just over the southeastern levee in the State Lands parcel (Figure 1). The traps were placed in areas of potential Point Reyes jumping mouse habitat, a California Department of Fish and Game Species of Special Concern. In a total of 200 trap-nights (100 traps run two nights) in July, 2002, no Point Reyes jumping mice were captured. However, this species is difficult to trap (G. Fellers, pers. comm.). A total of three voles (*Microtus californicus*) were captured.

Point Reyes mountain beaver, also a CDFG Species of Special Concern, is known to occur in the forested slope to the west of the study site. The only remotely suitable habitat for this species on the study site is in the riparian-brush on the eastern edge of the property adjacent to the channelized portion of Tomasini Creek. This area was searched for the characteristic burrow systems of the mountain beaver, but none were located.

II. Methods

Trap lines were placed at a total of six locations (Fig. G2-1). Sites were selected based on habitat suitability for Point Reyes jumping mice and other small mammals (see Special Status Species Accounts). At each location, Sherman-type small mammal live traps were placed in pairs every 15 meters on a straight line. Traps were baited with a mixture of peanut butter, rolled oats, and birdseed. Bedding was placed in each trap to provide a warm environment for any small mammal caught in the trap. Trap lines were run by William Carmen and Jessica Martini-Lamb (Sonoma County Water Agency Wildlife Biologist) on July 19 and 20, 2002, for a total of 200 trap-nights.

Point Reyes mountain beaver, a CDFG Species of Special Concern, is known to occur in the forested slope to the west of the study site. The only remotely suitable habitat for this species

within the study site is in the coastal scrub-riparian association on the Point Reyes Mesa bluff on the eastern edge of the property adjacent to the channelized portion of Tomasini Creek. This area was searched on June 6, 2002, for the characteristic burrow systems of the mountain beaver.

III. Results

In two hundred trap-nights (July 19-20, 2002), three voles were captured and released, all in ruderal field habitat in the northwest portion of the study site. No Point Reyes jumping mice were caught or have been observed during field work on the study site. No Point Reyes mountain beaver burrow systems were located in the riparian-brush habitat on the eastern edge of the study site.

Figure G2-1. Small mammal trap line locations, July 2002