Detailed Background on Existing Resource Conditions in Project/Study Area

Giacomini Wetland Restoration Project
Golden Gate National Recreation Area/
Point Reyes National Seashore

Land Use: The Giacomini Ranch has been used for dairy farming since 1917. The Giacominis established their operation in the 1940s with diking of what is now referred to as the East and West Pastures and are still farming the ranch currently. The National Park Service's reservation of use agreement with the Giacominis ends in 2007 at which the dairy operation will cease, and the entire 563 acres will be under the National Park Service (Park Service) ownership and management. Olema Marsh, which is directly south of the Giacomini Ranch in the Olema Valley, has been owned by the non-profit organization, Audubon Canyon Ranch. The marsh is primarily used by the public for walking, birding, and sightseeing opportunities.

The West Marin area, including Point Reyes National Seashore (Seashore) and north district of Golden Gate National Recreation Area (GGNRA), is largely rural and comprised of agricultural operations and small residential communities. The dominant type of agriculture within the region is dairy and beef cattle operations. South of Olema Marsh lies pasturelands that are owned by the Park Service and grazed under lease by beef cattle. Leased beef cattle grazing also occurs near Park Service land at Railroad Point northeast of the Giacomini Ranch. Otherwise, most of the Giacomini Ranch and Olema Marsh is surrounded by the towns of Point Reyes Station and Inverness Park, which consist largely of residential homes and small businesses. To the north of Giacomini Ranch lies undiked marshlands that are owned by the State Lands Commission.

Geology: The Project Area is surrounded by two very distinct geologic formations (**Figure 3**). The eastern perimeter of Tomales Bay falls in the Franciscan Formation. The Franciscan Formation consists of a sheared "paste" of sandstone and shale particles, in which are embedded "lozenge-shaped" fragments of coherent sandstone from a few cm to several meters in diameter (Wahrhaftig 1974). Distributed haphazardly through this matrix or melange are blocks of Franciscan-associated rock types such as chert, limestone, greenstone, schist, other metamorphic rocks, and serpentine (Wahrhaftig 1974). Weathered Franciscan melange is highly susceptible to landsliding, and a major erosional process on melange is the movement of soil in large and small earthflows (Wahrhaftig 1974). The town of Point Reyes Station is situated on a stream-cut terrace of loosely consolidated silt and sand that is overlain by a gravel layer about 6 m thick (NMWD et al. 1987).

The western portion of Tomales Bay is dominated by granodiorite and granite, which forms the backbone of the Point Reyes Peninsula (Galloway 1977). The granitic rocks of the Salinian block underlay other formations such as the Purisima and Monterey on the Point Reyes Peninsula at depths often exceeding 200 m, but are exposed at several locations, including the Inverness Ridge (Clark et al. 1984). Weathering of the granitic surface extends relatively deeply, leaving a granitic, sandy residue that is hard to distinguish in the field from the basal Miocene sand, which is also granitic (Galloway

1977). The geology of the Point Reyes Peninsula bears strong resemblance to that of the Santa Cruz Mountains and Monterey areas, indicating that these regions were probably split through 455 km of displacement along the San Gregorio fault (Clark et al. 1984).

The Project Area itself is mapped as alluvium. It occupies the ancient rift valley of the San Andreas Fault (Daetwyler 1966). Prior to 1862, a substantial amount of the Giacomini Ranch was actually open water and intertidal mudflats, with the historic coastal salt marsh concentrated in the eastern portion of the Giacomini Ranch, Olema Marsh, and the mouth of Olema Creek (PWA et al. 1993; **Figure 2**). Logging, heavy grazing, and tilling in the latter half of the 19th century and early part of the 20th century, however, accelerated sediment delivery into the Tomales Bay watershed, resulting in a rapid growth of wetland habitat in the headwaters of the bay. Between the 1860s and the 1980s, approximately 650 acres of salt marsh habitat were created due to excessive sedimentation (PWA et al. 1993). The largest portion of sedimentation occurred prior to 1950: During the last 50 years, sedimentation delivery has been reduced due to the construction of several dams, including the Peters and Lagunitas Dams, which control about 70 percent of the Lagunitas Creek watershed (PWA et al. 1993). Excessive sedimentation has continued to occur in Olema Marsh due to several factors, including constraints on sediment transport from the levee and culverts, low channel gradient, historically heavy sediment loads on Bear Valley Creek, and episodic sedimentation events from the Silver Hills drainage.

Topography: The U.S. Geological Survey (USGS) is in the process of finalizing a topographic map of the Giacomini Ranch. Previous topographic information collected by the California Department of Transportation (1966) showed elevations as ranging from +1 foot NGVD (+3.64 feet NAVD88) in the northern end of the Giacomini Ranch to +6-+7 feet NGVD (+8.64 to +9.64 feet NAVD88) in the southern end. This topographic information, combined with spot checks of the adjacent undiked marsh by Philip Williams & Associates (1993), suggested that subsidence of the pasturelands had been relatively minimal (1-2 feet) since levees along Lagunitas Creek were constructed in the 1940s.

Current topographic information collected by the USGS and PORE shows elevations within the Giacomini Ranch ranging from +4 to +5 feet NAVD88 in the northern end to +8 to +10 feet NAVD88 in the southern end and suggests that subsidence has been minimal. Some preliminary hydraulic modeling using this topographic information indicates that elevations within the Project Area relative to tidal datum are actually higher than originally anticipated. If levees were completely removed without topographic alterations, the Project Area could largely become mid- to high intertidal habitat, with a large portion of the southeastern end falling above intertidal elevations. Since diking, topography of the Giacomini Ranch has largely been affected by land-leveling activities, efforts to re-direct flood and creek/drainage flows, and sediment deposited during flooding. Current topography of the Giacomini Ranch levees is highly variable due to maintenance activities and erosion- and cattle-related degradation, with top of levee elevations generally ranging from +9 to +14 feet NAVD88. Elevations of the adjacent undiked marsh to the north of the ranch range from +3 (low marsh) to +7 feet (high marsh/upland ecotone) NAVD88, with the marsh plain at approximately +5 to +6 feet NAVD88.

A recent topographic survey of Olema Marsh also revealed that elevations were higher than originally anticipated. The center of the marsh ranged in elevation from approximately +4 - to +8 feet NAVD88. Meanwhile, the elevations of the adjacent Levee Road range from +11- to +13 feet NAVD88, approximately the same elevation as the county's White House Pool park on the north side of Levee Road across from the Olema Marsh.

Soils: Soil types mapped within the Giacomini Ranch and Olema Marsh are consistent with this area's unique history. The northern 60 percent of the Giacomini Ranch and most of the Olema Marsh are comprised of Novato Clay (U.S. Soil Conservation Service 1985; **Figure 4**). Novato Clay is described as "very deep, very poorly drained soil…in saltwater marshes ...formed in alluvium derived from various kinds of rock" (U.S. Soil Conservation Service 1985). The historic coastal salt marsh in the southeastern corner of the Giacomini Ranch and the portion of Lagunitas Creek along Levee Road is mapped as Blucher Cole complex (U.S. Soil Conservation Service 1985; **Figure 4**). The Blucher-Cole complex is also formed in alluvium from various kinds of rock, although this mapping unit is typically found in basins and on alluvial fans. Both components of this mapping unit are characterized as very deep soils that are somewhat poorly drained with seasonally high water tables and occasional periods of flooding (U.S. Soil Conservation Service 1985).

Soil borings conducted in 2003, however, indicate that soil patterns within the Giacomini Ranch are much more complex than the soil map would suggest. The historic salt marsh areas in the southern and eastern portions of the East Pasture typically consist of intermixed estuarine clays and peats overlain with a thin (~0.3 –0.5 m) loam or clayey loam layer (Greg Kamman, Hydrologist, *pers comm*.). The loams probably date to the period in which the Project Area was isolated from tidal and freshwater flow influence and started being actively farmed. The very southern portion of the East Pasture has a very thick (2.5 m) accumulation of fluvially derived, interbedded silt and sand that appears to have resulted from the Giacominis' efforts to deliberately direct flood overflows from Lagunitas Creek to this portion of the property (G. Kamman, *pers comm*.). Conversely, sediment in many of the historic subtidal areas in the East Pasture that are directly adjacent to historic and current Lagunitas Creek channels are comprised of loam or silty loam overlain by interbedded silt, clay, and sand. In the West Pasture, a thin veneer of silty loam rests on a thick sequence of extremely permeable coarse-grained sands and gravels. The coarse-grained material probably mark the historic alignment of Lagunitas Creek or reflect near-channel accumulation of bedload and suspended sediment deposited during storm events (G. Kamman, *pers comm*.).

The most recent version of the Important Farmland map of Marin County shows the southeastern 156.5 acres of the Giacomini Ranch as Farmland of Statewide Importance soils, with the remainder of the ranch and Olema Marsh mapped as Farmland of Local Importance soils (California Department of Conservation, letter dated March 28, 2002). The Farmland of Statewide Importance designation was based on the fact that the soil type mapped in the southeastern portion, Blucher-Cole complex, has been designated as a Farmland of Statewide Importance soil. Also, as this area is irrigated for dairy pasturage, it would meet the second criteria: production of irrigated crops at some time during the

past four years prior to the Important Farmland map date (California Department of Conservation March 2000).

In Marin County, Farmland of Local Importance is defined as land that is not irrigated, but cultivated or has the potential for cultivation. It is possible that in the next version of the map to be produced that the extent of land mapped as Farmland of Local Importance will be reduced, because the prolonged ponding and high salinities present in the soil and groundwater would preclude most types of cultivation. The excluded areas could be remapped as Grazing Land. While Important Farmland maps suggest that the Project Area accounts for an extremely high percentage of the important farmland soils mapped in Marin County, it should be noted that the farmland map only encompasses the Tomales Bay and portions of the Bolinas Lagoon watersheds. It does not extend into the northern and eastern portions of the county, both of which have substantial agricultural lands.

Sediment Quality: Restoration activities are anticipated to cause some degree of soil disturbance and/or relocation. Through resuspension of disturbed soils in the water column, any sediment contaminants that are present could become available for uptake by biota within the Project Area or elsewhere in the Tomales Bay watershed. In addition, tidal wetland restoration may actually increase the toxicity of certain trace metals present such as mercury (Davis et al. *in prep*.). Because of these concerns, the Park Service decided to conduct a screening-level sediment contaminant study in the Giacomini Ranch and adjacent areas. Based on results, it appears that the risk of impact to the environment from sediment contamination in the Giacomini Ranch is minimal, although reporting limits for some of the analytes preclude us from conclusively stating that there is no threat (Parsons and Allen 2004b). The only contaminant that exceeded National Oceanic and Atmospheric Administration's (NOAA's) sediment quality guidelines was nickel, which exceeded NOAA's Effects Range-Median at several of the 20 sampling locations. Nickel and some other metals, however, are naturally high in certain geologic formations, including the Franciscan Formation, which borders the Project Area to the east. While cadmium levels exceeded the ASC standards at some sampling locations, they were typically substantially lower than ERL or ERM standards and, therefore, do not appear, in general, to represent a problem. The two analytes that perhaps were of most concern – mercury and lead – due to watershed mercury contamination and long-term hunting in the Project Area occurred at concentrations well below both published standards and levels observed in San Francisco Bay subtidal and wetland areas. Reporting limits for selenium and organics laboratory analytical methodologies used were high enough that they actually precluded comparisons with published standards. The relatively rural, non-industrialized nature of this watershed suggests, however, the potential for selenium and organics contamination is relatively low, except for those contaminants that disperse through atmospheric deposition, as well as point source and non-point source flow into adjacent waterbodies.

Hydrology: The Project Area represents a complex mixture of tidal and freshwater influences (**Figure 5**). It is located at the southern end of Tomales Bay, at the mouth of Lagunitas Creek, the largest subwatershed within Tomales Bay. Tomales Bay is considered a classic estuary with increased freshwater influence and stratification during the winter/spring and more mixed conditions during the summer/fall. However,

Lagunitas Creek remains somewhat stratified within the Project Area throughout the year, particularly in upstream reaches. An important process in the development of density stratification is the formation of relatively deep water pools or reaches of the creek upstream of elevated sand/gravel bars that appear to persist along the northern half of the Project Area.

In the winter, very uniform freshwater conditions (< 1 ppt) can persist in the upstream areas until June, when stratification starts to occur with salinities ranging between 0.5 to 7 ppt. In the late fall, salinities can reach as high as 14 ppt near the Green Bridge. At the northern end of the Project Area, fresh to slightly brackish conditions are present typically only during the months with rain, with salinities climbing rapidly to 20 to 30 ppt during the early summer to late fall.

Leaky gate on Fish Hatchery Creek

Tidal action within the East and West Pastures has been severely minimized, if not eliminated, by the construction of levees along Lagunitas Creek. Some tidal influence does exist. The one-way tidegates and flashboard dam structures on Tomasini and Fish Hatchery Creeks, which flow through the Project Area and into Tomales Bay, actually now function more as two-way systems and experience moderate to significant tidal action. As freshwater flow in Fish Hatchery and Tomasini Creeks decreases, a salt "wedge" has been observed to move up the creeks, although the upper portions of at least Tomasini Creek often go dry during the summer and early fall months. There also appears to be some groundwater interaction between Lagunitas Creek and the Giacomini Ranch, perhaps due to the coarse alluvial nature of the sediment that formed this deltaic marsh. The shallow nature of tidally influenced, saline groundwater (at or very near the ground surface) has encouraged reestablishment of salt marsh vegetation in some of the northern portions of the Project Area. Bear Valley Creek, which flows through Olema Marsh to its confluence with Lagunitas Creek, is only minimally tidal, with tidal inflow occurring only on tides greater than 4.1 feet NAVD88. Tidal datum information from the Inverness station, which has been verified to some extent by recent tidal monitoring, is shown in Table 1.

In terms of freshwater influences, there are two primary drainages – Tomasini and Fish Hatchery Creeks -- and several small drainages originating from Inverness Ridge that flow into the Giacomini Ranch. The influence of Tomasini Creek on the Giacomini Ranch has been minimized by a levee constructed in the 1950s that keeps the creek on the east side of the ranch along the base of the Point Reyes Mesa until the drainage eventually flows into Tomales Bay. Berming of Fish Hatchery

Tidal Datums for Inverness, Tomales Bay

	MLLW Datum (feet)	NAVD88 Datum (feet)
MHHW	5.34	5.83
MHW	4.64	5.13
MTL	2.76	3.25
NGVD29	2.15	2.64
MLW	0.88	1.37
MLLW	0.00	0.49

has been less extensive, although some excavation activities have been performed, creating a low "spoil pile" berm. Some of the smaller drainages in the West Pasture flow into what appears to be a remnant tidal slough that eventually connects with Fish Hatchery Creek and flows into Tomales Bay. There are also strong freshwater influences from seeps present along portions of the Giacomini Ranch perimeter. Seep influences from the Inverness Ridge support a fringe of riparian and freshwater marsh/wet meadow communities along the entire western boundary of the Project Area. A similar phenomenon occurs in selected areas of the eastern boundary of the Giacomini Ranch, due to seep or run-off flow from the Point Reyes Mesa (a remnant terrace composed of relatively permeable sand, silt, and gravel material). It is possible that some of the seep flow has been augmented by septic input from residential communities along the Inverness Ridge and Point Reyes Mesa areas. There are also at least two (2) areas where stormwater run-off from the town of Point Reyes Station flows either into the Giacomini Ranch or into a county park parcel directly upstream.

Another source of freshwater in the Giacomini Ranch comes from groundwater that is pumped into irrigation ditches and remnant sloughs/channels by the Giacominis during the summer months. This water is supplied to the Giacominis by the North Marin Water District and originates from a well located in the Lagunitas Creek aquifer a short distance upstream of the ranch. This groundwater is used to flood- and spray irrigate pastures during the summer months, with flood irrigation mostly performed in the southeastern portion of the Project Area. Only the pastures on the eastern side of Lagunitas Creek (East Pasture) are irrigated.

Hydrologic sources for Olema Marsh include Bear Valley Creek and the Silver Hills drainage, both of which are perennial, as well as groundwater seeps. Bear Valley Creek flows along the eastern side of the marsh, while the Silver Hills drainage has been rerouted to its northwestern corner. Some of the drainage from the marsh flows through a culvert on the western side adjacent to the parking lot from this drainage and the marsh in general.

Water Quality: While Tomales Bay is often considered a relatively pristine estuary, it is still vulnerable to anthropogenic impacts. The San Francisco District of the Regional Water Quality Control Board has determined that Tomales Bay is impaired by sediment, nutrients, fecal coliform, and mercury under Section 303(d) of the Clean Water Act. The impairment listing resulted from the fact that water quality conditions within the Bay often did not meet standards for designated beneficial uses such as oyster mariculture and public recreation. Several times during the last decade, oyster fisheries have been forced to close down operations temporarily due to poor water quality, and fish consumption advisories have been established for Bay-endemic species ranging from smelt to shark. Knowing the importance of water quality issues to the restoration project and the watershed as a whole, a portion of the proposed long-term monitoring program, water quality monitoring, was implemented in February 2002 in the Giacomini Ranch. Once a month, field parameters such as dissolved oxygen, salinity, conductivity, temperature, pH, and turbidity is measured, with water samples collected quarterly for assessment of nutrients, pathogens, and chlorophyll a.

Based on results through January 2004, water quality within the Giacomini Ranch appears to be relatively good. In general, waters do not appear to be eutrophic. There were low concentrations of nutrients and chlorophyll a, even in drainage ditches (ranging from 0.2-1.5 mg/L), with the exception of seasonal pulses. During the approximately two (2) years of sampling, only three (3) winter pulses of nitrate (5 - 54 mg/L) and two (2) winter pulses of ammonia (13 and 26 mg/L) were observed. With the exception of these pulses, nutrient concentrations were generally comparable to those measured in local reference wetlands. Dissolved oxygen (D.O.) levels were generally moderate (5.0 -10.0 mg/L). Consistently hypoxic and anoxic dissolved oxygen conditions have been observed in both the upper and lower portions of the water column in drainage ditches and old sloughs in the East Pasture. Dissolved oxygen (D.O.) concentrations in these areas are almost always below 5 mg/L and are often below 2 mg/L. High concentrations of dissolved organic matter within the waters may be increasing biological oxygen demand and thereby driving oxygen levels down.

Concentrations of pathogen indicators such as total and fecal coliform were one to five orders of magnitude greater in the Giacomini Ranch than in the reference wetlands, often exceeding 900 – 1,600 MPN. One station on Fish Hatchery Creek within the diked pasture had levels exceeding >160,000 MPN in July 2003. The log mean value of all the Giacomini Ranch sites exceeded the USEPA criteria for recreational water contact (<200 log mean MPN), whereas only two (2) of the nine (9) sites in the reference wetlands exceeded the criteria. Surprisingly, coliform levels from the Giacomini Ranch were up to three orders of magnitude lower than those reported for three other watersheds used for dairy ranching at Point Reyes National Seashore (National Park Service 2001). The fact that nutrients and pathogen concentrations in the Project Area are lower than other ranches in the watershed suggests that the high percentage of wetlands already present in the Giacomini Ranch may be playing some role in improving water quality of drainage ditches and creeks within the pastures.

Vegetation and Special Status Plant Species: Vegetation communities within the Giacomini Ranch and adjoining areas (Study Area) were mapped using a combination of classification systems (Parsons and Allen 2004a). Point Reyes National Seashore and developed by Todd Keeler-Wolf and John Sawyer (*A Manual of California Vegetation* --1996). However, the type of vegetation communities encountered within the Project Area were not well represented in the Keeler-Wolf and Sawyer classification system, so a modified Holland (1986) system was employed, as well.

Most of the Giacomini Ranch (~ 50 percent) is comprised of Wet Pasture, which is dominated by grass species such as creeping bentgrass (*Agrostis stolonifera*), rough bluegrass (*Poa trivialis*), ryegrass (*Lolium perenne* and *multiflorum*), and barley (*Hordeum marinum* and *brachyantherum*), as well as clover (*Trifolium* spp.) species (**Figure 6**). Pasture areas that have subsided and/or are influenced more by saline groundwater or surface water flows have evolved into Salt Marsh Pasture (combination of salt marsh and pasture species) and even Diked Salt Marsh. Areas along the perimeter of the Giacomini Ranch where seeps are present or within slow-moving reaches of freshwater drainages such as Fish Hatchery and Tomasini Creeks support Freshwater

Marsh, Vernal Marsh, Wet Meadow, and Moist Meadow vegetation communities. Freshwater Marsh systems are very diverse, but are often characterized by bulrush (*Scirpus californicus*), cattails (*Typha* spp.), bur-reed (*Sparganium erectum ssp. stoloniferum*), hydrocotyle (*Hydrocotyle ranunculoides*), and water parsley (*Oenanthe sarmentosa*). Brackish marsh vegetation communities are also diverse in general, but Tidal Brackish Marsh habitats often consist of extensive stands of bulrush and alkali bulrush (*Scirpus maritimus*) along the upper reaches of Lagunitas Creek. Diked Salt Marsh and Tidal Salt Marsh communities are comprised of varying mixtures of salt marsh species such as pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), jaumea (*Jaumea carnosa*), spearscale *(Atriplex triangularis*), and alkali heath (*Frankenia salina*). A list of plant species is provided in **Table 2**.

Tidal Salt Marsh

Extensive surveys resulted in documentation of three rare plant species within the Study Area (Parsons 2003). Only one species, Humboldt Bay owl's-clover (*Castilleja ambigua* ssp. *humboldtiensis*; FSC; CNPS List 1B) was recorded within the Giacomini Ranch. This species occurred in Tidal Salt Marsh "shelves" that have developed on the outboard side of both the western and eastern levees along Lagunitas Creek and on "islands" or bars between the levees, as well as in undiked and diked marsh habitats north of the Project Area. Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*; FSC; CNPS List 1B) was observed exclusively in diked and undiked marsh habitats north of the Project Area. A very small patch of another salt marsh species, Marin knotweed (*Polygonum marinense*; FSC; CNPS List 3) also occurred in the undiked marsh north of the Giacomini Ranch. Surveys in Olema Marsh have not been conducted as yet, but historic surveys did not uncover any rare plant species (CNPS 1984), and the potential habitat for most of the freshwater marsh species is poor.

Point Reyes bird's-beak

The presence of non-native invasive plant species was generally limited (**Table 3**). Cape ivy (*Delaria odorata*) has established in some portions of the riparian zone along the west side of the West Pasture, adjacent to Sir Francis Drake Boulevard. A few isolated clumps of pampas grass (*Cortaderia jubata*) have also been observed. Moderate to significant stands of eucalyptus (*Eucalyptus globosus*) occur directly adjacent to the Giacomini Ranch along Point Reyes Mesa. Otherwise, the most significant non-native present in terms of total cover remains Himalayan blackberry (*Rubus discolor*), which exists in separate stands or intermixed with native riparian vegetation, and other ruderal species such as poison hemlock (*Conium maculatum*).

Wetlands: The Park Service is currently conducting a wetlands delineation within the Project Area using both the U.S. Army Corps of Engineers (Environmental Laboratory 1987) and modified U.S. Fish and Wildlife Service/Cowardin (Cowardin et al. 1979) methodologies. A preliminary Corps delineation was performed as part of the Feasibility

Study (PWA et al. 1993), which estimated that approximately 325 potential Section 404 jurisdictional wetlands and waters existed in the Project Area. The Park Service expects that acreage of potential jurisdictional Section 404 and Section 10 wetlands and waters will exceed 325 acres in current mapping efforts.

Wildlife: As with the Tomales Bay watershed in general, the Study Area (Project Area and adjoining areas) currently supports a large number of common and special status wildlife species (**Figure 7; Table 4**). During the course of baseline wildlife surveys, at least six (6) reptiles, four (4) amphibian, 32 fish, and 194 bird species were observed in the Study Area. Seventy-seven special status taxa -- three (3) invertebrates; six (6) fish, one (1) amphibian, one (1) reptile, 58 birds, and eight (8) mammal species -- either currently or historically occurred in the Study Area (Avocet Research Associates 2003). Of those 77, four (4) are federally endangered; seven (7) are federally threatened, and one (1) was recently removed from threatened status. An additional 28 taxa are federal Species of Concern, and many of these are also included on California's list of Special Concern Species (Avocet Research Associates 2003). A few of these species have only been observed historically, but some appear to be actually increasing in numbers after a decline, such as the federal Species of Concern, southwestern river otter (*Lutra canadensis sonorae*).

The four (4) federally endangered species observed during baseline studies or documented historically included the California freshwater shrimp (*Syncaris pacifica*), tidewater goby (*Eucyclogobius newberryi*), California brown pelican (*Pelecanus occidentalis californicus*), and California clapper rail (*Rallus longirostris obsoletus*). California freshwater shrimp has been historically documented as occurring in the upper reaches of Lagunitas Creek within the Project Area (Pearson 2000), although recent surveys only found the species on the section of Lagunitas Creek upstream of Shafter Bridge and on lower sections of Olema Creek (Fong 2002).

The tidewater goby had not been observed in the Tomales Bay watershed since 1953 until surveys conducted as part of the baseline wildlife studies found a dozen individuals on a section of Tomasini Creek within the Project Area (Fong 1992; Avocet Research Associates 2003). This portion of Tomasini Creek has been bermed to run against the base of Point Reyes Mesa until it drains into Tomales Bay: the flashboard dam and culvert structure installed now allows two-way flow, so brackish conditions appear to be a result of tidal inflow, headwater flooding, and freshwater seepage from Point Reyes Mesa. Recent genetic analyses performed by the University of California at Los Angeles (UCLA) suggest that this population may be most closely related to those at three (3) northern coastal marshes -- Estero de San Antonio, Estero Americano, and Salmon Creek – but the Tomasini Creek population does appear to be genetically distinct (David Jacobs, professor, UCLA, *pers. comm.*).

As of 2003, the California clapper rail has occurred four of the last six winters in the undiked tidal marsh north of the West Pasture (Avocet Research Associates 2003). This species uses the low-lying marsh plain for breeding and foraging, while the northern portion of the West Pasture levee is used for refugia during high tides. The California

Clapper Rail

brown pelican does not breed in Point Reyes, but is a fairly common non-breeding visitor to Tomales Bay.

Some of the largest remaining populations of the federally threatened California red-legged frog (*Rana aurora draytonii*) occur on the Point Reyes peninsula and adjacent areas. This species was first documented in the Giacomini Ranch during the Feasibility Study (PWA et al. 1993). Extensive surveys conducted during the baseline wildlife studies showed that, during the winter and spring of 2001/2002, all of the breeding adults, egg masses, and tadpoles were observed in the West Pasture, either in an extensive Freshwater Marsh (Red-Legged Frog Marsh) in the northwestern portion of the ranch or in portions of Fish Hatchery Creek that adjoin this marsh (Fellers and Guscio 2002). Only four non-breeding adults were found in the East Pasture, and Fellers and Guscio (2002) concluded that it was unlikely that this species breeds in that portion of the Giacomini Ranch. Fellers and Guscio (2002) also noted occurrences of a federal Species of Concern, northwestern pond turtle (*Clemmys marmorata mormorata*), along some of the creeks, old sloughs, and drainage ditches in the West and East Pastures.

California red-legged frog

Since the baseline studies were completed, culverts on Fish Hatchery Creek at the north levee collapsed, allowing more tidal inflow into the West Pasture. These waters flowed into the Freshwater Marsh and caused some dieback of glycophytic plant species or plant species adapted strictly to freshwater conditions. The culverts have been repaired, reducing tidal inflow, but only a few adults and no egg masses or tadpoles were observed in the Freshwater Marsh during the 2003/2004 season (Gary Fellers, research scientist, U.S. Geological Survey, *pers. comm*.). Red-legged frog adults and tadpoles have been found at Olema Marsh, but the size of this population is unknown, although there are significant numbers of bullfrogs (G. Fellers, *pers. comm*.).

The presence of the red-legged frog restricted the ability to conduct electrofishing surveys for federally threatened salmonids during baseline wildlife surveys, but at least one steelhead (*Oncorhynchus mykiss irideus*) juvenile was observed on Fish Hatchery Creek just upstream of the Giacomini Ranch (Avocet Research Associates August 2002). Both Fish Hatchery and Tomasini Creeks reputedly had historic runs of steelhead and possibly coho salmon (*Oncorhynchus kisutch*). Information on anadromous species runs in Bear Valley Creek is also poor, but smolt trapping by the Seashore upstream of Olema Marsh in 1999 netted 26 steelhead, 25 of which appeared to be non-residents or anadromous (Seashore *in prep.*).

Most of the remaining federally threatened or recently delisted species are either infrequent visitors or are exclusively using the undiked intertidal and subtidal areas north of the Giacomini Ranch. These species include chinook salmon (*Oncorhynchus tshawytscha*), Aleutian Canada goose (*Branta canadensisminima*), bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina*), and western snowy plover (*Charadrius alexandrinus nivosus*).

Many of the species observed in the Study Area rely upon the complex mosaic of wildlife habitats present. For example, 75 percent of the avian species observed during winter surveys were not restricted to just one habitat, but were utilizing a combination of riparian, marsh, and open water habitats (Avocet Research Associates 2003). The most rare species such as salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), California clapper rail, California black rail (*Laterallus jamaicensis coturniculus*), sora (*Porzana carolina*), and yellow rail (*Coturnicops noveboracensis*), often moved between tidal marsh, freshwater marsh, riparian, and wet pasture habitats (Avocet Research Associates 2003). This habitat interdependence extended to species other than avian ones. During 2002, red-legged frog numbers in the Freshwater Marsh and Fish Hatchery Creek dropped dramatically during the spring, possibly because frogs were moving into the riparian areas and hillsides to the west (Fellers and Guscio 2002). The proximity of some very different types of habitat such as coniferous forest and coastal scrub to the Study Area may also act to promote the diversity of wildlife species observed (Avocet Research Associates 2003).

Non-native wildlife species observed during surveys included primarily the mosquitofish, green crab, crayfish, yellowfin goby, and red fox. Mosquitofish (*Gambusia* sp.) occurred primarily in the fresh to slightly brackish drainage ditches. European green crab (*Carcinus maenas*) were observed in some of the undiked tidal or diked "muted" tidal (e.g., Tomasini Creek) intertidal areas in the northern portion of the Study Area. Crayfish (possibly *Procambarus* sp.) occurred principally in the drainage ditches and old sloughs within the diked ranch and in Lagunitas Creek. Also, during freshwater shrimp surveys, a brackish water shrimp (*Palaemon macrodactylus*) was observed in Lagunitas Creek: this species was accidentally introduced into San Francisco Bay from Asia and is of potential concern, because it can adapt to a wide range of salinities (Carlton and Kuris 1975, Hedgpeth 1968).

Shorebirds foraging on Giacomini Ranch

Cultural Resources: An archaeological survey of the Giacomini Ranch identified two previously unrecorded cultural resources: a historic-period railroad bed and a historic-period levee system and dam (Sonoma State University 2002). The dam was a temporary dam that the Giacominis installed each summer to provide some freshwater for irrigation purposes. The Giacominis stopped summer dam installation prior to selling the property to the Park Service. While the original levee system was constructed more than 50 years ago, the degree of alteration to this system due to repairs and reinforcement (e.g., rip-rapping) will probably reduce its value as a historic resource (Mark Rudo, archaeologist, Park Service, *pers. comm.*). No other archaeological resources or human remains were identified (Sonoma State University 2002). The Park Service is currently having a survey of the historic structures undertaken on the portion of the dairy operations that it purchased.

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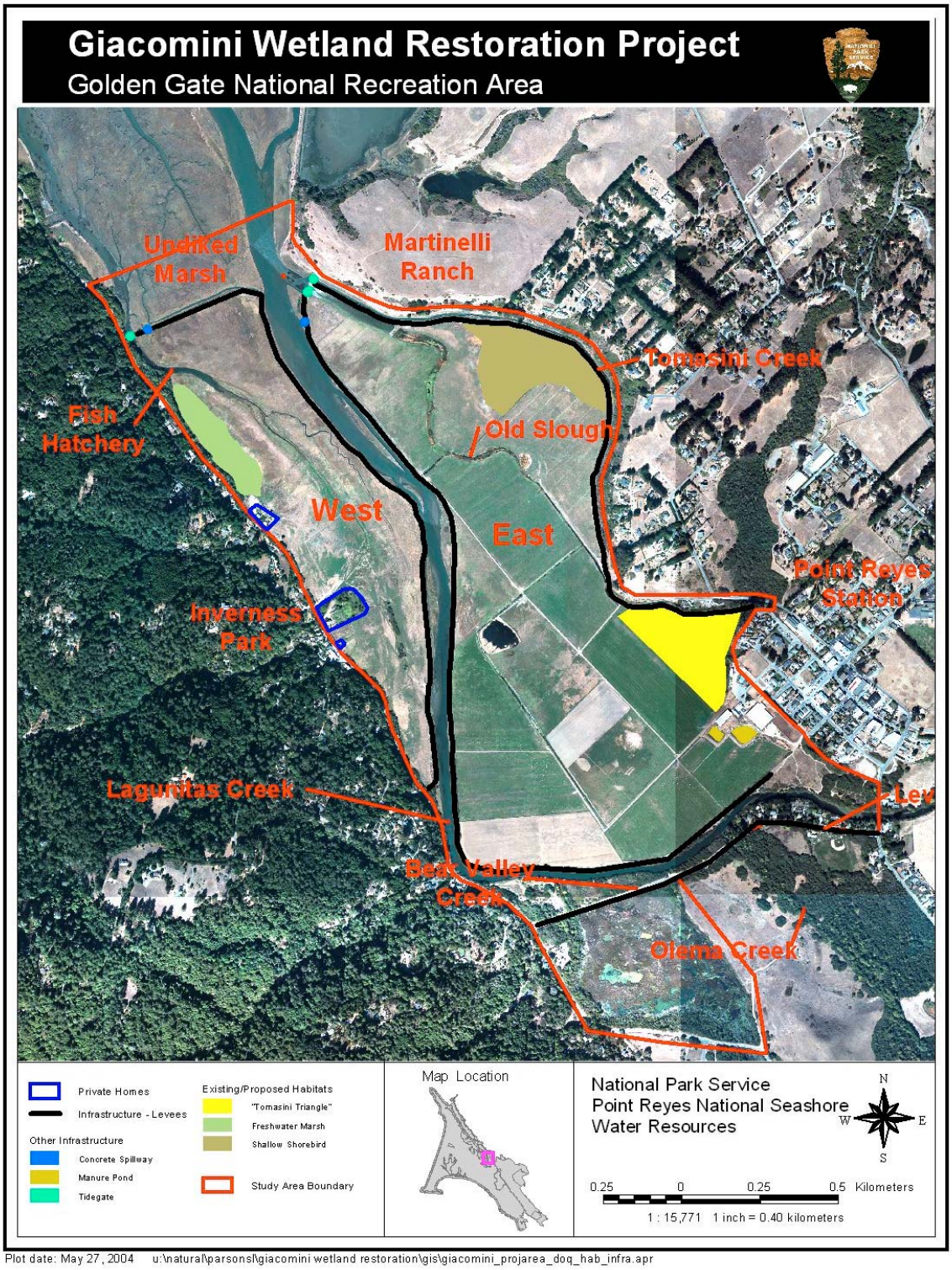
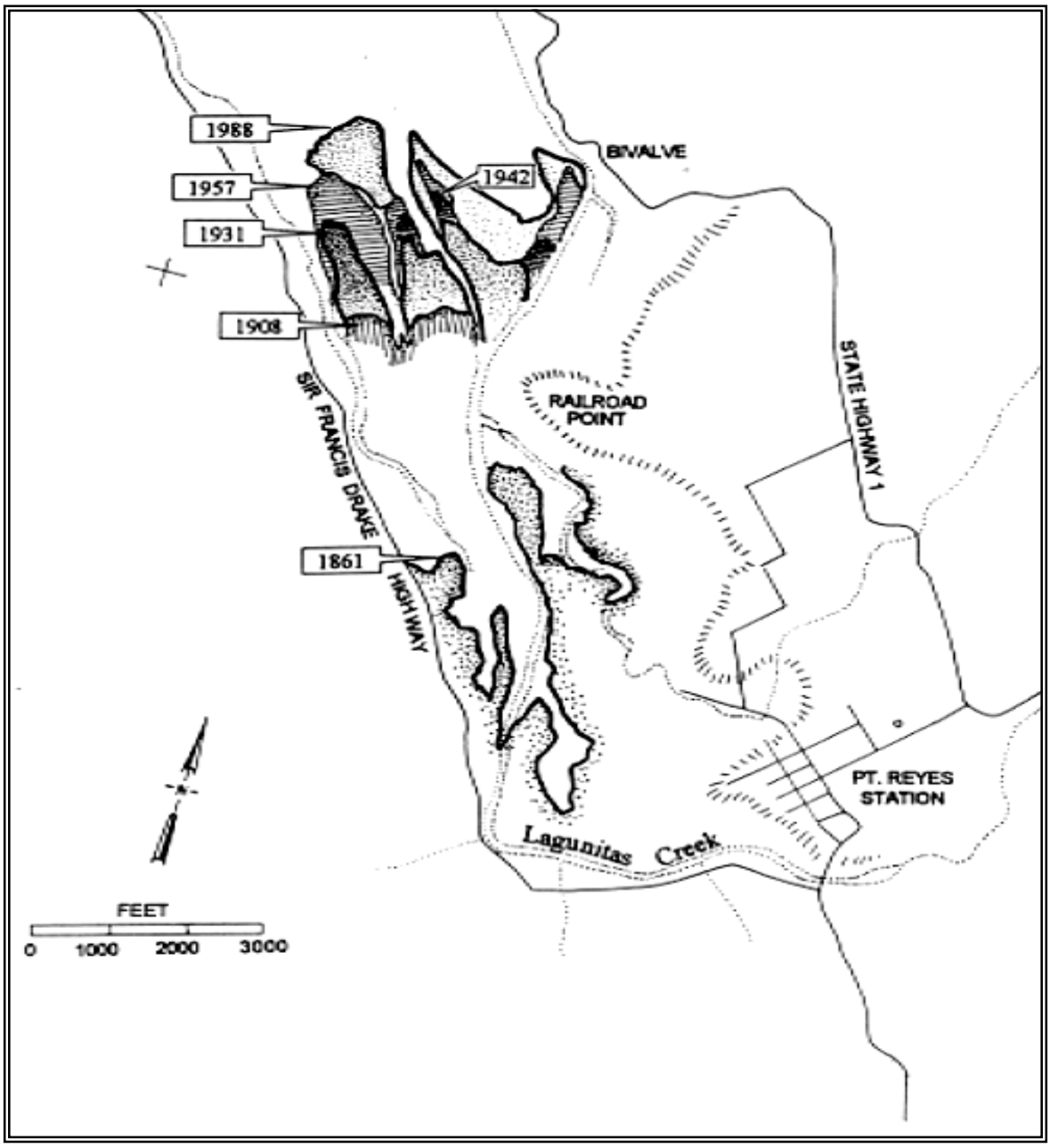


Figure 1. Giacomini Wetland Restoration Project Study Area. Marin County, California. Map shows some of the existing infrastructure and habitats.



Phillip Williams and Associates, Ltd., 1993

Figure 2. Giacomini Wetland Restoration Project Study Area. Marin County, California. Expansion of Lagunitas Creek delta. Location of Edge of Marsh from 1861-1988.

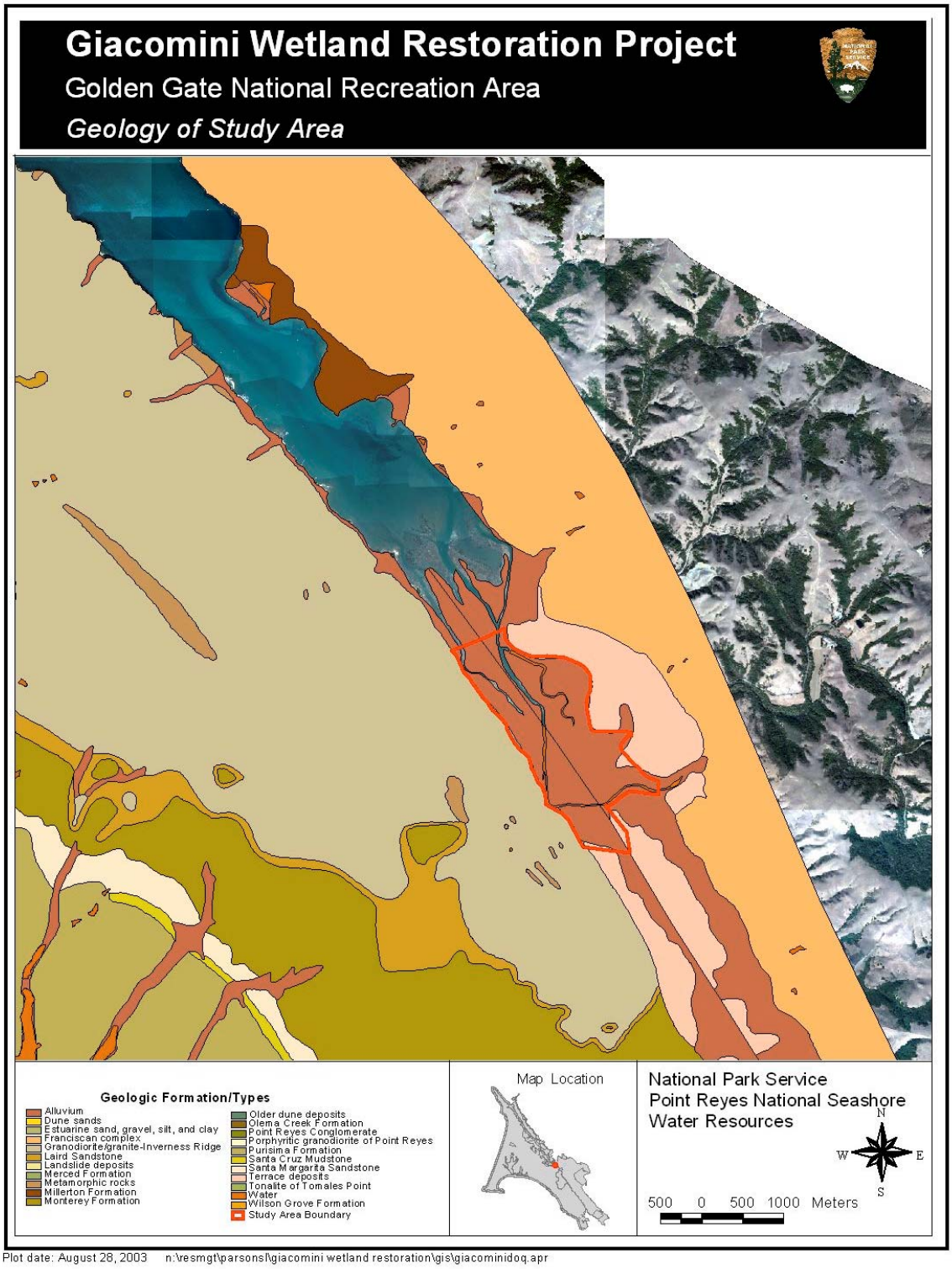


Figure 3. Geology of the Giacomini Wetland Restoration Project Study Area and vicinity.

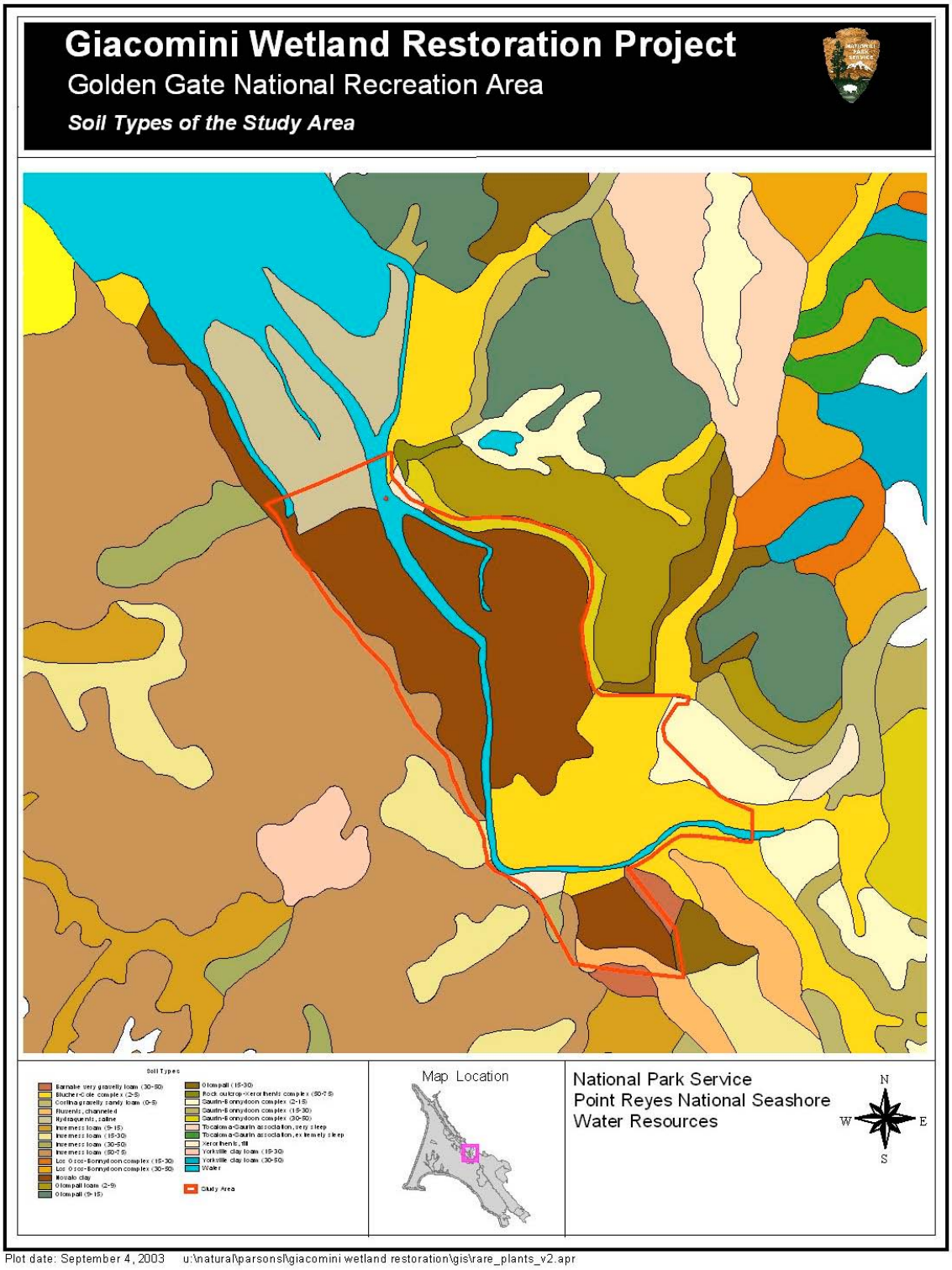


Figure 4. Soil types within the Giacomini Wetland Restoration Project Study Area and vicinity.

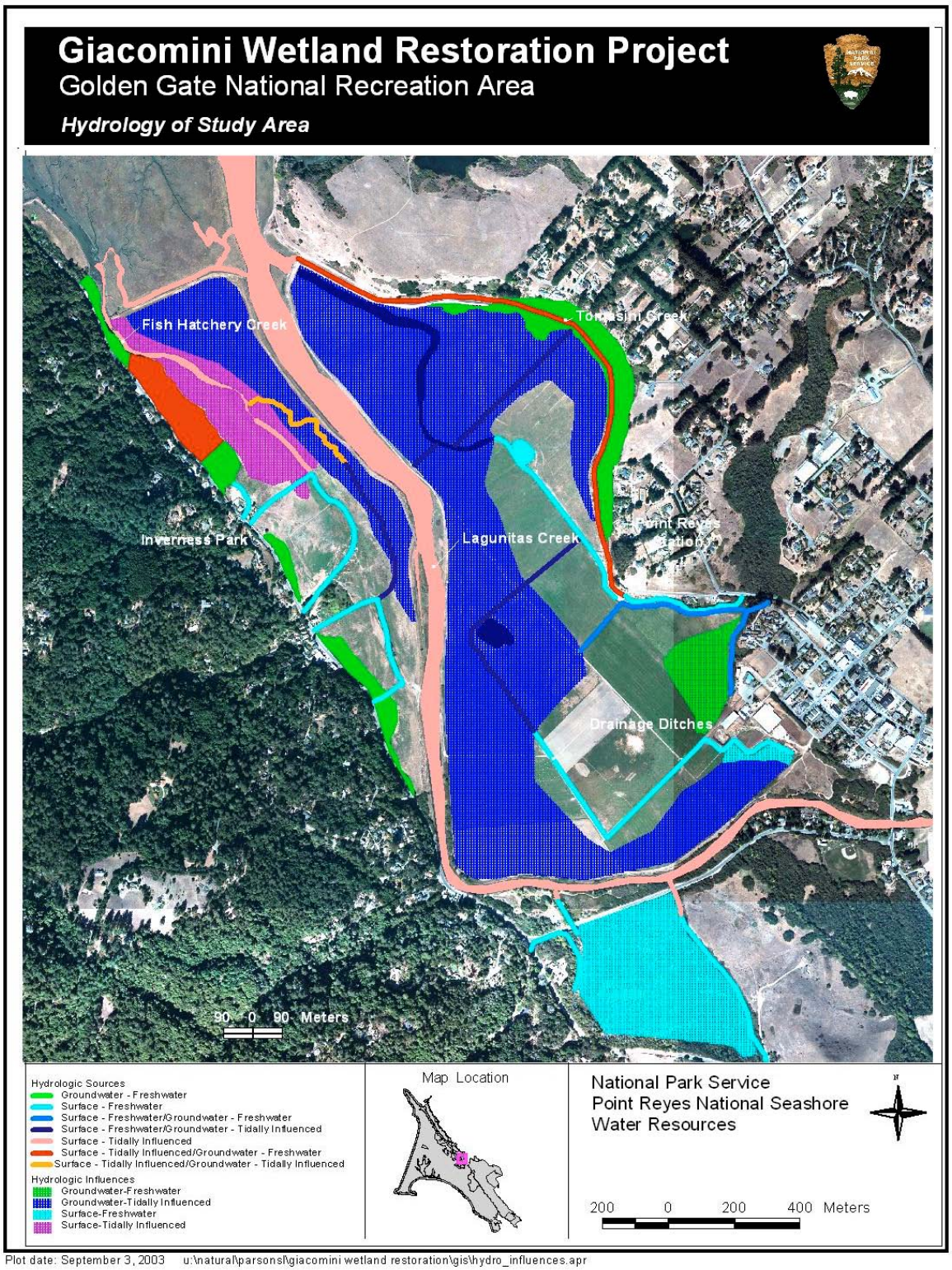


Figure 5. Hydrologic sources and influences within the Giacomini Wetland Restoration Project Study Area and vicinity.

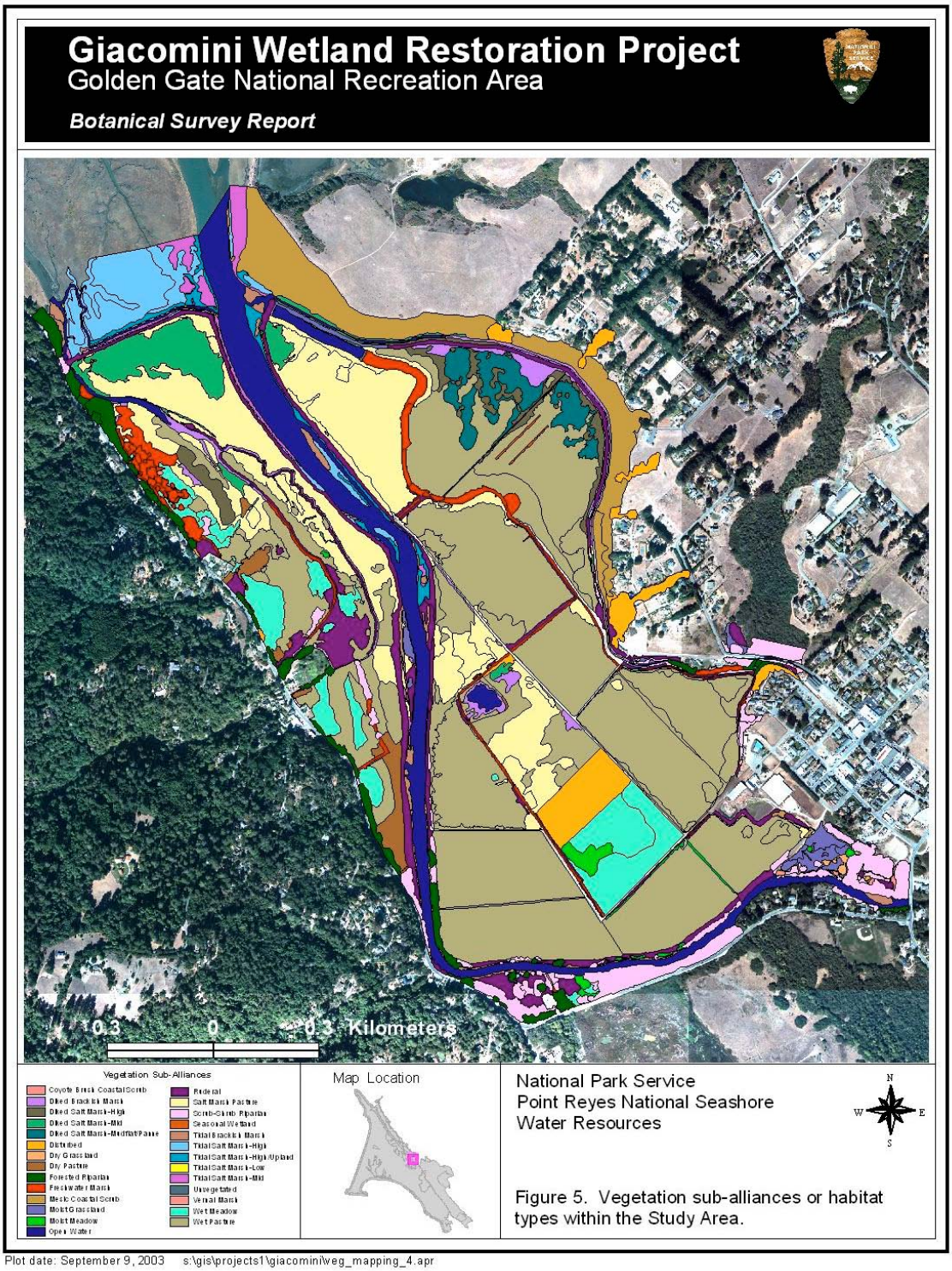


Figure 6. Vegetation sub-alliances or habitat types within the Giacomini Wetland Restoration Project Study Area and vicinity.

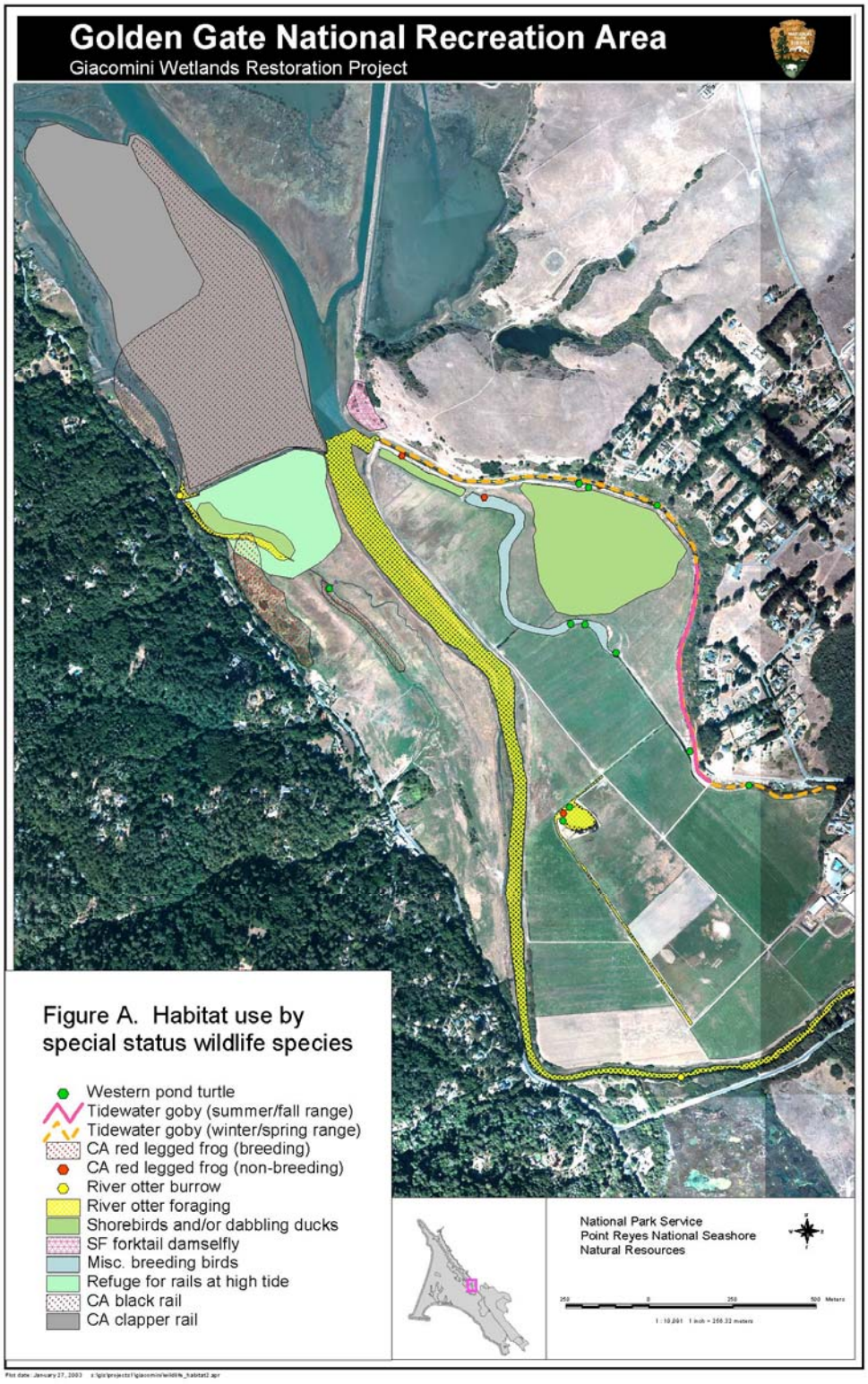


Figure 7. Habitat use by special status wildlife species in the Giacomini Wetland Restoration Project Study Area and vicinity.

TABLE 3: List of CalIPC Invasive Species documented in the Giacomini Wetland Restoration Project Study Area during 2001-2003.

COMMON NAME	SCIENTIFIC NAME	COMMENTS
List A-1: Most Invasive Wildland Pest Plants; Widespread		
cheat grass	*Bromus tectorum*	Very uncommon
yellow star thistle	*Centaurea solstitialis*	Very uncommon
pampas grass	*Cortaderia selloana*	Only one (1) occurrence; one (1) individual in East Pasture near Tomasini Creek berm.
Scotch broom	*Cytisus scoparius*	Only one (1) occurrence
Cape ivy	*Delairea odorata*	Present in 13 polygons mapped in Forested and Scrub-Shrub Riparian habitat along Sir Francis Drake road.
eucalyptus	*Eucalyptus globulus*	Present in 32 polygons. Most occur in monotypic stands along "face" of Point Reyes Mesa.
fennel	*Foeniculum vulgare*	Very common. Present in 105 polygons, sometimes in very high densities on levees and berms along channels.
French broom	*Genista monspessulana*	Very uncommon.
Himalayan blackberry	*Rubus discolor*	Very common. Present in 200 riparian-associated polygons, often in fairly high densities.
List A-2: Most Invasive Wildland Pest Plants; Regional		
pennyroyal	*Mentha pulegium*	Very common (88 polygons) in wetland areas and dense in those areas in which it occurs.
List B: Wildland Pest Plants of Lesser Invasiveness		
wild mustard	*Brassica nigra*	Very common. Present in 60 polygons.
Italian thistle	*Carduus pynocephalus*	Moderately common. Present in 44 polygons, but typically not in high densities. Found within pastures and levees/berms.
bull thistle	*Cirsium vulgare*	Very common. Present in 152 polygons, but typically not in large densities. Found within pastures and levees/berms.
poison hemlock	*Conium maculatum*	Very common. Present in 195 polygons. Often dense along levees and berms of channels.
tall fescue	*Festuca arundinacea*	Very common. Present in 228 polygons. Typically dense patches within larger Wet Pasture or Salt Marsh Pasture areas.
List B: Wildland Pest Plants of Lesser Invasiveness		
common velvet grass	*Holcus lanatus*	Very common. Present in 158 polygons, but typically not in high densities.
Harding grass	*Phalaris aquatica*	Uncommon. Present in only 14 polygons. Typically not in high densities, with one exception near Tomasini Creek.
greater periwinkle	*Vinca major*	Uncommon. Present in 26 polygons in Forested and Scrub-Shrub Riparian habitat along Sir Francis Drake Boulevard.
Need More Information		
caper spurge	*Euphorbia lathyris*	Very uncommon. Present in only six (6) polygons in very low densities.
rough cat's-ear	*Hypochaeris radicata*	Common. Present in 26 polygons. Often found in drier pastures and levees and berms.
	Phyla nodiflora	Very uncommon. Present in only two (2) polygons.

TABLE 3 (CONT.): List of CalIPC Invasive Species documented in the Giacomini Wetland Restoration Project Study Area during 2001-2003.

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Considered, but not Listed		
field bindweed	*Convolvulus arvensis*	Very uncommon. Present in only eight (8) polygons and typically in low densities.
foxglove	*Digitalis purpurea*	Very uncommon. Present in only one (1) polygon.
California bur clover	*Medicago polymorpha*	Very uncommon. Present in only two (2) polygons.
bristly ox-tongue	*Picris echioides*	Common. Present in 66 polygons, but typically in fairly low densities.
milk thistle	*Silybum marianum*	Common. Present in 27 polygons and typically in low densities within pastures and levees.
spiny cocklebur	*Xanthium spinosum*	Common. Present in 19 polygons. Sometimes dense in areas where it does occur. Occurs along ranch roads, dairy facilities, drainage ditches, and low spots in pastures.

TABLE 4. Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
	Mammals			
√	*Didelphis marsupialis virginiana*	Virginia Opossum		
√	*Sorex vagrans vagrans*	Vagrant Shrew		
	Sorex pacificus sonomae	Pacific Shrew*		
	Sorex trowbridgei montereyensis	Trowbridge's Shrew*		
	Neurotrichus gibbsi hyacinthinus	Shrew-mole		
	Scapanus latimanus caurinus	Broad-handed Mole		
√	*Myotis lucifugus alascensis*	Little Brown Myotis?		
	Myotis evotis	Long-eared Myotis*	(FSC)	
	Myotis yumanensis saturantus	Yuma Myotis*	(FSC)	
	Myotis thysanodes thysanodes	Fringed Myotis*	(FSC)	
	Myotis volans longicrus	Long-legged Myotis*	(FSC)	
√	*Myotis californicus caurinus*	California Myotis		
	Lasionycteris noctivagrans	Silver-haired Bat*	transient	
?	*Pipistrellus hesperus*	Western Pipistrelle?		
√	*Eptesicus fuscus bemardimus*	Big Brown Bat		
	Lasiurus borealis teliotis	Red Bat		
	Lasiurus cinereus	Hoary Bat		
	Corynorhinus townsendii townsendii	Townsend's Western Big-eared Bat*	(FSC), CSC	
	Antrozous pallidus	Pallid Bat	CSC	
√	*Tadarida brasiliensis*	Brazilian Free-tailed Bat		
√	*Sylvilagus bachmani ubericolor*	Brush Rabbit		
√	*Lepus califomicus califomicus*	Black-tailed Jackrabbit		
	Aplodontia rufa phaea	Point Reyes Mountain Beaver*	(FSC)	
√	*Eutamias sonomae alleni*	Sonoma Chipmunk		
	Spermophilus beecheyi douglasi	California Ground Squirrel*		
	Sciurns griseus griseus	Western Gray Squirrel		
√	*Thomomys bottae minor*	Valley Pocket Gopher		
	Reithrodontomys megalotis longicaudis	Western Harvest Mouse		
√	*Peromyscus maniculatus rubidus*	Deer Mouse		
√	*Neotoma fuscipes monochroura*	Dusky-footed Woodrat		
√	*Microtus californicus eximus*	California Vole		
√	*Ondatra zibethica*	Muskrat		
√	*Rattus norvegicus norvegicus*	Norway Rat	non-native	
	Mus musculus	House Mouse	non-native	
?	*Zapus trinotatus orarius*	Point Reyes Jumping Mouse	(FSC)	
√	*Canis latrans ochropus*	Coyote		
√	*Vulpes fulva*	Red Fox	non-native	
√	*Urocyon cinereoargenteus townsendi*	Gray Fox		
	Bassariscus astutus raptor	Ringtail		

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
√	*Procyon lotor psora*	Raccoon		
	Mustela erminea	Short-tailed Weasel		
√	*Mustela frenata munda*	Long-tailed weasel		
	Mustela vison aestruarina	Mink		
√	*Lutra Canadensis sonorae*	Southwestern River Otter	(FSC)	
	Taxidea taxus neglecta	Badger		
	Spilogale putorius phenax	Spotted Skunk		
√	*Mephitis occidentalis*	Striped Skunk		
	Felis concolor californicus	Mountain Lion		
	Lynx rufus californicus	Bobcat		
√	*Felis domesticus*	Feral Cat	non-native	
	Dama dama dama	Fallow Deer	non-native	
√	*Odocoileus hemionus columbianus*	Mule Deer		
	Eumetopias jubatus	Steller's Sea Lion	FT	
√	*Phoca vitulina richarii*	Pacific Harbor Seal		
√	*Zalophus californianus*	California Sea Lion		
	Birds (73 taxa)			
√	*Gavia stellata*	Red-throated Loon		
	Gavia immer	Common Loon	(FSC)	
√	*Podilymbus podiceps*	Pied-billed Grebe		
√	*Aechmophorus occidentalis*	Western Grebe		
√	*Aechmophorus clarkii*	Clark's Grebe		
√	*Pelicanus erythrorhynchos*	American White Pelican	BSSC1	
√	*Pelecanus occidentalis californicus*	California Brown Pelican	FE, SE	
√	*Phalacrocorax auritus*	Double-crested Cormorant	CSC	
√	*Botarus lengtiginosus*	American Bittern	(FSC), BSSC3	
	Ixobrychus exilis hesperis	"Western" Least Bittern*	BSSC3	
√	*Ardea herodias*	Great Blue Heron		
√	*Ardea alba*	Great Egret		
√	*Egretta thula*	Snowy Egret		
√	*Bubulcus ibis*	Cattle Egret		
√	*Butorides virescens*	Green Heron		
√	*Nycticorax nycticorax*	Black-crowned Night Heron	(FSC)	
√	*Plegadis chihi*	White-faced Ibis	S1	
√	*Cathartes aura*	Turkey Vulture		
√	*Anser albifrons elgasi*	"Tule" Greater White-fronted Goose	BSSC2	
√	*Chen caerulescens*	Snow Goose		
√	*Chen rossii*	Ross's Goose		
√	*Branta canadensis*	Canada Goose		
√	*Branta canadensis minima*	"Aleutian" Canada Goose	FD	
√	*Branta canadensis minima*	"Cackling" Canada Goose	BSSC2	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
√	*Branta bernicla nigricans*	Black Brant	BSSC3	
√	*Cygnus columbianus*	Tundra Swan		
√	*Aix sponsa*	Wood Duck		
√	*Anas strepera*	Gadwall		
√	*Anas penelope*	Eurasian Wigeon		
√	*Anas americana*	American Wigeon		
√	*Anas platyrhynchos*	Mallard		
√	*Anas discors*	Blue-winged Teal		
√	*Anas cyanoptera*	Cinnamon Teal		
√	*Anas clypeata*	Northern Shoveler		
√	*Anas acuta*	Northern Pintail		
√	*Anas crecca*	Green-winged Teal		
√	*Aythya valisineria*	Canvasback		
√	*Aythya americana*	Redhead	BSSC2	
√	*Aythya collaris*	Ring-necked Duck		
√	*Aythya marila*	Greater Scaup		
√	*Aythya affinis*	Lesser Scaup		
√	*Melanitta perspicillata*	Surf Scoter		
	Melanitta fusca	White-winged Scoter		
√	*Bucephala albeola*	Bufflehead	BSSC3	
√	*Lophodytes cucullatus*	Hooded Merganser		
√	*Mergus merganser*	Common Merganser		
√	*Mergus serrator*	Red-breasted Merganser		
√	*Oxyura jamaicensis*	Ruddy Duck		
√	*Pandion haliaetus*	Osprey	CSC	
√	*Elanus leucurus*	White-tailed Kite	(FSC)	
	Haliaeetus leucocephalus	Bald Eagle*	FT, SE	
√	*Circus cyaneus*	Northern Harrier	CSC, BSSC2	
√	*Acipiter striatus*	Sharp-shinned Hawk	CSC	
√	*Accipiter cooperi*	Cooper's Hawk	CSC	
√	*Buteo lineatus*	Red-shouldered Hawk		
√	*Buteo jamaicensis*	Red-tailed hawk		
√	*Buteo regalis*	Ferruginous hawk*	(FSC), CSC	
√	*Buteo lagopus*	Rough-legged Hawk*		
√	*Aquila chrysaetos*	Golden Eagle*	CSC	
√	*Falco sparverius*	American Kestrel		
√	*Falco columbarius*	Merlin	CSC	
√	*Falco peregrinus anatum*	American Peregrine Falcon	SE, FD, (FSC)	
	Falco mexicanus	Prairie Falcon	BSSC3	
√	*Meleagris gallopavo*	Wild Turkey	non-native	
√	*Callipepla californica*	California Quail		
√	*Coturnicops noveboracensis*	Yellow Rail	CSC, BSSC2	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †
√	*Laterallus jamaicensis coturniculus*	"California" Black Rail	ST, (FSC)
√	*Rallus longirostris obsoletus*	"California" Clapper Rail	FE, SE
√	*Rallus limicola*	Virginia Rail	
√	*Porzana carolina*	Sora	
	Gallinula chloropus	Common Moorhen	
√	*Fulica americana*	American Coot	
√	*Grus canadensi tabida*	Greater Sandhill Crane	ST
√	*Pluvialis squatarola*	Black-bellied Plover	
√	*Charadrius semipalmatus*	Semipalmated Plover	
√	*Charadrius vociferus*	Killdeer	
√	*Recurvirostra americana*	American Avocet	
√	*Tringa melanoleuca*	Greater Yellowlegs	
√	*Tringa flavipes*	Lesser Yellowlegs	
√	*Tringa solitaria*	Solitary Sandpiper	
√	*Catoptrophorus semipalmatus*	Willet	
√	*Actitis macularia*	Spotted Sandpiper	
√	*Numenius phaeopus*	Whimbrel	
√	*Numenius americanus*	Long-billed Curlew	(FSC)
√	*Limosa fedoa*	Marbled Godwit	
√	*Calidris alba*	Sanderling	
√	*Calidris mauri*	Western Sandpiper	
√	*Calidris minutilla*	Least Sandpiper	
√	*Calidris alpina*	Dunlin	
√	*Limnodromus griseus*	Short-billed Dowitcher	
√	*Limnodromus scolopaceus*	Long-billed Dowitcher	
√	*Gallinago delicata*	Wilson’s Snipe	
√	*Phalaropus lobatus*	Red-necked Phalarope	
√	*Larus philadelphia*	Bonaparte's Gull	
√	*Larus canus*	Mew Gull	
√	*Larus delawarensis*	Ring-billed Gull	
√	*Larus californicus*	California Gull	CSC
√	*Larus argentatus*	Herring Gull	
√	*Larus occidentalis*	Western Gull	
√	*Larus glaucescens*	Glaucous-winged Gull	
√	*Sterna caspia*	Caspian Tern	
√	*Sterna elegans*	Elegant Tern	(FSC), SCS, BSSC3
√	*Sterna forsteri*	Forster's Tern	
	Chlidonias niger	Black Tern	(FSC), BSSC3
√	*Uria aalge*	Common Murre	
√	*Columba livia*	Rock Dove	non-native
√	*Columba fasciata*	Band-tailed Pigeon	
√	*Zenaida macroura*	Mourning Dove	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †
√	*Tyto alba*	Barn Owl	
√	*Bubo virginianus*	Great Horned Owl	
√	*Athene cunicularia*	Burrowing Owl	(FSC), CSC, BSSC1
	Strix occidentalis caurina	"Northern" Spotted Owl	FT
	Asio otus	Long-eared Owl	BSSC2
	Asio flammeus	Short-eared Owl	(FSC), BSSC2
	Aegolius acadicus	Northern Saw-whet Owl	
	Cypseloides niger	Black Swift*	SSC
√	*Chaetura vauxi*	Vaux's Swift	(FSC) ,BSSC3
√	*Calypte anna*	Anna's Hummingbird	
√	*Selasphorus sasin*	Allen's Hummingbird	(FSC)
√	*Ceryle alcyon*	Belted Kingfisher	BSSC3
√	*Melanerpes formicivorus*	Acorn Woodpecker	
√	*Sphyrapicus ruber*	Red-breasted Sapsucker	(FSC)
√	*Picoides nuttallii*	Nuttall's Woodpecker	
√	*Picoides pubescens*	Downy Woodpecker	
√	*Picoides villosus*	Hairy Woodpecker	
√	*Colaptes auratus*	Northern Flicker	
√	*Dryocopus pileatus*	Pileated Woodpecker*	
√	*Contopus cooperi*	Olive-sided Flycatcher	(FSC), BSSC2
√	*Contopus sordidulus*	Western Wood-Pewee	
√	*Empidonax traillii*	Willow Flycatcher	SE
√	*Empidonax hammondii*	Hammond's Flycatcher	
√	*Empidonax difficilis*	Pacific-slope Flycatcher	(FSC)
√	*Sayornis nigricans*	Black Phoebe	
√	*Sayornis saya*	Say's Phoebe	
√	*Myiarchus cinerascens*	Ash-throated Flycatcher	
√	*Tyrannus verticalis*	Western Kingbird	
	Lanius cristatus	Brown Shrike	
√	*Lanius ludovicianus*	Loggerhead Shrike	(FSC), CSC
	Vireo bellii pusillus	Least Bell's Vireo	SE; FE
√	*Vireo cassinii*	Cassin's Vireo	
√	*Vireo huttoni*	Hutton's Vireo	
√	*Vireo gilvus*	Warbling Vireo	
√	*Cyanocitta stelleri*	Steller's Jay	
√	*Aphelocoma californica*	Western Scrub-Jay	
√	*Corvus brachyrhynchos*	American Crow	
√	*Corvus corax*	Common Raven	
√	*Eremophila alpestris actia*	California Horned Lark	CSC, BSSC3
√	*Progne subis arboricola*	Purple Martin	CSC, BSSC1
√	*Tachycineta bicolor*	Tree Swallow	
√	*Tachycineta thalassina*	Violet-green Swallow	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †
√	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	
	Riparia riparia	Bank Swallow	ST, (FSC)
√	*Petrochelidon pyrrhonota*	Cliff Swallow	
√	*Hirundo rustica*	Barn Swallow	
√	*Poecile rufescens*	Chestnut-backed Chickadee	
√	*Baeolophus inornatus*	Oak Titmouse	
√	*Psaltriparus minimus*	Bushtit	
√	*Sitta canadensis*	Red-breasted Nuthatch	
√	*Sitta pygmaea*	Pygmy Nuthatch	
√	*Certhia americana*	Brown Creeper	
√	*Thryomanes bewickii*	Bewick's Wren	FSC
√	*Troglodytes aedon*	House Wren	
√	*Troglodytes troglodytes*	Winter Wren	
√	*Cistothorus palustris*	Marsh Wren	
√	*Regulus satrapa*	Golden-crowned Kinglet	
√	*Regulus calendula*	Ruby-crowned Kinglet	
	Polioptila caerulea	Blue-gray Gnatcatcher	
√	*Sialia mexicana*	Western Bluebird	
√	*Catharus ustulatus oedicus*	"California" Swainson's Thrush	BSSC3
√	*Catharus guttatus*	Hermit Thrush	
√	*Turdus migratorius*	American Robin	
√	*Ixoreus naevius*	Varied Thrush	
√	*Chamaea fasciata*	Wrentit	
√	*Mimus polyglottos*	Northern Mockingbird	
√	*Sturnus vulgaris*	European Starling	non-native
√	*Anthus rubescens*	American Pipit	
√	*Vermivora celata*	Orange-crowned Warbler	
√	*Dendroica petechia*	Yellow Warbler	CSC, BSSC2
√	*Dendroica coronata*	Yellow-rumped Warbler	
√	*Dendroica nigrescens*	Black-throated Gray Warbler	
√	*Dendroica townsendi*	Townsend's Warbler	
√	*Dendroica occidentalis*	Hermit Warbler	(FSC)
	Dendroica palmarum	Palm Warbler	
	Setophaga ruticilla	American Redstart	
√	*Geothlypis trichas sinuosa*	"San Francisco" Common Yellowthroat	(FSC), CSC, BSSC1
√	*Wilsonia pusilla*	Wilson's Warbler	
√	*Icteria virens*	Yellow-breasted chat	CSC, BSSC3
√	*Pipilo maculatus*	Spotted Towhee	
√	*Pipilo crissalis*	California Towhee	
√	*Spizella passerina*	Chipping Sparrow	
√	*Chondestes grammacus*	Lark Sparrow	(FSC)
√	*Passerculus sandwichensis*	Savannah Sparrow	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
√	*Ammodramus savannarum*	Grasshopper Sparrow	BSSC2	
√	*Ammodramus nelsoni*	Nelson's Sharp-tailed Sparrow*		
√	*Passerella iliaca*	Fox Sparrow		
√	*Melospiza melodia*	Song Sparrow		
√	*Melospiza lincolnii*	Lincoln's Sparrow		
√	*Melospiza georgiana*	Swamp Sparrow		
√	*Zonotrichia albicollis*	White-throated Sparrow		
√	*Zonotrichia leucophrys*	White-crowned Sparrow		
√	*Zonotrichia atricapilla*	Golden-crowned Sparrow		
√	*Junco hyemalis*	Dark-eyed Junco		
√	*Pheucticus melanocephalus*	Black-headed Grosbeak		
√	*Passerina amoena*	Lazuli Bunting		
√	*Dolichonyx oryzivorus*	Bobolink		
√	*Agelaius phoeniceus*	Red-winged Blackbird		
√	*Agelius tricolor*	Tricolored Blackbird	(FSC), BSSC1	
√	*Sturnella neglecta*	Western Meadowlark		
√	*Xanthocephalus xanthocephalus*	Yellow-headed Blackbird	BSSC1	
√	*Euphagus cyanocephalus*	Brewer's Blackbird		
√	*Molothrus ater*	Brown-headed Cowbird		
√	*Icterus bullockii*	Bullock's Oriole		
√	*Carpodacus purpureus*	Purple Finch		
√	*Carpodacus mexicanus*	House Finch		
√	*Loxia curvirostra*	Red Crossbill		
√	*Carduelis pinus*	Pine Siskin		
√	*Carduelis psaltria*	Lesser Goldfinch		
√	*Carduelis lawrencei*	Lawrence's Goldfinch		
√	*Carduelis tristis*	American Goldfinch		
	Coccothraustes vespertinus	Evening Grosbeak		
√	*Passer domesticus*	House Sparrow		
	Reptiles			
√	*Sceloporus occidentalis*	Western Fence Lizard		
√	*Pituophis melanoleucus*	Pacific Gopher Snake		
√	*Thamnophis elegans*	Western Terrestrial Garter Snake		
	Thamnophis couchi	Western Aquatic Garter Snake		
√	*Clemmys marmorata mormorata*	Northwestern Pond Turtle	(FSC), CSC	
	Amphibians			
√	*Batrachoseps attenuatus*	California Slender Salamander		
√	*Hyla reglia*	Pacific Tree Frog		
√	*Rana aurora draytonii*	California red-legged frog	FT, CSC	
√	*Rana catesbeiana*	Bullfrog		

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
	Fish			
√	*Lampetra tridentata*	Pacific Lamprey	(FSC)	
√	***Acipenser transmontanus***	White Sturgeon		
√	*Clupea pallasi*	Pacific Herring		
√	*Alosa sapidissima*	American Shad	non-native	
√	*Engraulis mordax*	Northern Anchovy		
√	*Oncorhynchus tshawytscha*	Chinook Salmon	FT	
√	*Oncorhynchus kisutch*	Coho or Silver Salmon	FT, SE	
√	*Oncorhynchus mykiss irideus*	Steelhead	FT	
	Pogonichthys macrolepidotus	Sacramento splittail	FT	
√	*Hypomesus pretiosus*	Surf Smelt		
	Spirinchus thaleichthys	Longfin Smelt	(FSC), CSC	
√	*Porichthys notatus*	Plainfin Midshipman		
√	*Gambusia affinis*	Mosquitofish	non-native	
√	*Cyprinus carpio*	Carp	non-native	
√	*Atherinops affinis*	Topsmelt		
√	*Lavinia exilicauda*	Hitch		
√	*Lavinia symmetricus*	California ("Tomales") Roach	CSC	
√	*Notemigonus crysoleucas*	Golden Shiner		
√	*Catostomus occidentalis*	Sacramento Sucker	non-native	
√	*Ictalurus punctatus*	Channel Catfish	non-native	
√	*Gasterosteus aculeatus*	Threespine Stickleback		
√	*Syngnathus griseolineatus (leptorhynchus)*	Bay Pipefish		
√	*Morone saxatilis*	Striped Bass	non-native	
√	*Lepomis macrochirus*	Bluegill	non-native	
√	*Micropterus salmoides*	Largemouth Bass	non-native	
√	*Pomoxis nigromaculatus*	Black Crappie	non-native	
√	*Cymatogaster aggregata*	Shiner Perch		
√	*Acanthogobius flavimanus*	Yellowfin Goby	non-native	
√	*Eucyclogobius newberryi*	Tidewater Goby	FE, CSC	
√	*Gillichthys mirabilis*	Longjaw Mudsucker		
√	*Ilypnus gilberti*	Cheekspot Goby		
√	*Clevlandia ios*	Arrow Goby		
√	*Cottus asper*	Prickly Sculpin		
√	*Leptocottus armatus*	Pacific Staghom Sculpin		
√	*Platichthys stellatus*	Starry Flounder		
√	*Gambusia affinis*	Mosquitofish	non-native	
	Invertebrates			
√	*Procambaru species*	crayfish		
√	*Carcinus maenas*	European Green Crab	non-native	
√	*Ischnura gemina*	San Francisco forktail damselfly	FSC	

TABLE 4 (CONT). Vertebrate, reptile, and selected invertebrate species observed in the Giacomini Wetland Restoration Project Area and vicinity during baseline studies. Compiled by Avocet Research Associates, Point Reyes Station, Calif.

Occ.	Scientific Name	Common Name *	Listing status †	
√	*Syncaris pacifica*	California freshwater shrimp	FE	
√	*Palaemon macrodactylus*	Oriental shrimp	non-native	
	*"**Occ**" indicates occurrence status. Those species preceeded by a check mark (√) were detected on site by Avocet Research Associates or are documented by NDDB, National Park Service records, or Philip Williams Associates surveys.*			
	† Listing codes			
	FE = Federal Endangered			
	FT = Federal Threatened			
	FC = Federal Candidate			
	FPE = Federal Proposed Endangered			
	FPT = Federal Proposed Threatened			
	(FSC) = Federal Species of Concern (Designation no longer applicable).			
	FD = Federal Delisted (5-year monitoring ongoing)			
	SE = State Endangered			
	ST= State Threatened			
	CSC= California Species of Concern (California Department of Fish and Game)			
	BSSC = California Department of Fish and Game Bird Species of Special Concern			
	** An asterisk following the common name indicates species that were not detected in reconnaissance studies (2001-2002) but are known to have occurred on the site or in habitat immediately adjacent.*			