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 Golden Gate National Recreation Area currently rely on a classification system 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.

Literature Cited:

Avocet Research Associates. 2003. *Giacomini Marsh Restoration Site Special Status Animal Species: Reconnaissance & Compliance*. Draft. Report to the National Park Service.

California Department of Conservation. March 2000. Important Farmland for Marin County, California.

California Native Plant Society. 1984 (May 16). List of plant species observed at Olema Marsh, Audubon Canyon Ranch property.

Carlton, J.T. and A.M. Kuris. 1975. Keys to decapod crustacea *in* R.I. Smith and J.T. Carlton, eds. *Light's Manual: Intertidal Invertebrates of the Central California Coast*. Third Edition. University of California Press, Berkeley, Calif.

Clark, J.C., E.E. Brabb, H.G. Greene, and D.C. Ross. 1984. *Geology of Point Reyes Peninsula and Implications for San Gregorio Fault History*. *In* Crouch, J.K. and Bachman, S.B., eds. *Tectonics and Sedimentation along the California Margin*. Pacific Section S.E.P.M.: 38:67-86.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Office of Biological Services, Fish and Wildlife Service. U.S. Dept. of the Interior. Washington, D.C.

Daetwyler, C.C. 1966. *Marine geology of Tomales Bay, Central California*. Scripps Institute and Pacific Marine Station. Research Report No. 6.

Davis, J.A., D. Yee, J.N. Collins, S. Schwarzbach, and S.N. Luoma. *In prep*. *Issues in San Francisco Estuary tidal wetlands restoration: Potential for increased mercury accumulation in the estuary food web*. San Francisco Estuary Institute and U.S. Geological Survey.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Waterways Experiment Station, Vicksburg, Miss.

Fellers, Gary. Research scientist. U.S. Geological Survey, Biological Resource Division. Point Reyes Station, Calif. Personal communications dated winter/spring 2004.

Fellers, G.M. and G. Guscio. 2002. *Red-legged Frog Surveys at Giacomini Wetlands, Point Reyes National Seashore*. Western Ecological Research Center, U.S.G.S., Point Reyes National Seashore. Prepared for National Park Service.

Fong, D. 2002. *California Freshwater Shrimp (Syncaris pacifica) and Tidewater Goby (Eucyclogobius newberryi) Surveys, Giacomini Ranch, Marin Co*. Prepared for the Division of Resource Management, Point Reyes National Seashore, National Park Service.

Galloway, A.J. 1977. *Geology of the Point Reyes Peninsula, Marin County, California*. California Division of Mines and Geology. Bulletin 202. Sacramento, Calif.

Hedgpeth, J.W. 1968. *The Aytid Shrimp of the Genus Syncaris in California*. Int. Revue Ges. Hydrobiol. 53:511-524.

Holland, Robert F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. Prepared for The Resources Agency, Department of Fish and Game. October 1986.

Jacobs, David. Professor. University of California at Los Angeles. Los Angeles, Calif. Personal communications dated spring 2004.

Kamman, Greg. Hydrologist. Kamman Hydrology & Engineering. San Rafael, Calif. Personal communications dated October-November 2003.

National Park Service. 2001. *Point Reyes National Seashore Water Quality Monitoring Report: May 1999-May 2001*.

Parsons, L. and L. Allen. 2004a. *Vegetation communities report: Giacomini Wetland Restoration Project*. Point Reyes National Seashore. Point Reyes Station, Calif.

Parsons, L. and L. Allen. 2004b. *Sediment contaminant screening: Giacomini Wetland Restoration Project*. Point Reyes National Seashore. Point Reyes Station, Calif.

Parsons, L. 2003. *Botanical survey report: Giacomini Wetland Restoration Project*. Point Reyes National Seashore. Point Reyes Station, Calif.

North Marin Water District (NMWD) and A.A. Rich and Associates. 1987. *The summer dam*. Prepared for Waldo Giacomini.

Pearson, J.M. 2000. *Fish and Mysids in Two Creeks/Estuary Systems in Marin County, California*. Master's Thesis. San Francisco State University.

Point Reyes National Seashore (Seashore). *in prep*. Outmigrant smolt trap summary monitoring report: 1998-2003. Point Reyes Station, Calif.

PWA (Philip Williams & Associates, Ltd), Wetlands Research Associates, Strong Associates, and L.J. Butler. 1993. *An evaluation of the feasibility of wetland restoration on the Giacomini Ranch, Marin County*. Prepared for the National Park Service.

Rudo, Mark. Archaeologist. National Park Service. Oakland, Calif. Personal communication dated 2002.

Sawyer, Jr., John O. and Todd Keeler-Wolf. 1996. *A Manual of California Vegetation*. California Native Plant Association. Sacramento, California.

Soil Conservation Service (SCS). 1985. *Soil survey of Marin County, California*. U.S. Department of Agriculture in cooperation with the U.S. Department of the Interior, National Park Service, and University of California Agricultural Experiment Station.

Sonoma State University. *A Cultural Resources Study for the Giacomini Wetland Restoration Project, Point Reyes National Seashore, Marin County, California*. Prepared by the Anthropological Studies Center, Sonoma State University, Rohnert Park, California . Prepared for the National Park Service.

Wahrhaftig, C. 1974. *Geology of the Golden Gate National Recreation Area*. Prepared for the National Park Service. University of California, Berkeley. Berkeley, Calif.