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**LOWER GLENBROOK QUARRY AND
DAM RESTORATION PROJECT
WETLAND DELINEATION REPORT
POINT REYES NATIONAL SEASHORE**



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INTRODUCTION

This report describes the methods and results of a delineation of wetlands within in the Lower Glenbrook Dam and Quarry Restoration Project (Project) area. This Project, which aims to remove the dam and recontour the quarry, is proposed by Point Reyes National Seashore (Seashore), a unit of the National Park Service (NPS). The purpose of this study is to map and characterize wetlands within the proposed Project area. The site lies within the coastal zone and is subject to a federal consistency review on the part of the California Coastal Commission (Coastal Commission).

1.1 PROJECT STATEMENT

Funding was obtained through the Abandoned Mine Lands Program of NPS to restore the lower Glenbrook Quarry. The Seashore plans to restore and recontour the quarry through removal of a breached, non-historic dam structure. The intent is to restore a more natural condition to the Philip Burton Wilderness and the Estero de Limantour Preserve. Removal of the dam will allow the return of the natural hydrologic regime in the Estero and remove a distinctive non-conforming structure from the Wilderness area. The quarry is visible to visitors on Limantour Beach, as well as those hiking within the wilderness area.

The objective of the Seashore is to support and protect the natural coastal systems for the protection of wildlife and the enjoyment of visitors. Restoration within the Philip Burton Wilderness Area intends to deconstruct anthropogenic structures and restore natural processes. The Project on Turney Point is intended to restore a two-acre quarry scar and remove more than 20,000 cubic yards of fill (the remains of a dam) from a tidal marsh. Restoration of 3.5 acres of disturbed lands is consistent with Goal Ia1 of the Government Performance and Results Act goals (GPRA). Management of the Wilderness is ongoing, and the short-term impact of mechanized treatment at the site is outweighed by the long-term benefit associated with treatment and closure of the quarry, and removal of the dam facility.

The Project proposal was submitted in 2000 and will be funded with FY 2002 money. Implementation is planned for August 2002. Completion of the Project will likely take five weeks.

1.2 PROJECT AREA SIGNIFICANCE

The California Department of Fish & Game (CDFG) Estero de Limantour Preserve was established in 1972 to "preserve these land and water areas in a natural condition, and protect the aquatic organisms and wildlife therein for public observation and scientific study." The Project area lies within this CDFG preserve and the Phillip Burton Wilderness Area. The Glenbrook watershed is within the Central California Coast Evolutionarily Sensitive Unit (CCCESU) and is designated Essential Fish Habitat for the federally listed coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Oncorhynchus*

mykiss). In 2001, the US Fish and Wildlife Service designated Point Reyes as a core recovery area for the threatened California red-legged frog (*Rana aurora draytonii*).

1.3 PROJECT SUMMARY

The lower Glenbrook pond was constructed across a portion of the Estero de Limantour in the early 1960s, prior to land acquisition by the Seashore. While it was functional, the dam flooded more than ten acres of tidal wetland, impeding passage to the watershed by anadromous fish and severely impairing tidal marsh habitat. Listed in the National Park Service Dam Inventory as the Lower Turney Dam, this pond breached during a storm in January 4, 1982. Upon dam failure, the estuarine system has self-restored by passage through the 80 foot opening, but tidal velocities and volume are still influenced by the remaining 80% of dam structure. Removal of the dam and filling the quarried area will allow for a recontouring and natural regeneration of a vegetated and functional area.

Restoration and fill removal logistics are complicated by limited access to only one side of the dam, the breach in the dam, and the dynamics of tidal fluctuation. Access to the site will be made along abandoned roadbeds beginning at Home Ranch. The Project will require a temporary crossing across the breach in the west side of the dam. The temporary crossing requires rock and minor amounts of fill from the dam to cover and armor temporary culverts while allowing for tidal flow during the Project. Large culverts will be installed to accommodate for wave and tidal action. Consultation with a regional engineer will be performed to determine appropriate construction specifications.

Once the crossing is established, the dam will be deconstructed using a large excavator with a 48 inch bucket. Topsoil from the dam and spillway (east) side of the dam will be removed and stockpiled. The spillway area will be scarified, fill will be added to the cut area, with minor recontouring required. Topsoil will be salvaged from the spillway access area and the dam.

Once work is completed on the spillway, dam fill removal will continue until the material texture returns to silts and clays or until mechanically impractical. These materials will be transported across the dam to the quarry site by on-site dump trucks. The removal will be limited to the footprint of the dam. Restoration of the mudflats will involve only minor smoothing adjacent to the dam. Ultimately, the tidal action will be allowed to make the final adjustments in the mudflats.

The quarry will be restored using fill from the dam and hardened keyway. Restoration will require scarification of the compacted quarry surfaces, recontouring, and grading using a D-8 sized bulldozer with the excavator and loader used to do some of the finish work. The vertical quarry wall will be laid back to a less severe slope after topsoil is removed and stockpiled. As the entire volume removed from the quarry is not available, the contouring will be performed in order to grade the fill into the existing landscape. Topsoiling and revegetation will accelerate recovery of the site.

2.0 METHODS

A wetland survey was conducted on October 23 – 25 2001 by Amy Parravano and David Williard, in an effort characterize estuarine habitat in the vicinity of lower Glenbrook dam and quarry. Wetlands were characterized and delineated according to the USFWS Cowardin Wetland Classification System. A wetland assessment was performed by collecting pertinent data, evaluating wetland criteria, and classifying each wetland type. Wetland boundaries were mapped using GPS.

In addition to a wetland survey and mapping effort, vegetation was characterized and classified. Completed field data forms with wetland and vegetation data are provided in Appendix A.

2.1 WETLAND ASSESSMENT

The Cowardin Wetland Classification System assesses wetlands according to three wetland criteria: hydrophytic vegetation, hydrology, and soils. Once a wetland assessment was complete, wetlands were classified according to the Cowardin System. A site must meet one of the three wetland criteria in order to be classified as a wetland.

2.1.1 Wetland Data Collection

Hydrophytic vegetation, hydrology and hydric soil data were collected while performing field reconnaissance and prior to classifying and mapping wetlands.

Hydrophytic Vegetation Data Collection

Hydrophytic vegetation cover was estimated for each potential wetland. The wetland indicator status was identified for all plant species using the 1996 Draft USFWS National List of Plant Species that Occur in Wetlands. The indicator status is used to determine the probability that a specific plant is found in a wetland habitat. Indicator categories as defined by U.S. Army Corps of Engineers (USACE) Delineation Manual (1987) are shown on Table 1.

Plants categorized as Obligate (OBL) and Facultative Wetland (FACW) species are more commonly adapted to saturated soil conditions within the Seashore and may indicate that wetland conditions are present. If there was any uncertainty regarding the amount of hydrophytic vegetation cover, vegetation data was initially collected as described in the section below, titled "Vegetation Sampling". Wetland indicator status was then recorded for each taxa, from which the sum of hydrophytic vegetation cover was calculated.

Hydrology Indicator Data Collection

Signs of wetland hydrology were identified and documented for potential wetland sites. Hydrology indicators include standing water, standing water depth, soil saturation or oxidized root channels in the upper twelve inches of soil, drift lines, sediment deposits, water marks/water stained leaves, and drainage patterns. Definitions for hydrology indicators follow the USACE Delineation Manual (1987). *Standing water* was recorded

Table1. Definition of Wetland Indicator Categories (USACE 1997)

Wetland Indicator Category	Definition
Obligate (OBL)	Plants that almost always occur (>99% probability) in wetlands.
Facultative Wetland (FACW)	Plants that usually occur (>67-99% probability) in wetlands.
Facultative (FAC)	Plants that are equally likely to occur in wetlands or uplands (33-67% probability).
Facultative Upland (FACU)	Plants that sometimes occur (<33% probability) in wetlands.
Upland (UPL/NI)	Plants that rarely occur (<1% probability) in wetlands

in inches for the average depth found within the wetland. If standing water was not present, the soil was checked for *saturation* and *oxidized root channels* in the upper twelve inches. Examination of these indicators required digging a soil pit to a depth of sixteen inches, observing the level at which water stands in the hole, and recording the presence of oxidized root channels. *Drift lines* are composed of debris such as branches, leaves, and stems that are moved by water and deposited on banks or entangled around vegetation. *Sediment deposits* are thin layers of organic matter or minerals found on vegetation after inundation. When the deposits are primarily organic, the detritus may become encrusted on or slightly above the soil surface. *Water-marks* and *water stained leaves* are bands of fine silt or sediment that have formed around tree trunks or leaves following inundation. *Drainage patterns* within wetlands consist of surface evidence of drainage flow into or through an area. These patterns include scouring of the soil surface, which is evident around roots or persistent vegetation. Special hydrogeomorphic features such as channels, seeps, basins, dune swales are also included in this category. Topographic position must be considered when applying this indicator, as these patterns may occur in upland areas following periods of heavy precipitation.

Hydric Soil Data Collection

In the lowest topographical area of the wetland, a 1½ by 12-inch soil core was removed using a Hoffer™ 21-inch soil probe. The matrix and mottle colors were identified using the Munsell™ Soil Color Chart (2000). The matrix color is the predominant soil color and mottles are contrasting color spots within the soil matrix. The soil chart characterizes soil color according to hue, value, and chroma. Hue measures the overall soil color, value describes the lightness or darkness of the hue, and chroma describes the amount of grayness in the color (USACE 1987).

The soil core was then inspected for hydric indicators including mottling, gleyed coloration, oxidized rhizospheres, sulfidic odor, high organic content and organic

streaking. Hydric soils form when soils remain inundated or saturated for long periods during the growing season. Waterlogged soils create anaerobic conditions, which changes the chemistry of the soil, causing a visual change in soil coloration. In general, under periods of extended inundation soils will turn gray or bluish. In cases of shorter inundation or varying saturation, orange or reddish mottles will appear in the soil matrix. A less reliable indicator is the presence of oxidized root channels or rhizospheres that form reddish marks in the soil surrounding fine plant roots.

2.1.2 Wetland Criteria Evaluation

After data on vegetation, hydrology, and hydric soil were collected, wetland criteria, as defined by the USFWS Cowardin Wetland Classification System, were evaluated to determine whether a wetland was present. A site is considered a wetland if one or more of the three wetland criteria is met. These criteria include presence of hydrophytic vegetation, signs of hydrology, and hydric soil indicators. If at least 50 percent of the wetland is covered with hydrophytic vegetation (FACW or OBL) the first criterion is considered fulfilled. An area meets hydrology criteria if the site is inundated or saturated for more than ten consecutive days some time during the year. The presence of one or more visible hydrology indicators may also meet wetland hydrology criteria. The third wetland criterion is met if soils exhibit any hydric indicators. Soils may be considered hydric if they are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor growth and regeneration of hydrophytic vegetation. Soils formed under these conditions generally display hydric indicators, as listed above, under the "Hydric Soil Data Collection" section.

2.1.3 Wetland Classification

If a site was determined to be a wetland after collecting data and evaluating wetland criteria, it was classified according to the Cowardin System. The hierarchical structure of this classification system is composed of three levels: System, Subsystem, and Class. The systems are subdivided into five subsystems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Systems and subsystems have similar hydrological, geomorphological, chemical, and biological mechanisms within each of their respective categories. Dominant plant life form and physiography and composition of the substrate describe the Class level. Water Regime Modifiers apply to Classes. This category considers specific hydrologic conditions that affect the periodicity and duration of inundation. Special Modifiers describe wetlands that have been created or highly modified by human activities. This includes wetlands that are diked or impounded, excavated, farmed, drained or ditched, grazed by cattle, filled with artificial substrate, or dammed by beavers. A detailed description of the Cowardin classification hierarchy is provided in Appendix D.

Once a wetland was evaluated and classified, it was assigned a mapping code developed by the National Wetlands Inventory (NWI), a division of USFWS. This code is derived from the USFWS Cowardin Wetland Classification System. A description of mapping codes is provided in Appendix C.

In addition to wetland classification, alteration of wetland function through disturbances or artificial structures was also documented for each wetland. This information was recorded in detail in the comment section of the field data form.

2.2 WETLAND MAPPING

Wetlands were typically mapped on the ground using Trimble GPS, which collected ground data at +/- two to sub-meter accuracy. Each polygon was mapped as a "wetland" feature by GPS. The polygon was then classified according to its Cowardin Wetland Type, and assigned the corresponding NWI mapping code. The Trimble GPS was loaded with a wetland data dictionary for classification of each wetland polygon. The data dictionary included fields for the hierarchical structure of the Cowardin Wetland Classification System: System, Subsystem, Class, Water Regime modifier, and special modifiers. These GPS data, including wetland mapping features and classification data, were downloaded daily onto a PC using Trimble Pathfinder Office 2.8. After downloading, contents of the data dictionary were transferred into a theme table where it could be viewed with its associated wetland polygon in ArcView GIS. Polygons that could not be mapped on the ground, due to impassable terrain, were digitized using digital orthoquads as a backdrop.

2.3 VEGETATION SAMPLING AND CLASSIFICATION

Vegetation sampling methods followed the United States Geological Survey (USGS)/NPS Vegetation Mapping and Accuracy Assessment protocol with slight modifications to capture specific wetland vegetation attributes. A comprehensive species list was compiled for each entire wetland polygon; no sub-sampling of polygons was conducted. Percent vegetation cover for each species was determined by visually estimating areal cover of each plant species. Percent cover of each plant taxon was documented as a cover class (<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%). Because vegetation layers overlapped, combined cover could exceed 100 percent.

The wetland indicator status was identified for all listed species using the 1996 Draft USFWS National List of Plant Species that Occur in Wetlands.

The final step in vegetation sampling was to key the wetland plant community to an Alliance and Association, using a dichotomous plant community key developed by Todd Keeler-Wolf (1999). For wetlands that could not be classified according to the key, alternative vegetation types were suggested in the comment field of the field data form. Unknown plants were collected and identified if possible.

3.0 PROJECT SETTING

The lower Glenbrook dam, its 80-foot wide gap and adjacent quarry, located approximately one mile west of Limantour Beach parking area, are visible features from a variety of vistas within the Park, namely Mount Vision and Limantour Spit (see Figure

1). Construction of the lower Glenbrook (Turney) Dam in the early 1960's flooded approximately ten acres of tidal marsh at the mouth of Glenbrook Creek, impounding more than 20 acre-feet of water. Dam construction converted tidal marsh and estuary habitat to open pond. The dam impounded water approximately 10 feet above the tidal limit, impairing access to the watershed for spawning anadromous fish populations. The dam breached in 1982, resulting in reconnection of the estuarine system to the footprint of the pond. While the estuary has returned to a more naturally functioning system, the tidal circulation is limited to the 80-foot breach in the dam.

The quarry was extracted for the sole purpose of dam construction. The take area west of the dam remains nearly barren, with steep walls and a wide flat table. Roads accessing the project area were constructed prior to 1960. Since acquisition by the Seashore, maintenance on some roads has been discontinued. However, the site may still be accessed by use these historic roadbeds.

Geology and Soils

Galloway, 1977 assigned the beds that make up the cliffs surrounding Drakes Bay to the Drakes Bay Formation. Subsequent studies on the part of Clark, et.al. 1984 describe this formation as part of the more broadly distributed Purisima Formation. This formation is described as typically thick to very thick bedded, light olive gray siltstone that, upon weathering becomes nodular and yellowish gray. On the syncline between Inverness Ridge and Point Reyes Headlands, the formation is as much as 490 meters thick. Throughout the Drakes Bay area, the top of the Purisima formation has been removed by erosion.

Turney Point stands up to 200 feet above sea level and is typical of a Purisima Formation bluff on Drakes Bay. Gradual slopes to the sea are bounded by steep slopes in excess of 50% where tidal estuaries flood more ancient river valleys. The bluff ends as a vertical wall representing the cliffs of Drakes Bay.

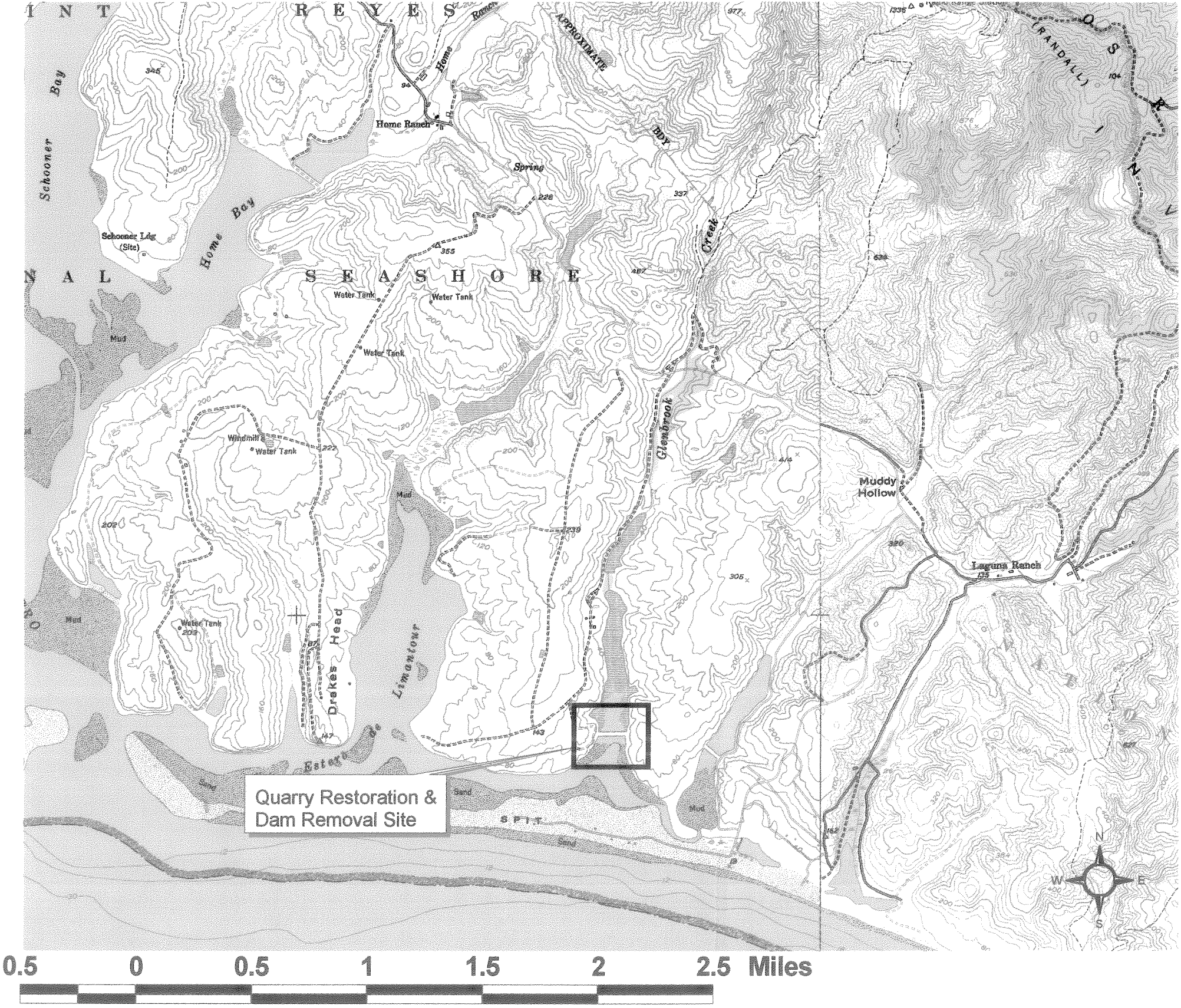
Soils within the area are predominantly Tomales fine sandy loams. Derived from the marine sedimentary Purisima Formation, the Tomales Soil series are deep, moderately well-drained coastal upland soils. The effective rooting depth is 40-60". Permeability is very slow, and runoff is medium to rapid, depending upon slope. Slopes range from 2% to 50%. The hazard of water erosion is moderate to high, depending upon slope. Annual precipitation is 25-35". The Soil Conservation Service derived Marin County Soils Map breaks Turney Point into four soil sub-series associated with the described range of slopes.

In addition, the Rodeo clay loam at the head of the estuary (general area of the Estero Trail Bridge) and Pablo Bayview loam (represented by low gradient, rounded slopes) are found in limited distribution within the Project area.

Vegetation

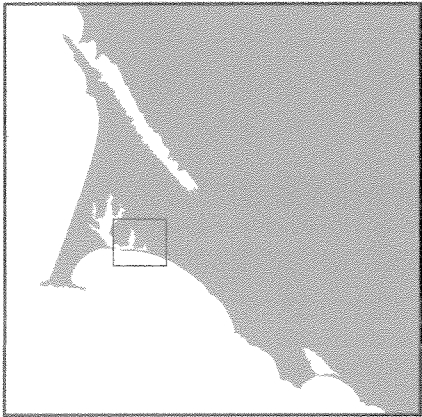
Northern coastal salt marsh (as defined by California Natural Diversity Database and Holland 1986) was reestablished on intertidal mudflats after the dam breached, on the

Figure 1. Map of Lower Glenbrook Dam Removal and Quarry Restoration Project Area



Site Access

USGS 7.5 Minute Quadrangles
Inverness, CA - east
Drakes Bay, CA - west



inside (north) and outside (south) of the dam, bordering subtidal channels. Northern coastal salt marsh is a highly productive plant community dominated by herbaceous and suffrutescent, salt-tolerant hydrophytes, forming a moderate to dense mat of vegetation up to one meter high. Species are segregated vertically into more or less distinct zones defined by the degree to which they are inundated by the tides. The irregularly flooded, hyperhaline, upper marsh zone is dominated by saltgrass (*Distichlis spicata*), associated with various halophytic plant species, including fleshy jaumea (*Jaumea carnosa*), alkali seaheath (*Frankenia salina*), and marsh gum plant (*Grindelia stricta* var. *angustifolia*). Vegetation in this zone is classified as Saltgrass Alliance (Sawyer and Keeler-Wolf 1995). Vegetation occupying the middle elevation, euhaline salt marsh is dominated by pickleweed (*Salicornia virginica*), a succulent, halophytic, perennial salt marsh species, classified as a Pickleweed Alliance. This Alliance is represented locally as pickleweed/saltgrass/fleshy jaumea Association (Sawyer and Keeler-Wolf 1995). Patches of cordgrass (*Spartina foliosa*) inhabit the lower salt marsh, bordering subtidal channels. A complete plant species list is provided in Appendix 1.

Vegetation cover and composition in surrounding upland areas within the Project area, including the spillway, quarry, and dam, show evident signs of disturbance. The quarry and spillway are severely denuded of the organic soil horizon, thus have very little vegetation cover. Vegetation cover on the dam, however, consists of a dense, continuous shrub cover composed of coyote brush (*Baccharis pilularis*) and California blackberry (*Rubus ursinus*) associated with various annual and biennial forbs and graminoids. Invasive and non-native velvet grass (*Holcus lanatus*) dominates the herbaceous layer. Minor herbaceous components include non-native annual grasses such as bristly dogstail grass (*Cynosurus echinatus*) and ripgut brome (*Bromus diandrus*), and native perennial graminoids including blue wildrye (*Elymus glaucus*), tufted hairgrass (*Deschampsia cespitosa*) and spreading rush (*Juncus patens*). Annual and biennial forbs include rough catsear (*Hypochaeris radicata*) and narrowleaf plantain (*Plantago lanceolata*). A plant species list for upland habitats within the Project area is included in Appendix 2.

Scattered, low-growing coyote brush shrubs, associated with a mixture of annual and perennial forbs and grasses, characterize vegetation on surrounding bluffs. Common herbaceous species include blue wildrye (*Elymus glaucus*), Douglas iris (*Iris douglasiana*), Pacific reedgrass (*Calamagrostis* sp.), soft chess (*Bromus mollis*), redtop (*Agrostis alba*) & slender hairgrass (*Deschampsia cespitosa*).

Wildlife

The dam acts as a conduit for travel across the marsh, but requires that species traverse the deeply incised tidal channel. The dam is slowly eroding, but the cliff faces provide habitat for tunnel or cliff dwelling birds. The estuary supports a very vibrant system of avian and aquatic species. A small population of steelhead currently occurs in the lower reach of the watershed. The Seashore is in the process of performing an ecological study of the Glenbrook estuary. The estuary within the use area of a free ranging herd of Tule Elk. Investigations on the dam show that deer use the dam, but it is not clear if they cross the tidal channel.

4.0 COWARDIN WETLAND DELINEATIONS

Wetland mapping and characterization efforts resulted in eight distinct delineations within estuarine and palustrine systems. A map of Cowardin-classified wetlands is provided in Figure 2. Classifications of wetlands within the estuarine system corresponded to vertical stratification of subtidal and intertidal zones with varying degrees of inundation. Non-natural modifiers that influence habitat character and function also differentiated wetland types. The subtidal habitat consists of a single inlet channel that flows through an 80 foot opening in the dam and branches into three smaller channels above the dam. At high tide, the channels flood out onto intertidal flats. The estuary extends upstream approximately 300 meters, where it grades into a mix of fresh and salt water-adapted vegetation at the mouth of Glenbrook Creek. A row of alders bounds the southwestern corner of the Project area. Two small rush dominated, palustrine wetlands occupy the northern end of the spillway and the quarry.

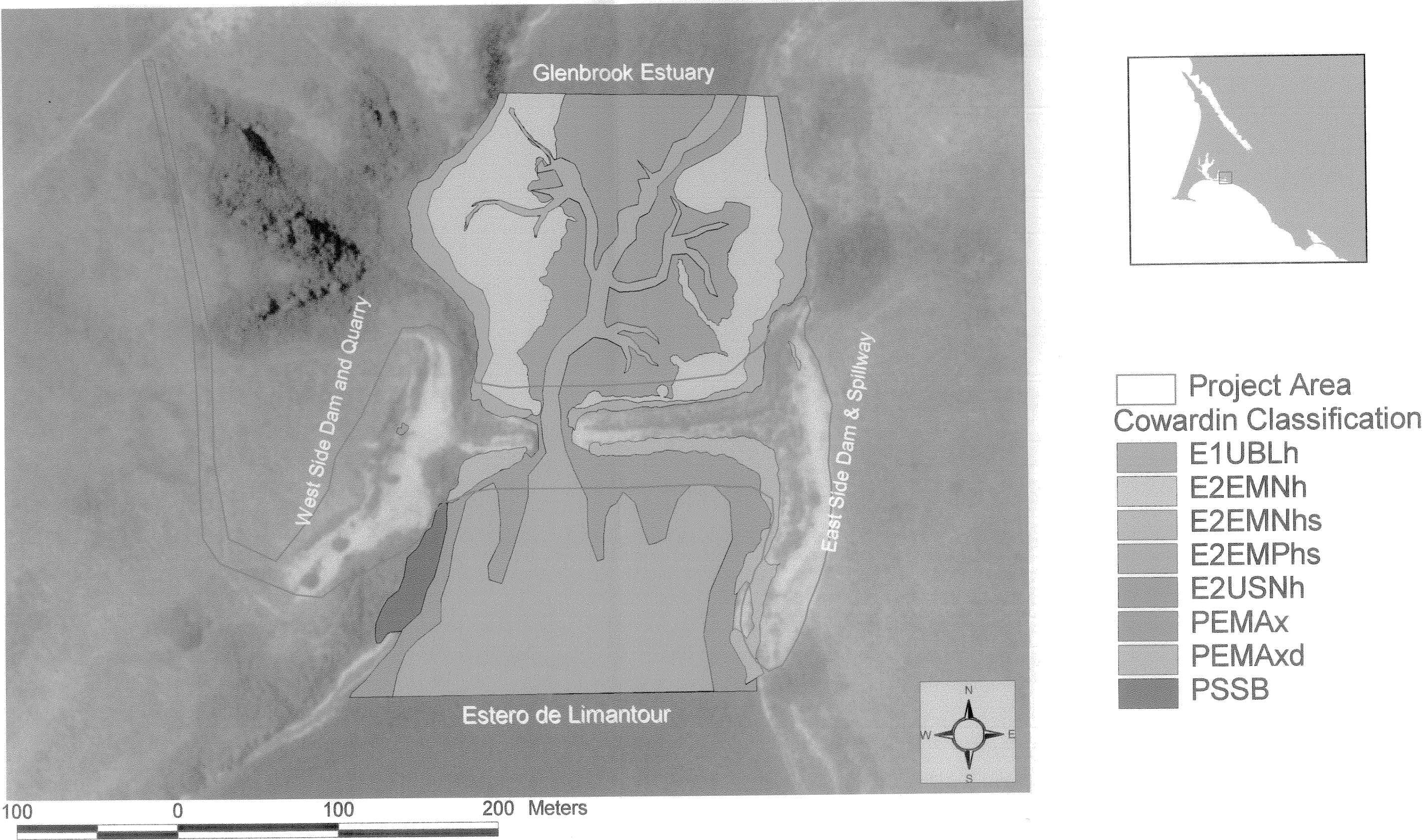
E1UBLh (Estuarine Subtidal, Unconsolidated Bottom, Subtidal, diked/impounded)

This subtidal channel lies within an estuarine system or adjacent tidal wetlands with low energy and variable salinity, semi-enclosed by land. Primary data used to identify the estuarine system is tidal influence, salinity, and plant communities. The Cowardin classification also includes the physiography and composition of the channel's substrate, the water regime, and special modifiers caused by human activity. This channel supports less than 30% vegetation cover and has at least 25% cover of particles smaller than stones (less than 6 – 7 cm diameter), characterizing an unconsolidated bottom classification. Permanently flooded with tidal water, the subtidal channel flows through an 80-foot wide breach in lower Glenbrook dam. The diked and impounded special modifier refers to the impact of the dam structure, which obstructs the inflow and outflow of water. Hydrology indicators include standing water at a depth of 48 inches, saturation in the upper 12 inches, water marks/water stained leaves, sediment deposits, drift lines, and drainage patterns. It was not possible, nor necessary, to collect a soil sample, as the substrate is permanently flooded.

E2EMNh (Estuarine Intertidal, Emergent, Regularly Flooded, diked/impounded)

These intertidal flats are predominantly at mid-littoral elevation, within an estuarine system. They support persistent emergent vegetation, and are alternately flooded and exposed by tides at least once daily. These flats expand upstream (northward) from above the dam opening, encompassing non-vegetated tidal mud flats and a subtidal channel. The emergent classification includes erect, rooted, herbaceous hydrophytes, present throughout the growing season in most years. Vegetation is strongly dominated (over 50% cover) by perennial pickleweed (*Salicornia virginica*), associated with patches of saltgrass on upper margins, and California cordgrass (*Spartina foliosa*) along low-lying areas. The upper margin is bound by irregularly flooded, saltgrass-dominated intertidal flats. As a dike/impoundment, the dam obstructs tidal flow, modifying the shape and extent of wetland boundaries. Hydrology indicators include standing water at a depth of 2 inches, saturation in the upper 12 inches, water marks/water stained leaves, sediment deposits, oxidized root channels, drift lines, and drainage patterns. Hydric soil

Figure 2. Map of wetlands within Lower Glenbrook Dam Removal and Quarry Restoration Project Area.



indicators include high organic content, organic streaking, oxidized rhizospheres, sulfidic odor, gley colors, and mottles. Soil collection and analysis resulted in two matrices within this classification: Gley2 4/10B on the west side of the channel and 7.5YR 4/1 with mottles, Gley2 6/5B, on the east side.

E2EMNhs (Estuarine Intertidal, Emergent, Regularly Flooded, diked/impounded, spoil)

This wetland bounds the downstream (southern) edge of the dam, extending along the east side dam and spillway. It has similar elevation, hydrology and vegetation composition to the wetland classification E2EMNh, as described above. However, this classification has a “spoil” special modifier; most of the substrate is composed of spoil material that has accumulated from erosion of the dam. This substrate exhibits hydric indicators including high organic content, organic streaking, oxidized rhizospheres, sulfidic odor, and mottles. The matrix is 10YR 3/1 with mottles, Gley2 2.5/10B.

E2EMPhs (Estuarine Intertidal, Emergent, Irregularly Flooded, diked/impounded, spoil)

This classification describes an intertidal flat with persistent emergent vegetation that is flooded by tides less often than daily. This wetland polygon represents upper, hyperhaline margins of intertidal salt marsh, encompassing tidal and subtidal portions. In this zone where inundation is uncommon and evaporation is intense, vegetation is adapted to an environment characterized by high salt accumulation. Saltgrass (*Distichlis spicata*; FACW) is the dominant plant species, accounting for over 75% vegetation cover. Saltgrass-dominated areas intergrade with small freshwater, palustrine emergent wetlands occupying gullies and bluff faces that carry surface runoff and drain into to the estuary. Plants adapted to a brackish environment, including Baltic rush (*Juncus balticus*), gumweed (*Grindelia stricta* var. *angustifolia*), rabbitsfoot grass (*Polypogon monspeliensis*) and *Scirpus pungens* are common in this narrow salt/freshwater interface that characterizes the upland boundary. Freshwater-adapted plants, including slough sedge (*Carex obnupta*) and broadleaf cattail (*Typha latifolia*) are also present. As a dike/impoundment, the dam obstructs tidal flow, modifying the shape and extent of wetland boundaries. Some of the substrate is composed of spoil materials. Hydrology indicators include saturation in the upper 12 inches of soil, water marks/water stained leaves, sediment deposits, oxidized root channels, and drift lines. Soil matrix was 10YR 4/3 with mottles Gley1 6/N, exhibiting hydric indicators. These indicators include high organic content, organic streaking, oxidized rhizospheres, gley colors and mottles. Delineation followed the mean high tide line, bordering regularly flooded areas along the lower boundary, and the high water line along upper margins.

PSSB (Palustrine, Scrub-Shrub, Saturated)

This small row of alders is located on the west side of the dam, along the southwest corner of the Project area. This small wetland, dominated by a small red alder (*Alnus rubra*) stand, lies on the upper boundary of a salt-grass dominated intertidal flat. The Scrub-Shrub Class describes an area dominated by woody vegetation less than six meters (20 feet) tall. The hydrologic source is freshwater baseflow or a small groundwater seep. This alder stand is also flooded by tides less often than daily, according to a wrack line along the base of the trees. The wetland lies between the mean high tide line and the high water line. Hydrology indicators include saturation in the upper 12 inches of soil, water

marks/water stained leaves, sediment deposits, oxidized root channels, and drift lines. The soil exhibited hydric features, including high organic content, oxidized rhizospheres, and mottles. The matrix is 10YR 4/3, with Gley1 6/N mottle.

E2USNh (Estuarine Intertidal, Unconsolidated Shore, Regularly Flooded, diked/impounded)

This tidal mud flat, surrounding either side of the subtidal channel, is alternately flooded and exposed by tidal water at least once daily. Supporting less than 30% vegetation cover and having less than 75% areal cover of stones, boulders or bedrock, it is classified as having an unconsolidated shore. As a dike/impoundment, the dam obstructs tidal flow, modifying the shape and extent of wetland boundaries. Hydrology indicators include standing water at a depth of 1 inch, saturation in the upper 12 inches, water marks/water stained leaves, sediment deposits, oxidized root channels, drift lines, and drainage patterns. Hydric soil indicators include high organic content, organic streaking, sulfidic odor, and gley colors. Soil matrix is Gley2 5/10B.

PEMAx (Palustrine Emergent, Temporarily Flooded, excavated)

This tiny wetland patch is situated in a depressional drainage on the west side of the dam, at the base of a steep quarry wall. The hydrologic source is likely a small groundwater seep. It has over 50% hydrophytic vegetation cover, consisting of (*Juncus effusus* var. *brunneus*; FACW+) and chain fern (*Woodwardia fimbriata*; FACW+), associated with coyote brush, huckleberry (*Vaccinium ovatum*), and California blackberry. The depressional drainage feature is the only hydrology indicator observed. The water regime is temporarily flooded. Water ponds for long enough periods to support hydrophytic vegetation, but the water table lies well below the surface for most of the year. Due to the hardness of the substrate, no soil sample was collected to verify. Because of its very small area, this wetland is considered "marginal". However, it was mapped and classified because it meets hydrophytic vegetation and hydrology criteria.

PEMAxd (Palustrine Emergent, Temporarily Flooded, excavated, ditched/drained)

This freshwater wetland occupies a small portion of the northern end of the spillway, under the remains of a footbridge, at the interface with the dam. Excavation of the spillway has created a topographically low lying area that intercepts the groundwater level and serves as a catchment basin for precipitation and surface runoff. Periods of inundation or saturation are long enough to support a prevalence of persistent emergent, hydrophytic vegetation adapted to saturated soil conditions. Vegetation is strongly dominated (over 50% cover) by Baltic rush (*Juncus balticus*; FACW), associated with a ruderal assemblage of California blackberry (*Rubus ursinus*; FAC+) and various facultative, non-native forbs and annual grasses. The only hydrology indicator observed was a drainage pattern, artificially created by construction of the spillway. No soil sample was collected due to hardness of the substrate. The wetland clearly met hydrophytic vegetation criteria of over 50% cover FACW or OBL species. Since only one hydrology indicator was observed, this criteria is marginal. It was not verified in the field whether the wetland meets hydric soil criteria.

5.0 DIRECT PROJECT IMPACTS

Estuarine wetlands above and below the dam have been modified by initial construction of the dam structure. The volume of tidal water flow is restricted by passage through a narrow opening in the dam. This obstruction has decreased the quality and extent of subtidal habitat and tidal mudflats by limiting the amount of water that floods out onto tidal and subtidal flats. This condition has resulted in: (1) a disturbed, intertidal “edge” habitat along the base of the dam and (2) a wider intertidal interface with surrounding upland areas.

Dam removal will restore subtidal habitat and tidal mudflats initially lost by dam construction. A subtidal channel and adjacent tidal mudflats will be directly impacted by construction activities associated with removal of the dam structure (see Table 2). These activities will involve operation of heavy equipment along a 600m² path across the estuary. However, removal of this obstruction will provide long term benefits to this system by increasing the extent of these wetlands and restoring the quality and function of estuarine habitat. Removal will also contribute to NPS land management values associated with Wilderness designation.

Table 2. Net area of wetlands to be directly impacted by dam removal and quarry restoration activities, listed by NWI mapping code (these codes are described in Appendix C).

NWI Mapping Code Description	Net Area (hectares)
E1UBL	0.110
E2USNh	0.365
TOTAL AREA	0.475

Table 3. Net area of wetlands to be lost by dam removal and quarry restoration activities, listed by NWI mapping code.

NWI Mapping Code Description	Net Area (hectares)
PEMAx	0.003
PEMAxd	0.004
Subtotal	0.007
E2EMNh	0.118
E2EMNhs	0.220
E2EMPhs	0.113

Subtotal	0.451
TOTAL AREA	0.458

There will be a corresponding loss of intertidal habitat, associated with restoration of subtidal zones and tidal mudflats. Removal of the dam and recontouring of the quarry will result in a total loss of 0.458 hectare of wetland habitat (see Table 3). This low quality, disturbed habitat developed from non-natural conditions created by construction of the dam and extraction from the quarry. It includes 0.007 hectare of palustrine wetlands in the spillway and quarry and 0.451 hectare of estuarine intertidal wetlands along the dam perimeter. The long-term benefits of restoring the subtidal zone will outweigh the loss of these wetlands.

Removal of these non-conforming structures is intended to enhance both wilderness and coastal values. The dam, though increasing intertidal edge habitat, impedes flow and has altered the natural sediment regime of the estuary. Restoration will impact less than 0.5 hectare of the wetland, while lending to natural hydrologic function in the long term. Restoration will also treat 3.5 acres of disturbed lands which is consistent with Goal Ia1, Disturbed Lands Restoration, of the Government Performance Results Act.

6.0 REFERENCES

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**Point Reyes National Seashore
Lower Glenbrook Quarry and
Dam Restoration Project
Appendices**

Appendix A. Field dataforms

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

✓ DMW

Surveyors Parravano, Williard Date 10/23/01
 NPS Polygon No./ Wetland Patch Code LEDW1 Inclusion #
 Northing 4209590 Easting 509484 Photo No./Time Able to
 Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m
 GPS Point if Taken: Name Accuracy? m Datum if not NAD83 GPS Unit TRIMBLE PRO X-2

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum
Trees			
Conifers			
Hardwoods			
Shrubs			
Herbs	99	10m	

Fill in if snags present
(Snags ≥ 15 degree angle)
per 1/2 hectare
DBH class
Decay code
Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
 Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
 Strata: (G) <.75m (S) .75m- 5m (T) >5m
 DBH classes: (1) <1" (2) 1- 4.9" (3) 5- 8.9" (4) 9- 20.9" (5) 21- 32.9" (6) >33"

Species	Percent Cover	Cover Class	Life Form	Stratum*	Wetland Indicator Status
<i>Salicornia virginica</i>		4			
<i>Spartina foliosa</i>		3b			
<i>Distichlis spicata</i>		4			
<i>Zostera marina</i>		3b			
<i>Juncus balticus</i>		3b			
<i>Carphoxanthus edulis</i>		1			
<i>Grindelia stricta</i> var <i>angustifolia</i>		3a			
<i>Jaumea carnosa</i>		3a			
<i>Triglochin concinna</i>		1			
<i>Scirpus maritimus</i>		1			
<i>Limonium californica</i>		1			
<i>Frankenia salina</i>		1			
<i>Carex obnupta</i>		1			

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES

If YES, ALLIANCE Pickleweed Association Salicornia / Distichlis / Jaumea

If NO, why not?

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each:

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each: 30% Saltgrass, 60% Pickleweed, 10% Cordgrass Alliances.

Do you think vegetation has changed here since 1993? If so, how?

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code 1CDW1 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth _____ in.) ☒ Sediment Deposits _____ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? (YES) NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? (YES) NO

☒ High Organic Content ☒ Oxidized Rhizospheres ☒ Gleyed
☒ Organic Streaking ☒ Sulfidic Odor ☒ Mottled
Munsell hue, value, and chroma soil color: Matrix 10YR4/3 Mottles Gley 16/N

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? (YES) NO UNK
- Is wetland hydrology present? (YES) NO UNK
- Is/are hydric soil(s) present? (YES) NO UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class EM Water Regime N Special Modifiers hS
Is this classified as a NWI wetland? (YES) NO N/A If Yes, NWI Classification E2USN

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

Coastal salt marsh along Limantour Estero, surrounding main side of lower Glenbrook dam. Emergent, intertidal, regularly flooded outer ring of estuary. Significant enough area to map separately; it is an approximately 25-30m wide strip surrounding an inner subtidal portion w/ unconsolidated bottom class. Bound by dam along northern edge. Dominated by pickleweed and saltgrass, with patchy distribution of cordgrass along subtidal area. Minor components include fleshy jaumea, sea lavender, gumplant, and alkali heath. Difficult to key to a single Alliance because saltgrass and pickleweed are strongly mixed and equally abundant. Thin strip of saltgrass on upper margins where pickleweed drops out. Mats of dead eelgrass deposited along drift lines. Distinct topographic, vegetation, and hydrologic transition between wetland and upland habitat types. Band of vegetation surrounded by mudflats on lower / dam on upper side. Baccharis scrub is surrounding vegetation type adjacent to wetland polygon. Strong wrack line w/ driftwood + debris. Mapped @ 3.5' tide

Spillway

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

Surveyors Parravano, Williard Date 10/24/01
NPS Polygon No./Wetland Patch Code LEDW2 Inclusion #
Northing 4209643 Easting 509538 Photo No./Time Able to
Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m
GPS Point if Taken: Name Accuracy? m Datum if not NAD83 GPS Unit TRIMBLE

✓ DMW

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum
Trees			
Conifers			
Hardwoods			
Shrubs	1	.70	
Herbs	99	.40	

Fill in if snags present
(Snags ≥ 15 degree angle)
per 1/2 hectare
DBH class
Decay code
Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%

Height Classes: (1) <5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable

Strata: (G) <.75m (S) .75m-5m (T) >5m

DBH classes: (1) <1" (2) 1-4.9" (3) 5-8.9" (4) 9-20.9" (5) 21-32.9" (6) >33"

Species	Percent Cover	Cover Class	Life Form	Stratum*	Wetland Indicator Status
<i>Juncus balticus</i>		5			FACW+
<i>Iris douglasiana</i>		2			NI
<i>Juncus effusus</i> var <i>brunneus</i>		2			FACW+
<i>Rubus ursinus</i>		3a			FAC+
<i>Baccharis pilularis</i>		1			NI
<i>Achillea millefolium</i>		1			FACU
<i>Anaphalis margaritacea</i>		1			NI
<i>Holcus lanatus</i>		4			FAC
<i>Plantago lanceolata</i>		2			FAC
<i>Elymus glaucus</i>		2			FACU
<i>Festuca arundinacea</i>		1			FAC-
<i>Cirsium vulgare</i>		1			FAC
<i>Rumex acetosella</i>		1			FAC
<i>Cynosurus echinoides</i>		2			NI
<i>Aira caryophylla</i>		1			NI
<i>Vulpia bromoides</i>		1			FACU*
<i>Lupinus arboreus</i>		1			

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES NO

If YES, ALLIANCE Rush Association NIA

If NO, why not?

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each:

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each:

Do you think vegetation has changed here since 1993? If so, how?

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDW2 Inclusion # _____

Hydrology Indicators (check all that apply)

☐ Standing Water (depth _____ in.) ☐ Sediment Deposits ☒ Drainage Patterns
☐ Saturation in Upper 12 Inches ☐ Oxidized Root Channels
☐ Water Marks/Water Stained Leaves ☐ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? ☒ YES ☐ NO ☒ UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? ☒ YES ☒ NO

☐ High Organic Content ☐ Oxidized Rhizospheres ☐ Gleyed
☐ Organic Streaking ☐ Sulfidic Odor ☐ Mottled

Munsell hue, value, and chroma soil color: Matrix _____ Mottles _____

Could not get below 2" too hard.

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? ☒ YES ☐ NO ☐ UNK
- Is wetland hydrology present? ☒ YES ☐ NO ☐ UNK
- Is/are hydric soil(s) present? YES ☐ NO ☒ UNK

NWI Field Classification (fill in wetland letter code)

System P Subsystem _____ Class EM Water Regime A Special Modifiers x,d

Is this classified as a NWI wetland? YES ☒ NO ☐ N/A If Yes, NWI Classification _____

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This is a small, linear wetland totally dominated by Rush. It occupies the North end of the old spillway right where the old trail bridge was. Vegetation is a mix of Rush, Velvet grass and Blackberry. Very dry right now. Could not get a soil sample because ground is too hard. Hydrology is weak because it only shows drainage patterns, which are partially manmade from digging out the spillway. Now this acts as a catchment basin for surface runoff during rainy season. This is a low point in the spillway. Rest is either unvegetated or covered sparsely with upland species. Very disturbed area.

✓ BHW

Surveyors William D. Pavakuro

Date 10/24/00

NPS Polygon No./ Wetland Patch Code LGDW3

Inclusion # _____

Northing 4209630 Easting 509487 Photo No./Time _____ Able to _____

Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m

GPS Point if Taken: Name _____ Accuracy? _____ m Datum if not NAD83 _____ GPS Unit Trimble Pro X-R

Trees		
Conifers		
Hardwoods		
Shrubs		
Herbs	100	25

(Snags ≥ 15 degree angle)

per 1/2 hectare

DBH class

Decay code

Species

Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable

Strata: (G) <.75m (S) .75m- 5m (T) >5m

DBH classes: (1) <1" (2) 1-4.9" (3) 5-8.9" (4) 9-20.9" (5) 21-32.9" (6) >33"

Salicornia virginica
Distichlis spicata
Spartina foliosa
Suaeda carnosa
Zostera marina
Scirpus maritimus
Scirpus pungens
Triolochin concinna

Percent
Cover

Cover Class

Life
Form

Stratu

Wetland
Indicator Status

Were you able to key out vegetation plot? YES

NO

IF YES, ALLIANCE Pickleweed Association Salicornia/ Distichlis/ Jaumea

If NO, why not?

Level of confidence in type? ☒ HIGH ☐ MED ☐ LOW Was plot more than one type? ☒ YES ☐ NO

If Yes, List Types and Approximate Percentage of Each: _____

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each: 35% Cordgrass; 60% Pickleweed
5% Saltgrass.

Do you think vegetation has changed here since 1993? If so, how? *No*

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGBW3 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth 1 in.) ☒ Sediment Deposits ☒ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? ☒ YES ☐ NO ☐ UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? ☒ YES ☐ NO

☒ High Organic Content ☒ Oxidized Rhizospheres ☒ Gleyed
☒ Organic Streaking ☒ Sulfidic Odor ☒ Mottled
Munsell hue, value, and chroma soil color: Matrix 7.5YR 4/1 Mottles Gley 2 6/5B

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? ☒ YES ☐ NO ☐ UNK
- Is wetland hydrology present? ☒ YES ☐ NO ☐ UNK
- Is/are hydric soil(s) present? ☒ YES ☐ NO ☐ UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class EM Water Regime N Special Modifiers h

Is this classified as a NWI wetland? ☒ YES ☐ NO ☐ N/A If Yes, NWI Classification E2EM/USN and E2USP

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

Intertidal saltmarsh above (North) lower
Calenbrook dam. Floods on a daily basis via tidal flow
through opening in dam. Majority of wetland dominated by
Pickleweed w/ minor of saltgrass, fleshy yarrow, and
Scirpus spp. The other major component was
made up of isolated patches of Cordgrass that
occupied lower, wetter margins of this wetland.
They were bordered by unvegetated mudflats
on the marsh side. Land side of polygon
bordered by a thin strip of saltmarsh wetland
that is flooded less often
than daily. It is dominated
by Saltgrasses with Pickleweed,
Juncus balticus and Grindellia
stricta components. That strip
of Wetland designated as "LGBW4"

$\sqrt{DML}$

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum	Fill in if snags present
Trees				(Snags ≥ 15 degree angle)
Conifers				# per $\frac{1}{2}$ hectare
Hardwoods				DBH class
Shrubs	—			Decay code
Herbs	100	0.5m		Species

[illegible]

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LG1BW4 Inclusion # _____

Hydrology Indicators (check all that apply)

☐ Standing Water (depth _____ in.) ☒ Sediment Deposits ☐ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

☒ High Organic Content ☒ Oxidized Rhizospheres ☒ Gleyed
☒ Organic Streaking ☐ Sulfidic Odor ☒ Mottled
Munsell hue, value, and chroma soil color: Matrix 10YR4/3 Mottles Gley 1 G/N

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class EM Water Regime P Special Modifiers h, s

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification _____

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This wetland is a thin strip of tidal flat that is irregularly flooded. It is dominated by emergent hydrophytic vegetation. The overall dominant was Saltgrass with associated components of *Grindellia stricta*, *Juncus balticus*, *Pickleweed* and *Frankenia salina*. The wetland is bordered by upland dam covered with Coyote Brush scrub on one side and the regularly flooded saltmarsh on the other. This thin strip occupies the area between the daily drift line (eelgrass) and extreme high tide rack line (heavy driftwood debris). There is evidence of deer grazing here. Line of *grindellia* along base of dam slope. The soil here may be mixture of sediment and spoil from the dam.

✓ AMJ

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum	Fill in if snags present
Trees				(Snags ≥ 15 degree angle)
Conifers				# per $\frac{1}{2}$ hectare
Hardwoods				DBH class
Shrubs				Decay code
Herbs	100	0.9 m		Species

[illegible]

Do you think vegetation has changed here since 1993? If so, how?

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDW5 Inclusion # _____

Hydrology Indicators (check all that apply)

- ☒ Standing Water (depth 2 in.) ☒ Sediment Deposits ☒ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

- ☒ High Organic Content ☒ Oxidized Rhizopheres ☒ Gleyed
☒ Organic Streaking ☒ Sulfidic Odor ☐ Mottled

Munsell hue, value, and chroma soil color: Matrix Gley 2 4/10B Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class EM Water Regime N Special Modifiers h

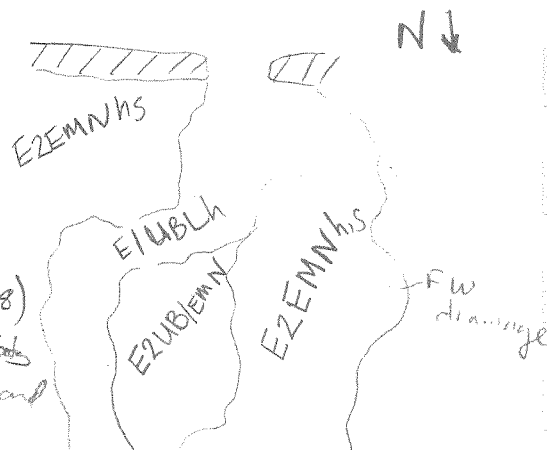
Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification E2EM/USN and E2USP

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

Coastal saltmarsh on intertidal flat above lower Glenbrook dam. Distinct bands of vegetation - cord grass, pickleweed, saltgrass, + rush dominated. Regularly flooded (daily basis). 3 Cowardin types across the flat - estuarine, intertidal, emergent veg. flooded on outer edges, both sides of subtidal channel. Betw estuarine, subtidal, unconsol bottom, subtidal channel and outer portion just described, lies an estuarine, intertidal, emergent/unconsol bottom, regularly flooded salt marsh flat. The only difference between inner + outer intertidal flats is amount of vegetation cover. Since walking out there w/ the GPS is not a viable option, we may just lump these into an EM/UB class.

Difficult to map subtidal boundary accurately since a) can't walk out w/ out sinking in mud and b) the water levels fluctuate on an hourly basis.

Note: Boundary of vegetated salt marsh (LGDW5) mapped using GPS. Subtidal portion digitized (LGDW8) using digital photos and aerial photos. Unvegetated mudflats mapped as remaining area between subtidal portion and vegetated polygon. DML 10/31/01



VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDN6 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth _____ in.) ☒ Sediment Deposits ☒ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

☒ High Organic Content ☒ Oxidized Rhizospheres ☐ Gleyed
☒ Organic Streaking ☒ Sulfidic Odor ☒ Mottled
Munsell hue, value, and chroma soil color: Matrix 10YR 3/1 Mottles G1ay2 2.5/10B

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK *most likely*

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class FM Water Regime N Special Modifiers h s
Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification E2USN

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

Saltmarsh flat bordering marine-side of Western portion of Lower Glenbrook dam. This is a smaller wetland dominated by Pickleweed and Saltgrass with minor components of Jaumea carnosa, Sarcocornia and a layer of Eelgrass along the margins bordering upland. This wetland is bordered by tidal mudflats toward the water and Coyotebrush scrub toward the dam. There are several drift lines within the polygon and one major debris track line at the base of the dam. There is a line of graminoides stricta that follows just inside of the debris line. Seagulls are picking at the head of a large fish at the end of this wetland.

Small
Tunic +
chainmail
patch
Sur

Date 10/26/01

Inclusion #

Photo No./Time	Able to
----------------	---------

If Yes, what is GPS Accuracy? m

GPS Unit *TRIMBLE*

Fill in if snags present	
(Snags ≥ 15 degree angle)	
# per $\frac{1}{2}$ hectare	
DBH class	
Decay code	
Species	

Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable

DBH classes: (1) <1" (2) 1-4.9" (3) 5- 8.9" (4) 9-20.9" (5) 21- 32.9" (6) >33"

[illegible]

Were you able to key out vegetation plot?

YES

NO

HIGH

MED

YES

NO

Yes burned

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LEDW7 Inclusion # _____

Hydrology Indicators (check all that apply)

☐ Standing Water (depth _____ in.) ☐ Sediment Deposits ☒ Drainage Patterns
☐ Saturation in Upper 12 Inches ☐ Oxidized Root Channels (swale)
☐ Water Marks/Water Stained Leaves ☐ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

☐ High Organic Content ☐ Oxidized Rhizopheres ☐ Gleyed
☐ Organic Streaking ☐ Sulfidic Odor ☐ Mottled

Munsell hue, value, and chroma soil color: Matrix _____ Mottles _____

Too hard

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK ✓ collect info

NWI Field Classification (fill in wetland letter code)

System P Subsystem _____ Class EM Water Regime A Special Modifiers X

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification _____

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This is a tiny depressional wetland situated at the base of the lower Glenbrook quarry, adjacent to and west of the dam. Although the area of this wetland is below the MMLU used at PORE, it is mapped to achieve full characterization of this project site. It is composed predominantly of FACW and FACW+ vegetation, and is situated in a slight swale, an indication of wetland hydrology. Although this is a particularly dry year, it this wetland patch is saturated or inundated long enough during the growing season to support wetland vegetation under normal circumstances. Source of hydrology is direct runoff from precipitation and groundwater seepage.

subtidal channel

✓ DMW

Northing 4209593 Easting 509385 Photo No./Time _____ Able to _____

GPS Point if Taken: Name _____ Accuracy? _____ m Datum if not NAD83 _____ GPS Unit Trimble

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
Height Classes: (1) <5 m (2) 5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
Strata: (G) <.75m (S) .75m- 5m (T) >5m
DBH classes: (1) <1" (2) 1- 4.9" (3) 5- 8.9" (4) 9- 20.9" (5) 21- 32.9" (6) >33"

* Fill in stratum only if different than life form

If NO, why not? _____

If Yes, List Types and Approximate Percentage of Each: _____

If Yes, List Types and Approximate Percentage of Each: _____

Rev: 10/10/01

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDN8 Inclusion # _____

Hydrology Indicators (check all that apply)

- ☒ Standing Water (depth 48 in.) ☒ Sediment Deposits ☒ Drainage Patterns
☒ Saturation in Upper 12 Inches ☐ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site ~~inundated~~ or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

- ☐ High Organic Content ☐ Oxidized Rhizopheres ☐ Gleyed
☐ Organic Streaking ☐ Sulfidic Odor ☐ Mottled
 Munsell hue, value, and chroma soil color: Matrix _____ Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK

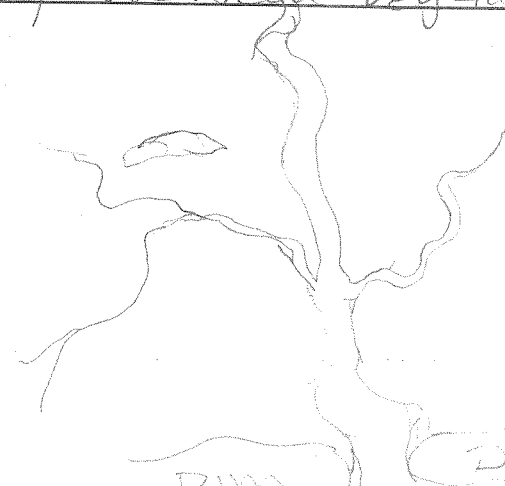
NWI Field Classification (fill in wetland letter code)

System E Subsystem 1 Class UB Water Regime L Special Modifiers h

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification E1UBL and E2USN and E2EM/USN and E2USP

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This wetland polygon represents
the subtidal channels above and below the Lower
Glenbrook Dam. It is composed of a series of
arms and minor tributaries that are always flooded
with water from Estero de Limantour, even at extreme
low tides. There is no rooted vegetation visible but
small amounts of floating eel grass were noted. Entire
subtidal channel system bordered by intertidal, unvegetated
mudflats except in upper reaches of tributaries
where it is bordered by emergent pickle weed vegetation.
Special modifier of diked/imponded
b/c flow of water is impeded
even though the dam is blown
out.



✓ DML

Date 10/26/01

Inclusion # _____

Photo No./Time _____ Able to _____

If Yes, what is GPS Accuracy? _____ m

Datum if not NAD83 _____ GPS Unit Trimble R2 XR

Fill in if snags present	
(Snags ≥ 15 degree angle)	
# per $\frac{1}{2}$ hectare	
DBH class	
Decay code	
Species	

Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable

DBH classes: (1) <1" (2) 1-4.9" (3) 5-8.9" (4) 9-20.9" (5) 21-32.9" (6) >33"

[illegible]

Were you able to key out vegetation plot? **YES**

IF YES, ALLIANCE Mudflat Association _____

If NO, why not? _____

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each: _____

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each: _____

Do you think vegetation has changed here since 1993? If so, how? No

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDW9 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth 1 in.)
 ☒ Sediment Deposits
 ☒ Drainage Patterns
 ☒ Saturation in Upper 12 Inches
 ☐ Oxidized Root Channels
 ☐ Water Marks/Water Stained Leaves
 ☐ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? ☒ YES ☐ NO ☐ UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? ☒ YES ☐ NO

☒ High Organic Content
 ☐ Oxidized Rhizospheres
 ☒ Gleyed
 ☒ Organic Streaking
 ☒ Sulfidic Odor
 ☐ Mottled

Munsell hue, value, and chroma soil color: Matrix Gley2 5/10B Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? ☒ YES ☐ NO ☐ UNK
- Is wetland hydrology present? ☒ YES ☐ NO ☐ UNK
- Is/are hydric soil(s) present? ☒ YES ☐ NO ☐ UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class US Water Regime N Special Modifiers h

Is this classified as a NWI wetland? ☒ YES ☐ NO ☐ N/A If Yes, NWI Classification E2 USN and E2EM/CA

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This large wetland polygon consists of all of the predominantly unvegetated intertidal mudflats above & below Lower Glenbrook dam. These areas are covered by water and exposed daily with the tides and are extremely mucky with dark gleyed sulfidic smelling soils. There is sparse cover of Pickleweed in the higher areas, but is mostly just bare mud. It is bordered by subtidal flooded channels and intertidal emergent vegetated polygons dominated by Cordgrass or Pickleweed. Special modifier of diked/imponded because flow of water is impeded even though dam is blown out.

✓BMW

✓BMW

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum	Fill in if snags present
Trees	85	6		(Snags >=15 degree angle)
Conifers				# per 1/2 hectare
Hardwoods	85	6		DBH class
Shrubs				Decay code
Herbs	25	0.30		Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
Strata: (G) <.75m (S) .75m-5m (T) >5m
DBH classes: (1) <1" (2) 1-4.9" (3) 5-8.9" (4) 9-20.9" (5) 21-32.9" (6) >33"

[illegible]

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES NO
If YES, ALLIANCE Red Alder Association

If NO, why not? _____

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each: _____

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each: _____

Do you think vegetation has changed here since 1993? If so, how? no

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDW10 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth _____ in.) ☒ Sediment Deposits _____ Drainage Patterns
☒ Saturation in Upper 12 Inches ☒ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

☒ High Organic Content ☒ Oxidized Rhizospheres _____ Gleyed
☐ Organic Streaking ☐ Sulfidic Odor ☒ Mottled
Munsell hue, value, and chroma soil color: Matrix 10YR 4/3 Mottles Gley 1 6/10

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK

NWI Field Classification (fill in wetland letter code)

System P Subsystem _____ Class SS Water Regime B Special Modifiers _____

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification E2USN

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This small wetland patch is dominated by Red Alders on the south-west side of the Lower Glenbrook Dam. The alders are growing right over the edge of the estero where it floods only occasionally, during extreme high tides and storm surges. There is a heavy drift line at the base of the alders. Below the alders it is sparsely vegetated with Saltgrass, Pickleweed, Carex obnupta and other minor hydrophytic components. This was mapped due to its proximity to the Quarry site, even though it probably will not be affected. The soils were varied but mostly a sandy/loam - border mudflat soil with lots of rocks and sediments. Hydrologic source = fresh water seep or groundwater flow.

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

Surveyors Wilbur Date 10/26/01
 NPS Polygon No./ Wetland Patch Code LCADN 11 Inclusion #
 Northing 4209711 Easting 509302 Photo No./Time Able to
 Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m
 GPS Point if Taken: Name Accuracy? m Datum if not NAD83 GPS Unit Trim Pro XR

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum	Fill in if snags present
Trees				(Snags >=15 degree angle)
Conifers				# per 1/2 hectare
Hardwoods				DBH class
Shrubs				Decay code
Herbs				Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
 Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
 Strata: (G) <.75m (S) .75m- 5m (T) >5m
 DBH classes: (1) <1" (2) 1- 4.9" (3) 5- 8.9" (4) 9- 20.9" (5) 21- 32.9" (6) >33"

Species	Percent Cover	Cover Class	Life Form	Stratum*	Wetland Indicator Status
<i>Distichlis spicata</i>		5			
<i>Juncus balticus</i>		3b			
<i>Typha latifolia</i>		2			
<i>Grindelia stricta</i>		3b			
<i>Atriplex triangularis</i>		2			
<i>Juncus effusus</i>		3b			
<i>Carex abrupta</i>		3a			
<i>Senecio asper</i>		1			
<i>Salticornia virginica</i>		2			
<i>Frankenia salina</i>		2			
<i>Jaumea carnosa</i>		1			
<i>Baccharis pilularis</i>		1			
<i>Polypogon monspeliensis</i>		1			
<i>Juncus patens</i>		1			

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES NO
 If YES, ALLIANCE Saltgrass Association

If NO, why not?

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each:

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each:

Do you think vegetation has changed here since 1993? If so, how? Not

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDW11 Inclusion # _____

Hydrology Indicators (check all that apply)

☒ Standing Water (depth _____ in.) ☐ Sediment Deposits ☐ Drainage Patterns
☒ Saturation in Upper 12 Inches ☐ Oxidized Root Channels
☒ Water Marks/Water Stained Leaves ☒ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES NO

☒ High Organic Content ☒ Oxidized Rhizospheres ☐ Gleyed
☒ Organic Streaking ☐ Sulfidic Odor ☐ Mottled
Munsell hue, value, and chroma soil color: Matrix 10YR 3/1 Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES NO UNK
- Is wetland hydrology present? YES NO UNK
- Is/are hydric soil(s) present? YES NO UNK

NWI Field Classification (fill in wetland letter code)

System E Subsystem 2 Class EM Water Regime P Special Modifiers h,s
Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification E2US P

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

This is a thin strip of tidal flat that is irregularly flooded by extreme high tides and storm surges. It is dominated by emergent hydrophytic vegetation. The overall dominant is Saltgrass with associated components of Grindelia, Juncus spp., Carex obsoleta and Frankenia salina. The wetland is bordered by upland dune and hill sides covered with Coyote Brush scrub on the up slope side. Toward the water (East) it is bordered by regularly flooded Pickleweed dominated saltmarsh. The wetland occupies the area between the daily drift line (eelgrass) and the extreme high tide rock line (heavy driftwood debris). There is a line of Grindelia along the outer edge (driest part) and a patch of Cattail at the bottom of a small drainage at the edge of this flat. The soil is a mixture of sandy sediment and spoil from the dune.

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

Surveyors Parravano, Williard Date 10/24/01
 NPS Polygon No./ Wetland Patch Code LEGDM Inclusion #
 Northing 4209596 Easting 509522 Photo No./Time Able to
 Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m
 GPS Point if Taken: Name Accuracy? m Datum if not NAD83 GPS Unit

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum
Trees			
Conifers	<u>3</u>	<u>1.6</u>	
Hardwoods			
Shrubs	<u>65</u>	<u>1</u>	
Herbs	<u>35</u>	<u>1.3</u>	

Fill in if snags present
(Snags >=15 degree angle)
per 1/2 hectare
DBH class
Decay code
Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
 Height Classes: (1) <.5 m (2) .5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
 Strata: (G) <.75m (S) .75m- 5m (T) >5m
 DBH classes: (1) <1" (2) 1- 4.9" (3) 5- 8.9" (4) 9- 20.9" (5) 21- 32.9" (6) >33"

Species	Percent Cover	Cover Class	Life Form	Stratum*	Wetland Indicator Status
<i>Baccharis pilularis</i>		<u>5</u>	<i>Vicia</i>	<i>sativa</i>	
<i>Rubus ursinus</i>		<u>4</u>	<i>Juncus</i>	<i>effusus</i>	
<i>Lupinus arboreus</i>		<u>2</u>	<i>Toxicodendron</i>	<i>diversibulum</i>	
<i>Juncus patens</i>		<u>2</u>	<i>Polystichum</i>	<i>montanum</i>	
<i>Holcus lanatus</i>		<u>4</u>	<i>Gnaphalium</i>	<i>camesii</i>	
<i>Carex</i> 1		<u>2</u>	<i>Satureja</i>	<i>douglasii</i>	
<i>Cynosurus echinoides</i>		<u>2</u>	<i>Juncus</i>	<i>lesedrii</i>	
<i>Ris douglasiana</i>		<u>2</u>	<i>Rhamnus</i>	<i>californica</i>	
<i>Mimulus aurantiacus</i>		<u>2</u>			
<i>Plantago lanceolata</i>		<u>2</u>			
<i>Elymus glaucus</i>		<u>1</u>			
<i>Achillea millefolium</i>		<u>2</u>			
<i>Hypochaeris radicata</i>		<u>2</u>			
<i>Heracleum lanatum</i>		<u>1</u>			
<i>Liriodendron</i>		<u>1</u>			
<i>Anaphalis margaritacea</i>		<u>1</u>			
<i>Bromus diandrus</i>		<u>1</u>			
<i>Carex</i> 2		<u>1</u>			
<i>Carex obnupta</i> ?		<u>1</u>			
<i>Distichlis spicata</i>		<u>1</u>			

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES NO

If YES, ALLIANCE Coastal Scrub Association Bac.pil. / Rub.urs. / wedy

If NO, why not?

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each:

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each:

Do you think vegetation has changed here since 1993? If so, how?

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LG Dam Inclusion # _____

Hydrology Indicators (check all that apply)

☐ Standing Water (depth _____ in.)
 ☐ Sediment Deposits
 ☐ Drainage Patterns
☐ Saturation in Upper 12 Inches
 ☐ Oxidized Root Channels
☐ Water Marks/Water Stained Leaves
 ☐ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES ☒ NO UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES ☒ NO

☐ High Organic Content
 ☐ Oxidized Rhizospheres
 ☐ Gleyed
☐ Organic Streaking
 ☐ Sulfidic Odor
 ☐ Mottled

Munsell hue, value, and chroma soil color: Matrix _____ Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES ☒ NO UNK
- Is wetland hydrology present? YES ☒ NO UNK
- Is/are hydric soil(s) present? YES ☒ NO UNK

NWI Field Classification (fill in wetland letter code)

System _____ Subsystem _____ Class _____ Water Regime _____ Special Modifiers _____

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification _____

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants, wildlife observations, etc.)

Lower Glenbrook dam stretches across the Estero de Limantour, standing 15' high. An 80' wide breach allows some tidal flow between the inside (north) & outside (south) portion of the dam. The vegetation is similar in composition to that of surrounding bluffs, but it is more dense and disturbed, with a continuous Bayok brush/blackberry canopy/subcanopy. Fringe of *Franseria* 2 base of dam along upland/wetland interface. *Baccharis* scrub across top, open grassy w/ scattered shrubs on steep sides - occasional ^{Bishop} pines scattered around. ~~Many~~ ^{Bishop} pines growing but not under canopy brush. This area was burned in 1995 Vision Fire. Recruitment of Bishop pines?

- 2 needles
 - pines close to branch tips
 - subside

(surveyed entire quarry)
VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

✓BMW

Surveyors Williard, Parravano Date 10/25/01
NPS Polygon No./ Wetland Patch Code LGD (Quarry) Inclusion #
Northing 4209591 Easting 509306 Photo No./Time Able to
Verify Location w/GPS? YES NO If Yes, what is GPS Accuracy? m
GPS Point if Taken: Name Accuracy? m Datum if not NAD83 GPS Unit

55%
total veg.
cover

Life Form	% Cover	Avg Ht (m)	Avg Ht- additional stratum
Trees	7	2 (m)	
Conifers	7	2	
Hardwoods	—		
Shrubs	17	1	
Herbs	45	4	

Fill in if snags present
(Snags >=15 degree angle)
per 1/2 hectare
DBH class
Decay code
Species

Cover classes: (1) <1% (2) 1-5% (3a) 6-15% (3b) 16-25% (4) 26-50% (5) 51-75% (6) 76-100%
Height Classes: (1) <5 m (2) 5-2 m (3) 2-5 m (4) 5-15 m (5) 15-35 m (6) 35-50 m (7) >50 m (9) Not Applicable
Strata: (G) <.75m (S) .75m- 5m (T) >5m
DBH classes: (1) <1" (2) 1- 4.9" (3) 5- 8.9" (4) 9- 20.9" (5) 21- 32.9" (6) >33"

Species	Percent Cover	Cover Class	Life Form	Stratum*	Wetland Indicator Status
<i>Baccharis pilularis</i>		3a			
<i>Deschampsia cespitosa</i>		4			
<i>Vaccinium oxatum</i>		2			
<i>Pinus muricata</i>		3a			
<i>Myrica californica</i>		3a			
<i>Iris douglasiana</i>		2			
<i>Cytisus scoparius</i>		1			
<i>Juncus balticus</i>		3a			
<i>Equisetum arvense</i>		1			
<i>Rubus ursinus</i>		1			
<i>Woodwardia ambriata</i>		1			
<i>Juncus effusus</i>		1			
<i>Polystichum munitum</i>		1			
<i>Lupinus arboreus</i>		1			
<i>Plantago lanceolata</i>		1			
<i>Aica canyophylla</i>		1			
<i>Pteridium aquilinum</i>		1			
<i>Agoseris heterophylla</i>		1			
<i>calamagrostis nutkaensis</i>		1			
<i>Holcus lanatus</i>		1			

* Fill in stratum only if different than life form

Were you able to key out vegetation plot? YES NO
If YES, ALLIANCE Tufted Hairgrass Association

If NO, why not?

Level of confidence in type? HIGH MED LOW Was plot more than one type? YES NO

If Yes, List Types and Approximate Percentage of Each:

Was polygon/wetland more than one vegetation type? Unknown YES NO

If Yes, List Types and Approximate Percentage of Each:

Do you think vegetation has changed here since 1993? If so, how?

VEGETATION COMMUNITY ASSESSMENT FORM: PORE/GOGA

NPS Polygon # / Wetland Patch Code LGDQ Inclusion # _____

Hydrology Indicators (check all that apply)

☐ Standing Water (depth _____ in.) ☒ Sediment Deposits ☒ Drainage Patterns
☐ Saturation in Upper 12 Inches ☐ Oxidized Root Channels
☐ Water Marks/Water Stained Leaves ☐ Drift Lines

Is the site inundated or saturated with water for more than ten (10) consecutive days at some time during the year? YES ☒ NO ☐ UNK

Hydric Soil Indicators (must occur in upper 12 inches, check all that apply) Soil sample taken? YES ☒ NO ☐

☐ High Organic Content ☐ Oxidized Rhizopheres ☐ Gleyed
☐ Organic Streaking ☐ Sulfidic Odor ☐ Mottled
 Munsell hue, value, and chroma soil color: Matrix _____ Mottles _____

Wetland Criteria (must have at least one to be considered a wetland)

- Does the site support > 50% cover hydrophytic (FACW or greater) plant species? YES ☒ NO ☐ UNK
- Is wetland hydrology present? YES ☒ NO ☐ UNK
- Is/are hydric soil(s) present? YES ☒ NO ☐ UNK

NWI Field Classification (fill in wetland letter code) UPLAND

System _____ Subsystem _____ Class _____ Water Regime _____ Special Modifiers _____

Is this classified as a NWI wetland? YES NO N/A If Yes, NWI Classification _____

Comments (disturbance type and degree; adjacent series and land uses, sensitive habitat, rare plants,

wildlife observations, etc.) The entire quarry adjacent and west of Glenbrook dam was surveyed for vegetation composition, and checked for wetlands. Two hydrology indicators were observed, but they appear to be the result of runoff from direct precipitation - rather than extended periods of saturation or inundation. Sparse vegetation cover, steep slope and lack of top soil, inhibit extended inundation/saturation. Drainage patterns include scouring around bunchgrasses and a 1' drainage channel. A very small (1 m²) patch of Equisetum arvense sits at the lower end of the channel where it meets the dam. Sediment deposits were also present; they were in the form of encrusted detritus in scoured areas. Additionally, a small wet patch dominated by FACW & FACW+ vegetation was situated in a slight depression at the base of the bluffs. The source of hydrology is surface runoff and possibly ground water seepage. Although this lies outside of the MMU (10 m²) for PORE, it was mapped anyways to achieve full characterization of this site. Remaining and predominant vegetation was tufted hairgrass Alliance, with scattered Bishop pine saplings and healthy, large CA wax myrtles. Herbaceous cover was sparse, but well established. It appears the veg cover results from successful post-fire recruitment of fire followers & re-sprouters, despite the lack of any top soil.

Appendix B. List of plant species observed on lower Glenbrook Dam and Quarry Restoration Project site.

Species	Common Name	Wetland Indicator Status ¹
<i>Achillea millefolium</i>	common yarrow	FACU
<i>Agoseris heterophylla</i>	annual agoseris	
<i>Aira caryophylla</i>	silver hairgrass	NI
<i>Alnus rubra</i>	red alder	FACW
<i>Anaphalis margaritacea</i>	pearly everlasting	
<i>Atriplex triangularis</i>		
<i>Baccharis pilularis</i>	coyotebrush	
<i>Bromus diandrus</i>	ripgut brome	
<i>Calamagrostis nutkaensis</i>	Pacific reedgrass	FACW
<i>Carex obnupta</i>	slough sedge	OBL
<i>Carex</i> sp.		
<i>Carpobrotus edulis</i>	hottentot fig	
<i>Cirsium vulgare</i>	bull thistle	FAC
<i>Cuscuta salina</i> var. <i>major</i>	goldenthread	
<i>Cynosurus echinatus</i>	bristly dogstail grass	
<i>Cytisus scoparius</i>	scotchbroom	
<i>Deschampsia cespitosa</i>	tufted hairgrass	FACW
<i>Distichlis spicata</i>	inland saltgrass	FACW
<i>Elymus glaucus</i>	blue wildrye	FACU
<i>Equisetum arvense</i>	field horsetail	FAC
<i>Festuca arundinacea</i>		FAC-
<i>Frankenia salina</i>	alkali seaheath	FACW+
<i>Gnaphalium ramosissimum</i>		
<i>Grindelia stricta</i>	Oregon gumweed	OBL*
<i>Heracleum lanatum</i>		
<i>Holcus lanatus</i>	common velvetgrass	FAC
<i>Hypochaeris radicata</i>	hairy catsear	FACU*
<i>Iris douglasiana</i>	Douglas iris	
<i>Jaumea carnosa</i>	marsh jaumea	OBL
<i>Juncus balticus</i>	Baltic rush	FACW+
<i>Juncus effusus</i> var. <i>brunneus</i>	lamp rush	FACW+
<i>Juncus lesueurii</i>	salt rush	FACW
<i>Juncus patens</i>	spreading rush	FAC
<i>Leymus mollis</i> ssp. <i>mollis</i>	American dunegrass	UPL
<i>Limonium californicum</i>	California sealavender	OBL

¹ Wetland status of plant species based on Reed (1996). See Table 1 for explanation.

Appendix B (continued). List of plant species observed on lower Glenbrook Dam and Quarry Restoration Project site.

Species	Common Name	Wetland Indicator Status ¹
<i>Linum bienne</i>	pale flax	
<i>Lupinus arboreus</i>	yellow bush lupine	
<i>Mimulus aurantiacus</i>		
<i>Myrica californica</i>	California wax myrtle	FAC+
<i>Pinus muricata</i>	Bishop pine	
<i>Plantago lanceolata</i>	narrowleaf plantain	FAC-
<i>Polypogon monspeliensis</i>	annual rabbitsfoot grass	FACW+
<i>Polystichum munitum</i>	western swordfern	FACU
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	hairy brackenfern	FACU
<i>Rhamnus californica</i> ssp. <i>californica</i>		
<i>Rubus ursinus</i>	California blackberry	FAC+
<i>Rumex acetosella</i>	common sheep sorrel	FAC-
<i>Salicornia virginica</i>	Virginia glasswort	OBL
<i>Satureja douglasii</i>		
<i>Scirpus maritimus</i>		OBL
<i>Scirpus pungens</i>		OBL
<i>Sonchus asper</i>	spiny sowthistle	FAC
<i>Spartina foliosa</i>	California cordgrass	OBL
<i>Toxicodendron diversilobum</i>	Pacific poison oak	
<i>Triglochin concinna</i> var. <i>concinna</i>	Utah arrowgrass	OBL
<i>Typha latifolia</i>	broadleaf cattail	OBL
<i>Vaccinium ovatum</i>	California huckleberry	
<i>Vicia sativa</i>	garden vetch	FACU
<i>Vulpia bromoides</i>	brome fescue	FACU*
<i>Woodwardia fimbriata</i>	giant chainfern	FACW+
<i>Zostera marina</i>	eel grass	OBL

¹ Wetland status of plant species based on Reed (1996). See Table 1 for explanation.

Appendix C. Description of National Wetlands Inventory (NWI) mapping codes.

SYSTEM	SUBSYSTEM	NWI CODE
Marine	Subtidal	M1
	Intertidal	M2
Estuarine	Subtidal	E1
	Intertidal	E2
Palustrine	--	P
Lacustrine	Limnetic	L1
	Littoral	L2
Riverine	Tidal	R
	Lower Perennial	LP
	Upper Perennial	UP
	Intermittent	I

CLASS	NWI CODE
Rock Bottom	RB
Unconsolidated Bottom	UB
Aquatic Bed	AB
Reef	RF
Unconsolidated Shore	US
Rocky Shore	RS
Streambed	SB
Moss-Lichen Wetland	ML
Emergent Wetland	EM
Scrub-shrub Wetland	SS
Forested Wetland	FO

WATER REGIME	NWI CODE
Tidal	
Subtidal	L
Irregularly Flooded	M
Regularly Flooded	N
Irregularly Flooded	P
Temporarily Tidal	S
Seasonal Tidal	R
Semi-permanently Tidal	T
Permanent Tidal	V
Non-Tidal	
Temporarily Flooded	A
Saturated	B
Seasonally Flooded	C
Semi-permanently Flooded	F
Intermittently Exposed	G
Permanently Flooded	H
Intermittently Flooded	J
Artificially Flooded	K
Intermittently Flooded/Temp	W
Saturated/Semipermanently/Seasonally Flooded	Y
Intermittently Exposed/Permanently Flooded	Z
Unknown	U

SPECIAL MODIFIERS	NWI CODE
Beaver	b
Partially drained/Ditched	d
Farmed	f
Diked/Impounded	h
Artificial Substrate	r
Spoil	s
Excavated	x
Grazed	g

Appendix D. Chart illustrating hierarchical structure of USFWS Cowardin Wetland Classification System.

SYSTEM-SUBSYSTEM-CLASS CHART

SYSTEM	Marine (M)		Estuarine (E)		Riverine (R)				Lacustrine (L)		Palustrine (P)
SUB-SYSTEMS	1 ST	2 IT	1 ST	2 IT	1 T	2 LP	3 UP	4 I	1 LIM	2 LIT	--
CLASSES											
RB	X		X		X	X	X		X	X	X
UB	X		X		X	X	X		X	X	X
AB	X	X	X	X	X	X	X		X	X	X
RF	X	X	X	X							
US		X		X	X	X	X			X	X
RS		X		X	X	X	X			X	
SB				X	X			X			
ML											X
EM				X	X	X				X	X
SS				X							X
FO				X							X

CLASS DESCRIPTION

NWI CODE	CLASS NAME	DESCRIPTION
RB	Rock bottom	Over 75% cover of stones, boulders, or bedrock and < 30% veg cover.
UB	Unconsolidated bottom	At least 25% cover of particles smaller than stones and < 30% veg cover.
AB	Aquatic bed	Dominated by plants that grow on or below the surface water in most years.
RF	Reef	Ridge/mound-like structures dominated by colonized sedentary invertebrates.
US	Unconsolidated shore	Must have: 1) unconsolidated substrate with < 75% cover of stones boulders or bedrock, 2) veg cover < 30%, and 3) saturated, irregularly exposed, or regularly, irregularly, seasonal, intermit, temp, or artificially flooded.
RS	Rocky shore	Over 75% cover of bedrock, stones or boulders and < 30% veg cover.
SB	Streambed	Vary greatly in substrate and for. Most have little to no veg cover due to scouring.
ML	Moss-lichen wetland	Veg cover < 30% and mosses or lichens cover substrates other than rock.
EM	Emergent wetland	Erect, rooted, herbaceous hydrophytes present most of growing season in most years.
SS	Scrub-shrub wetland	Dominant veg is woody plants < 6m (20 feet) tall.
FO	Forested wetland	Dominant veg is woody plants > 6m (20 feet) tall.

WATER REGIMES AND CLASSES

NON TIDAL	RB	UB	AB	RF	US	RS	SB	ML	EM	SS	FO
H (Perm. Flooded)	X	X	X						X	X	X
G (Intermitt. Exposed)	X	X	X						X	X	X
F (Semiperm. Flooded)	X	X	X						X	X	X
C (Seasonally Flooded)			X		X	X	X		X	X	X
B (Saturated)					X			X	X	X	X
A (Temp. Flooded)					X	X	X		X	X	X
J (Intermitt. Flooded)					X	X	X		X	X	X

Appendix D (continued). Chart illustrating hierarchical structure of USFWS Cowardin Wetland Classification System.

WATER REGIMES AND CLASSES

SALTWATER TIDAL	RB	UB	AB	RF	US	RS	SB	ML	EM	SS	FO
L (Subtidal)	X	X	X	X							
M (Irregularly Exposed)			X	X	X	X	X			X	X
N (Regularly Flooded)			X	X	X	X	X		X	X	X
P (Irregularly Flooded)				X	X	X	X		X	X	X
FRESHWATER TIDAL											
S (Temp-Tidal)					X	X	X		X	X	X
R (Seasonal-Tidal)			X		X	X	X		X	X	X
T (Semiperm-Tidal)	X	X	X						X	X	X
V (Perm.- Tidal)	X	X	X						X	X	X
K (Artificially Flooded)	X	X	X	X	X	X	X	X	X	X	X

WATER REGIME MODIFIER DESCRIPTION

(year-round growing season)

Tidal	Description
L (Subtidal)	Permanently flooded with tidal water.
M (Irregularly Exposed)	Land surface exposed by tides less often than daily.
N (Regularly Exposed)	Tidal water alternately floods and exposes the land surface at least once daily.
P (Irregularly Flooded)	Tidal water floods the land surface less often than daily.
K (Artificially Flooded)	Duration of flooding is controlled by artificial means (i.e. pumps, siphons, dikes, dams, etc.)

Non-Tidal	
A (Temp. Flooded)	Surface water is present for brief periods during the year.
B (Saturated)	Surface water is seldom present, but substrate is saturated to the surface for extended periods.
C (Seasonally Flooded)	Surface water is present for extended periods, especially after seasonal rainfall and/or runoff.
H (Perm. Flooded)	Land inundated throughout year in all years. Vegetation consists of obligate wetland plants.
F (Semiperm. Flooded)	Surface water persists throughout the year in most years.
G (Intermitt. Exposed)	Surface water present throughout the year except in extreme drought.
J (Intermitt. Flooded)	Substrate usually exposed, but surface water is present for variable periods w/o detectable seasonal periodicity.
K (Artificially Flooded)	Duration of flooding is controlled by artificial means (i.e. pumps, siphons, dikes, dams, etc.)

SPECIAL MODIFIERS

b- Beaver	d- Partially Drained/ Ditched	f- Farmed	h- Diked/ Impounded	r- Artificial Substrate	s- Spoil	x- Excavated
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