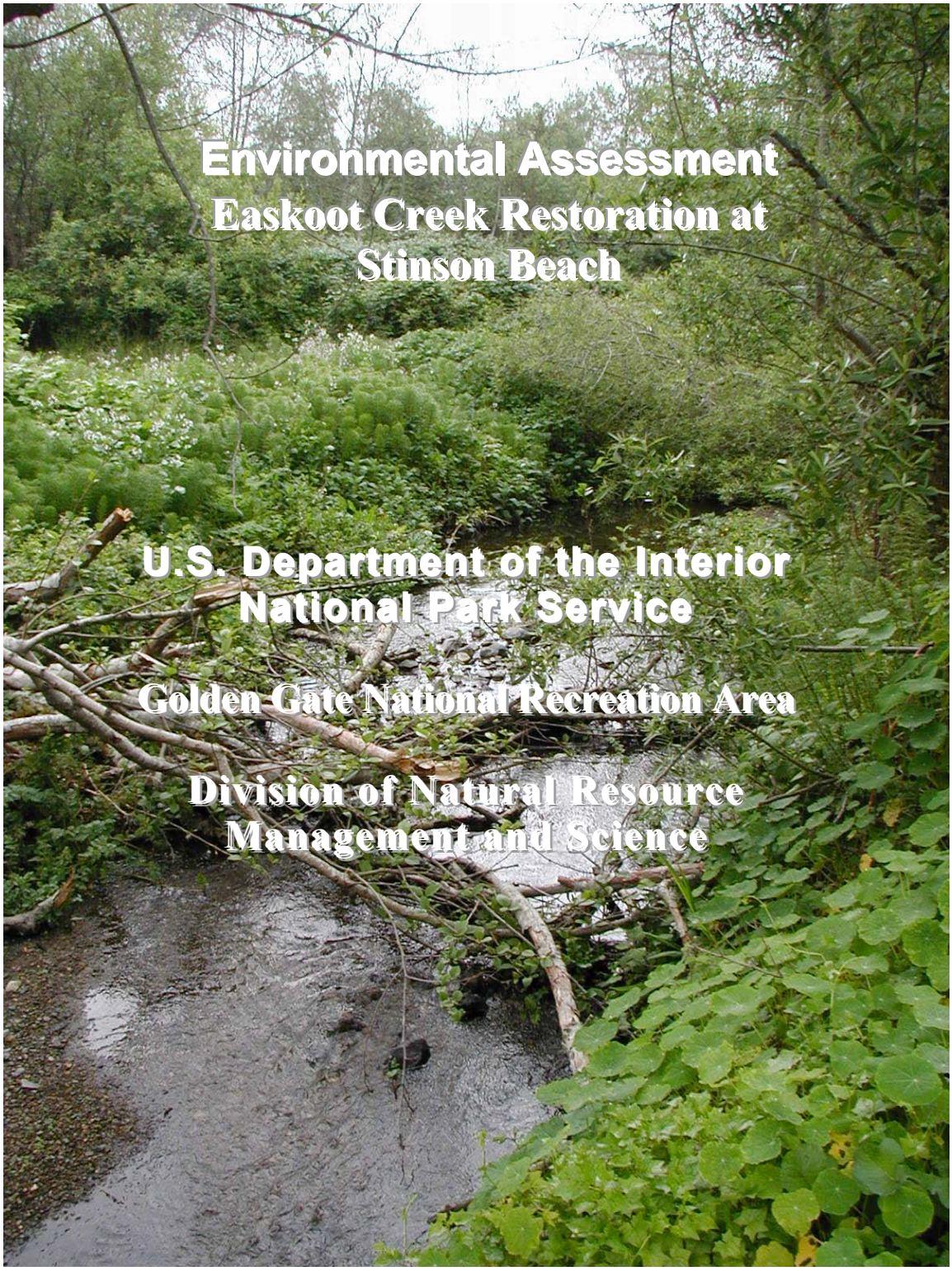

Environmental Assessment
Easkoot Creek Restoration at Stinson Beach

U.S. Department of the Interior
National Park Service

Golden Gate National Recreation Area

Division of Natural Resource Management and Science

Environmental Assessment
Easkoot Creek Restoration at Stinson Beach

Figures and Tables

Figures

Tables

1.0 INTRODUCTION

1.1 Project Overview

The Golden Gate National Recreation Area (GGNRA) (Figure1) is proposing a restoration effort for a portion of the Easkoot Creek Watershed (Figure 2). This restoration effort would further the National Park Service (NPS) mission of restoring and protection natural resources within NPS lands. NPS Management Policy states, "The Service will not intervene in natural biological or physical processes, except:

- When directed by Congress;
- In some emergencies in which human life and property are at stake;
- To restore natural ecosystem functioning that has been disrupted by past or ongoing human activities; or
- When a park plan has identified the intervention as necessary to protect other park resources or facilities." (NPS Management Policies 2001).

The proposed restoration would create habitat for federally threatened species as well as restore the area's native vegetation and floodplain by restoring natural ecosystem functions and features that have been previously disrupted by human activities.

1.2 Project Location

In 1972, Congress authorized establishment of the Golden Gate National Recreation Area and incorporated the existing Stinson Beach Park. From its headwaters along the western slopes of Mt. Tamalpais, Easkoot Creek flows westward through the town of Stinson Beach into the Stinson Beach Park. The Stinson Beach Park consists of a public beach operated by GGRNA, 3 parking areas, 3 restroom facilities, and a small maintenance facility. Lower Easkoot Creek flows through a portion of the GGNRA's Stinson Beach Park and then north to Bolinas Lagoon.

1.3 Purpose and Need

Consistent with NPS Management Policies 2001, the primary goal of the proposed habitat restoration project is to improve summer and winter rearing habitat within the watershed for the threatened Central California Coast steelhead trout (*Oncorhynchus mykiss*) and coho salmon (*O. kisutch*).

Easkoot Creek supports remnant, but dwindling populations of steelhead trout and has at least one-year class coho salmon (salmon returning to spawn after only one year at sea). The need for restoration is due to the decline of quality rearing habitat within the watershed. The absence of deep pools, instream and overhanging materials for cover, native riparian vegetation and sufficient in-stream flows limit the value of lower Easkoot Creek as juvenile salmonid rearing habitat. One of the primary factors contributing to the listing of steelhead and coho as threatened species is the loss of habitat complexity in streams. In particular, the loss results from reduction in number and depth of deep pools from sedimentation and removal of pool-forming structures such as boulders and large wood.

The proposed project would address two important limiting factors for fish production: 1) the absence of pool habitats with associated large woody debris and 2) lack of natural riparian habitat. This project, in conjunction with other restoration efforts upstream and downstream of the GGNRA lands, would have a long-term beneficial effect on the steelhead trout and coho salmon habitat of Easkoot Creek.

Project objectives have been defined to assist planners in developing alternatives that meet the restoration needs. These objectives reflect the GGNRA's desire to create viable habitat for endangered species, restore native vegetation, create quality ecosystems within GGNRA boundaries, and work with surrounding communities to enhance the awareness of natural and cultural resources.

Objective 1: Rehabilitate the existing creek ecosystem to the greatest extent possible given present day physical constraints.

- Retain and enhance important existing qualities of the site;
- Develop sustainable scour pools;
- Restore appropriate riparian vegetation and cover; and
- Increase instream cover for aquatic life.

Objective 2: Create a creek ecosystem that functions naturally with minimal maintenance.

- Improve floodplain functionality;
- Widen the riparian corridor; and
- Capitalize on opportunities to restore remnant riparian and wetland habitats.

Objective 3: Improve habitat quality and expand habitat area for native plants and animals over existing conditions within the project area.

- Expand the native riparian and wetland communities to allow viable biological processes to occur; and
- Remove non-native vegetation.

Objective 4: Maintain public access to the Stinson Beach facility and result in no impact to the recreational resources of Stinson Beach.

- No net loss of parking spaces; and
- Minimize impacts during construction activities.
- Maintain bus access and turnaround.

Objective 5: Involve local landowners, community organizations, and resource agencies in the planning and implementation of restoration/rehabilitation actions.

Objective 6: Design rehabilitation/restoration actions that do not increase flooding risk or property damage.

GGNRA established the following criteria to evaluate the success of project actions for meeting the objectives.

- The amount of stream and riparian habitat available for aquatic life would be of higher quality and greater, in area, than pre-project conditions (assessed using wetted area cross-sections and profiles).
- Extent the measurements of the late summer-fall mean biomass of various juvenile steelhead age groups would be greater than pre-project conditions.
- Extent the alternative minimizes long-term "in-channel" maintenance actions.

1.4 Issues and Concerns

Comments received during scoping, in general, supported restoration efforts within Easkoot Creek. The following issues and concerns were identified as potential impacts of the proposed restoration.

Flooding
Easkoot Creek has been the site of previous flooding events. Residents and business owners do not want restoration efforts to alter stream flow patterns that could increase flooding and threaten property.

Parking
The Stinson Beach Park site is a multi-use recreation area visited by local residents, the greater Bay Area, national and international travelers. Due to occasional heavy demand for parking, local residents prefer no reductions in parking resources within the park. Commenters felt that during heavy visitation reduced parking could lead to visitors parking in nearby neighborhoods.

Roads
Local residents and property owners are concerned that changes in the landscape could alter stream flow patterns and adversely impact flooding on local roads.

Figure 1: GGNRA Boundary

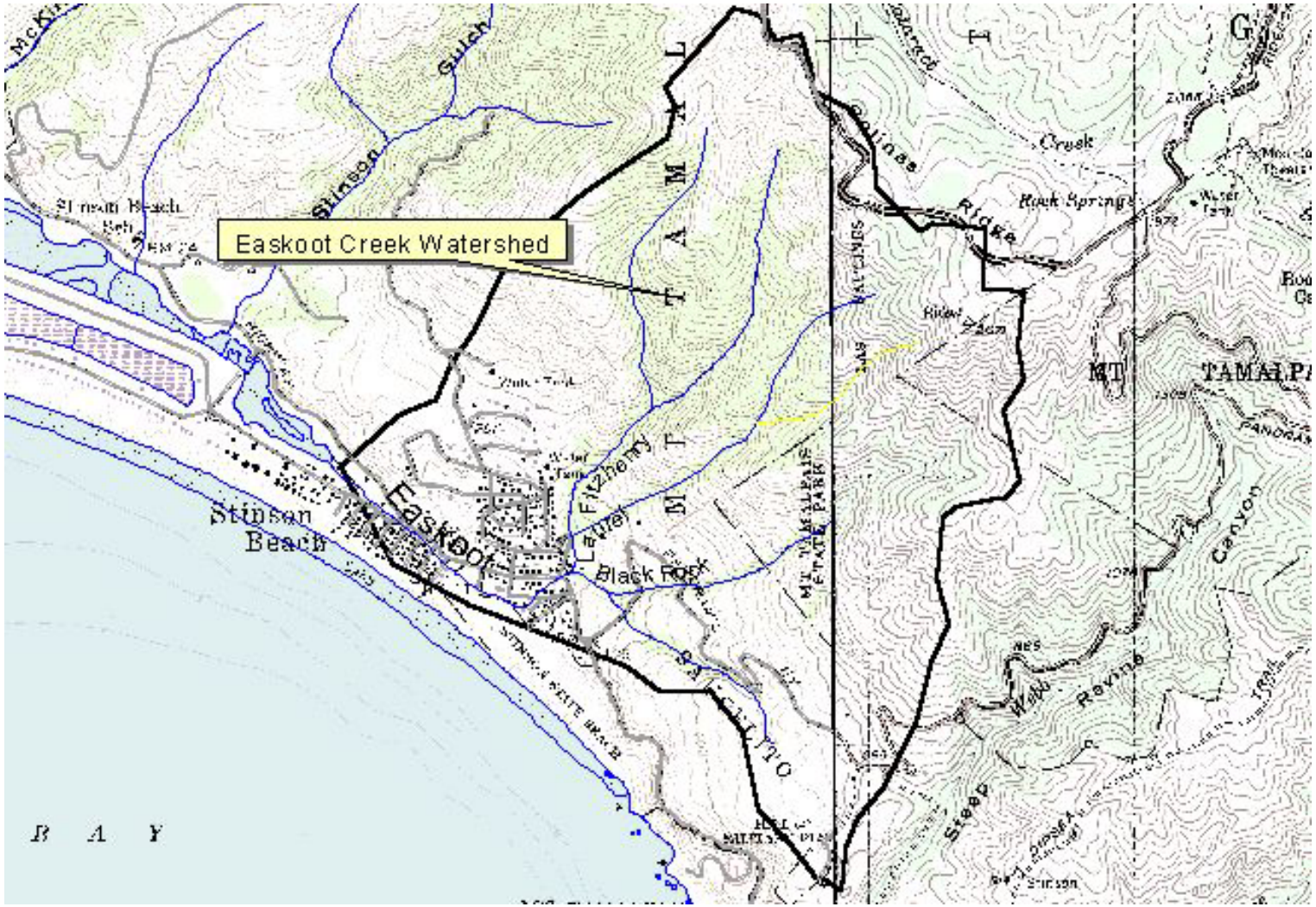

Figure 2: Easkoot Creek Watershed

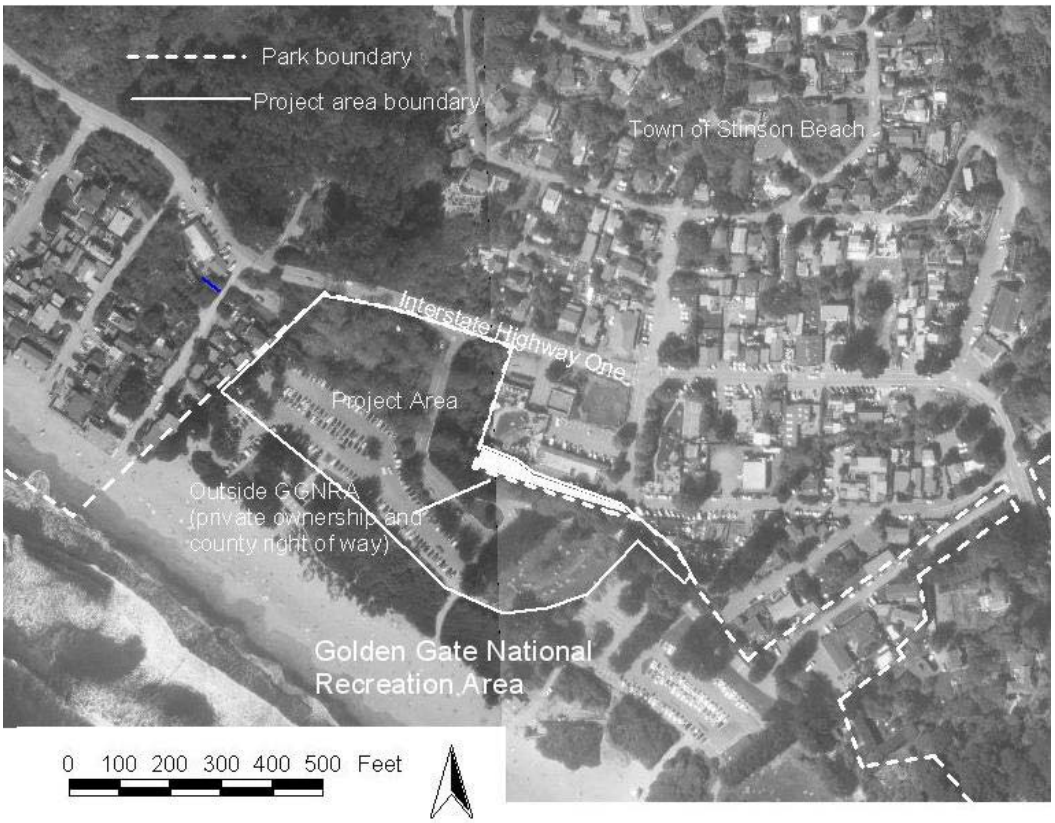

Figure 3 Project Area

DESCRIPTION OF THE PROPOSED ACTION

2.1 Project Study Area

Stinson Beach Park is located approximately 12 miles northwest of San Francisco in the town of Stinson Beach, Marin County. Easkoot Creek is a small perennial stream flowing into Bolinas Lagoon through Stinson Beach, draining a watershed of 1062 acres. The supporting tributaries of Bolinas Lagoon provide habitat for the Central California Coast steelhead trout (*Oncorhynchus mykiss*) and the Coho salmon (*Oncorhynchus kisutch*); both listed as a federally threatened species. Private land owners, the GGNRA, and the State of California the lands adjacent to the stream. Much of the upper watershed is in public ownership while the lowest reach flows through mostly private lands. The project area boundaries are outlined in Figure 3.

Stinson Beach Park consists of natural areas, beach areas, picnic and barbecue areas, trails, restroom facilities, and parking spaces for visitors. The study area (5.7 acres) includes a portion of Easkoot Creek within the NPS Stinson Beach Park. Most of the project study area is developed with features such as parking lot and road (Table 1). About 900 ft of stream channel flows through the project site (Figure 2). The project area is partly within National Park Service ownership, with private ownership and county road easement including the streambed and right bank between the siren tower and pedestrian bridge.

2.2 Public Involvement

Public involvement for the current plan began in April 1999 with community efforts dating back to 1992. Local residents have led the drive to restore and protect fish habitat and have undertaken several actions.

- In 1993, an ad hoc Easkoot Creek Advisory Committee was formed by the Stinson Beach Village Association and funded the development of a restoration plan to harmonize flood control with fishery, scenic, educational, and cultural values. The plan also included the first fisheries assessment along Easkoot Creek (Rich, A.A., May 1992, Feasibility study to rehabilitate the fishery resources of Easkoot Creek, Marin County. This is an unpublished document prepared for the Environmental Action Committee of West Marin.)
- Streamatrix, a local, environmental non-profit organization, initiated and completed a project in 1998 to improve adult fish passage for Easkoot Creek. In April 1999, members of the GGNRA Marin Advisory Committee, Streamatrix, and the GGNRA visited with the Stinson Beach Village Association. During the meeting parties reviewed the recently completed fish passage structure and the GGNRA presented a conceptual proposal for creek restoration to the group.
- The GGNRA met with Trout Unlimited (local chapter) and Tomales Bay Association regarding the proposed restoration project. These groups wrote a letter of support for the project in 1999.
- During July 1999 the GGNRA went door-to-door to a portion of residents along lower Easkoot Creek to present a conceptual proposal and measures to protect riparian and creek habitat.
- In September 1999, the NPS led a site visit to discuss conceptual proposal and scoping elements with Streamatrix and GGNRA staff. Also during September, 1999 the NPS presented the Easkoot Creek project at the Marin Advisory Commission meeting
- In January 2000, the NPS conducted a riparian restoration training program for the local community. This meeting described appropriate restoration activities along creeks and also introduced the proposed restoration project to the residents who attended. GGNRA continues to work on a public outreach program to encourage minimal maintenance of riparian habitats within private property along Easkoot and other local creeks.

2.3 Scoping

Through the scoping process, the NPS sought to obtain input from NPS staff, the public, including the community of Stinson Beach, government and regulatory agencies, and environmental organizations. During scoping, NPS staff noted that three principal areas of potential effects included natural resources, flooding downstream of the creek, and the effects on visitor use. NPS staff discussed the project and environmental concerns with local citizens and environmental groups. During scoping, the need for permitting and consultation was identified. Regulatory and government agency scoping and consultation is discussed in Chapter 5, Consultation and Coordination.

On May 4, 2002, the NPS shared the conceptual alternative with the Stinson Beach Village Association (SBVA) regarding the Easkoot Creek project. Meeting participants questioned how the GGNRA was going to ensure that the actions would not cause flooding. GGNRA noted that the project designers have assessed the design of proposed elements on flooding and have noted that there would be no change from existing conditions. Also noted was that the project would be monitored after major rain events to check for debris and the deposition of sediment. GGNRA would remove problems as necessary. Comments were made with regard to integrating educational activities into the project and it was recommended that the GGNRA involve local schools (both public and private) in the project.

On January 21, 2003 a public scoping meeting was held at the Stinson Beach Community Center. Meeting participants questioned how the actions will not result in flooding down stream and GGNRA explained that analysis had been completed that shows that this project would not result in an increase or decrease in flooding.

2.4 Alternatives

No Action Alternative

The No-Action Alternative is a continuation of existing conditions at lower Easkoot Creek within GGNRA. The No-Action Alternative does not subject Easkoot Creek to impacts related to construction activity but does not address the current degraded habitat conditions. Under the No Action Alternative, the habitat within that area of Easkoot Creek would continue to be of low value and would not improve over time.

Under the No-Action Alternative:

- No grading, excavation, transport or disposal of fill materials would occur along the lower Easkoot Creek stream channel in the Stinson Beach Recreation Area.
- The existing narrow channel and limited floodplain would continue to exist as presently configured. No increase in flood storage capacity would occur.
- No exotic trees would be removed from the stream banks, parking lot and picnic facilities. Only limited on-going restoration of riparian habitat and native plant revegetation would occur.
- No beneficial impacts for steelhead trout fishery and riparian habitat would occur. Steelhead trout and coho salmon populations could continue to decline.

Future actions in the lower Easkoot Creek project area would be limited to continuing maintenance and management of existing resources and facilities in the condition that currently exists at Easkoot Creek.

Riparian/ Rock and Wood Weir Alternative (Preferred Alternative)
The preferred alternative would address the main limiting factors for production of juvenile salmonids: the unnatural absence of stream pools and lack of native riparian habitat. The intent of the preferred alternative is to restore a stable, functional channel and enhance habitat for federally threatened fish. This would be accomplished by:

- producing a non-uniform, meandering channel,
- creating natural channel dimensions,
- planting native riparian vegetation,
- removing non-native vegetation and
- creating a floodplain area.

Construction would call for the relocation of aquatic species to sites outside the project area. A qualified biologist would oversee the dewatering and movement of species. NPS staff would be responsible for future maintenance and monitoring the progress of restoration activities. Monitoring actions would include collection of stream topographic, riparian habitat, and fish data. The stream would also be monitored for the deposition of excessive debris and sediment after major rain events. Material would be removed if property is threatened.

Instream Design
To address factors limiting natural fish production, the design would be utilized to establishment gentle meanders, a low flow channel, and connected floodplain. Rock and wood weirs would be installed and orientation and spacing would be used to guide flows into alternating banks. Revetment structures (Figure 4) composed of logs, boulders, and rootwads would be placed at the outside of these meander bends. The intent would be to establish self-maintaining lateral scour pools at these locations. The revetment structures would be used to create needed cover for juvenile salmonids. Up to five revetments and sixteen weir structures would be installed within the project area (see Layout Plan).

Excavation
The preferred alternative utilizes excavation to modify the existing channel within the limits shown on Figure 5. The current channel would be excavated at key points within the channel and along the east bank and be filled a certain points along the west bank to create a slightly more sinuous channel (see Grading Plan). Excavation would also provide for placement of wood and rock structures. Excavation of approximately 512 cubic yards (CY) of soil would occur. Of the 512 CY excavated, 313 CY would be used for fill within jurisdictional areas (150 CY used to place a flood control berm adjacent to Highway One (Figure 5) and 163 CY for channel modifications) and 50 CY would be used for fill outside jurisdictional areas (see Layout Plan). Approximately 10 cubic yards would be used to reinforce an existing flood control berm on the north side of the parking lot). Therefore a total of 373 CY of excavated material would be used at the site and approximately 139 CY would be removed from the site. Up to 200 CY of rock would be used to construct instream structures. If the remaining unused fill materials are determined to be appropriate for reuse in other areas of the GGNRA, they would be left in an appropriate temporary storage area within the GGNRA for later use as needed. Any excavated fill materials determined to exceed applicable criteria for reuse at the GGNRA would be transported to an appropriate off-site disposal location. Most of the removed soil containing the weed seed bank would be buried within the project area. These sites would include the base of the new flood berm and recontoured riparian banks.

Grading and excavation would be conducted using an excavator. To protect existing habitats and facilities, grading would be confined to the limits shown in Figure 5. The highlighted

area shows the maximum extent of grading and placement of instream structures. The excavated materials, if dry, would be placed in trucks for transport and disposal. If the excavated material is wet, the material would be de-watered prior to transport. The de-watering area would be contained by a berm or otherwise managed to prevent discharge of decant water. Materials would be allowed to dry for approximately one to three weeks, depending on weather conditions. Materials would be periodically turned to allow for more efficient drying. After de-watering, excavated fill would be transported in trucks for disposal.

Riparian Vegetation

The development of the native-plant community restoration plan was a joint effort between plant ecologists with the Golden Gate National Parks Association and GGNRA. T he revegetation of native plants would be conducted in phases. After the initial planting, supplemental plantings would be required if at least 50% cover along stream bank was not achieved after one year and 80% cover in five years. Revegetated areas would be monitored on a semiannual basis for the first five years to document the percent cover and success of revegetation efforts and plant community composition. Monitoring would continue for three years after replacement plantings.

Plant community types were selected based on existing habitat types within the project area. Species composition for each plant community has been developed using analysis of remnant native vegetation around Easkoot Creek and lists of native plant species likely to occur in the area (NPS 2000). Plantings in riparian woodland areas would include Arroyo and yellow willow (*Salix lasiolepis* and *S. lucida* ssp. *lasiandra*) and red alder (*Alnus rubra*). Most of these native plants currently exist at the GGNRA. All plants would be propagated from local GGNRA sources to prevent contamination of the existing native plant gene pool.

An integrated weed removal strategy would be used. Hand removal techniques (ivy), brush cutters (Himalayan blackberry), and chain saws would be combined. Eradication of persistent weeds such as Cape ivy would be conducted in accordance with removal specifications used successfully for other projects throughout the GGNRA. In heavily infested areas several inches of top soil may be removed to eliminate the exotic plant seed bed. Cape ivy removal is considered a high priority management effort within the GGNRA (NPS 2000).

Exotic weed removal in wetland areas would follow appropriate agency guidelines for the protection of surface waters and wildlife. All removals of invasive species located within existing riparian and wetland habitats would take place from mid-August through February, outside the bird breeding season. Appendix B includes the planting palette with associations for the project area. Please see detailed information contained in the Easkoot Creek Vegetation Management Plan found in Appendix C for plants selected for planting. Table 1 includes a summary of current habitat types found at the project site and the proposed quantities of those same habitat types following implementation of the preferred alternative.

Non-native Tree Removal and Re-use

Logs and root wads for in-stream actions would be obtained from trees within the Stinson Beach facility. Up to twenty-five trees would be used for this purpose, mostly non-native Monterey cypress and Myoprum. These trees would be removed due to their non-native status. Tree removal would occur outside of the bird breeding season. Areas targeted for tree removal, including the South Parking lot and the Central Parking lot near the visitor center, would be temporarily closed for public use with signage and temporary fencing until removal work is completed. Tree limbs would likely be mulched and used on-site.

Table 1: Existing Project Area Habitat

Habitat	Existing (sq. m)	Existing (acre)
PEM-native	534	0.13
PEM/PSS-native	2606	0.64
PSS-native	462	0.11
PFO-non-native	1697	0.42
PFO-native	1170	0.29
Riverine-Intermittent, not forested	205	0.05
Developed	13768	3.40
Upland	2796	0.69
TOTAL	**23238**	**5.74**

Key-Palustrine emergent (**PEM),** Palustrine scrub-shrub **(PSS),** Palustrine Forested **(PFO)**

After tree removal, native landscaping materials would be planted in disturbed areas as needed. The planting palette for the tree removal area would include California box elder (*Acer negundo*), California buckeye (*Aesculus californica*), wax myrtle (*Myrica californica*), coast live oak (*Quercus agrifolia*), willow (*Salix* sp.) and bay laurel (*Umbellularia californica*). Limited watering may be used to establish the plantings in the first year.

Buffer Strip

A six-foot wide section of the northern parking lot (closest to the creek) would be removed and replaced with a "buffer strip" intended to reduce impacts the creek currently incurs from parking lot run-off during rain events. This buffer zone would utilize a treatment recommended by the California Coastal Commission. The selected treatment would absorb pollutants (automotive fluids) that rain water carries across the parking lot via the natural drainage flow. The treatments under consideration include:

- Vegetative filter strip, swale, or infiltration trench. The runoff from the parking lot would be directed to this strip
- Provide runoff pretreatment prior to the runoff reaching the newly created vegetative filtering strip
- Using a street sweeper on the parking area as well as planting a vegetative filtering strip

NPS staff would select a treatment and would include a discussion of the treatment within the preparation of a Finding of No Significant Impact (FONSI), if a FONSI is deemed appropriate for the proposed action.

Easements

An encroachment permit from Caltrans will not be required. The footprint of the proposed action will not extend into the Caltrans right of way for Highway 1. Upstream of the car bridge, a section of stream adjacent to the Shakespeare-at-Stinson and U.S. Postal Service buildings are on private lands and contain a County road right-of-way. Permission for work in these areas would be obtained from private land owners prior to work.

Utilities
The location of known utilities has been identified. Utilities, specifically PG&E and PacBell lines, are located just outside the area of excavation and adjacent to the entrance kiosk, also located outside the project area.

Visitor Service / Parking
The footprint of the northern parking area would be slightly reduced to allow widening the riparian habitat by approximately 6 feet. This action would not result in any net loss of parking spaces. The action would not create additional traffic congestion and would meet minimum requirements for safety. Retaining the turnaround would prevent any additional traffic congestion from buses circulating through the parking areas.

Project Monitoring

- Following completion of construction, GGNRA staff would be responsible for on-going maintenance and monitoring the progress of restoration activities for a minimum of 5 years. Monitoring actions would include collection of stream topographic, riparian habitat, and fish data. The stream would also be monitored for debris and deposition of sediment after major rain events. Material would be removed, under use of regulatory permits, if GGNRA determine the materials were adversely affecting habitat. Stream banks and structures would be periodically inspected for signs of undesired instability and invasive plant species would be removed.
-

Mitigation Measures
Mitigation measures are included as part of the Preferred Alternative pending approval by regulating agencies USACE, NMFS and RWQCB. (Please see Appendix D). Detailed information regarding plants selected for planting is found in Appendix C, the Easkoot Creek Vegetation Management Plan.

Environmentally Preferred Alternative
The environmentally preferred alternative is the alternative that will promote the national environmental policy expressed in NEPA (sec. 101 (b)). This includes alternatives that:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

Insert Layout Plan

Insert Grading Plan

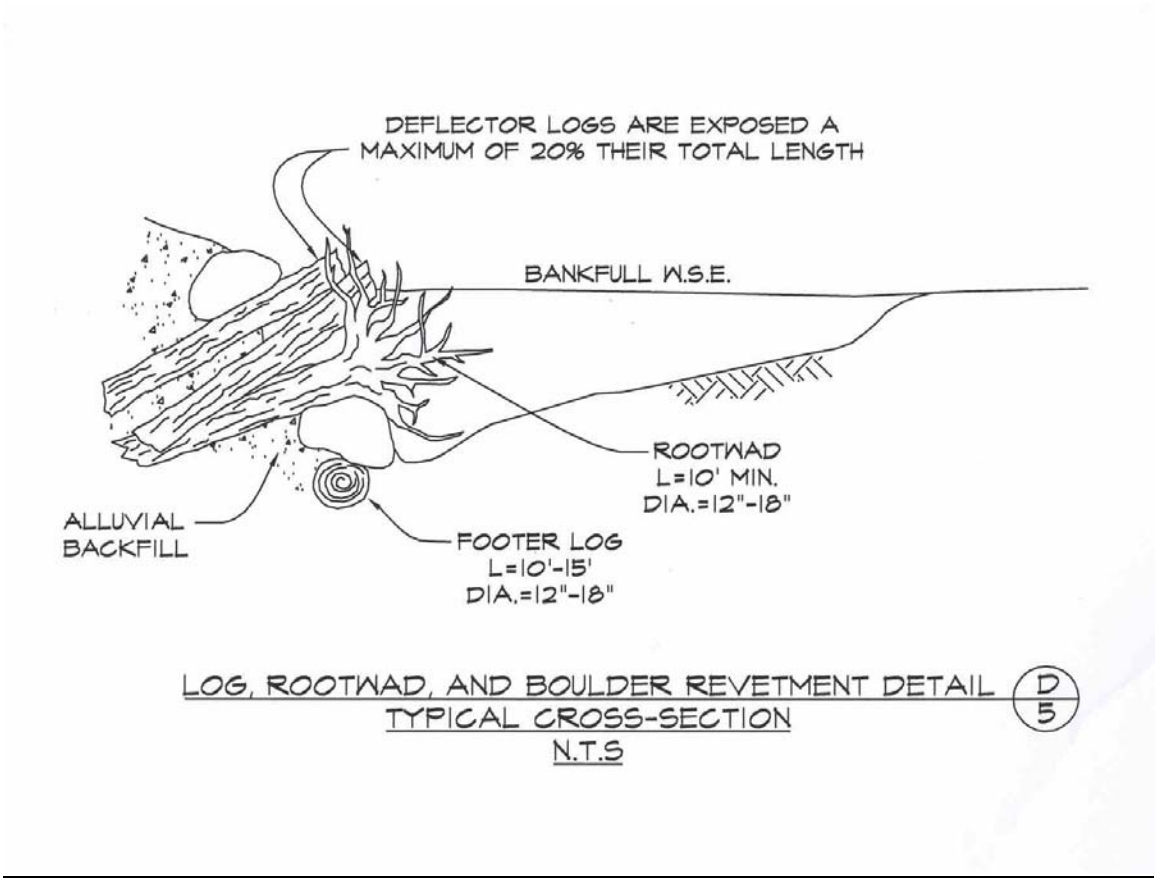

Figure 4: Revetment Cross-Section

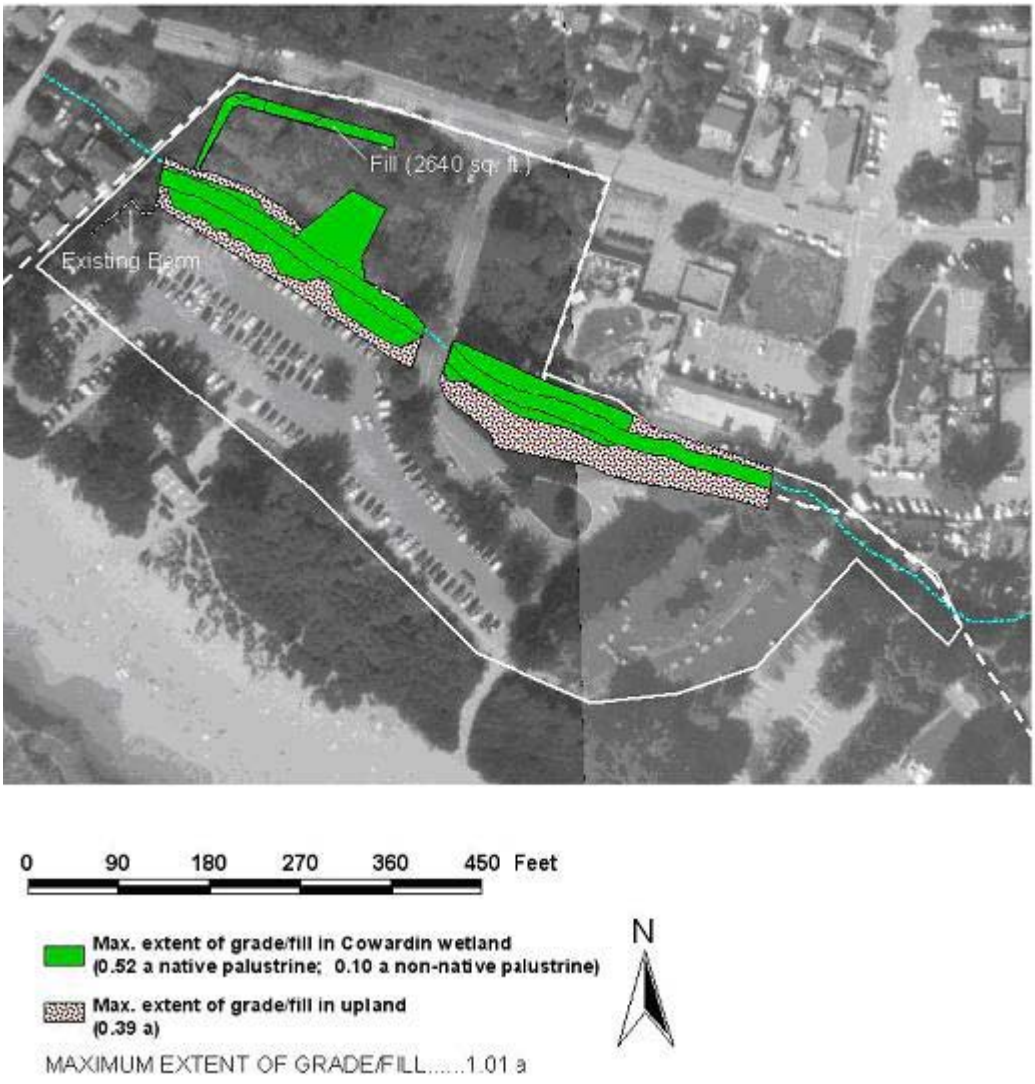

Figure 5: Grade and Fill Areas

➢ Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The Preferred Alternative is the environmentally preferred alternative because it restores habitat for federally threatened species while causing minimal disturbance to the recreational values of the site. The Preferred Alternative is considered the environmentally preferred alternative.

Alternatives Considered but Rejected

Alternatives that were considered but rejected were rejected based on their inability to meet project objectives, issues and concerns raised by the public and regulatory agencies, and the criteria used to evaluate the success of the project. The following alternatives or elements were considered and rejected.

- An alternative that would utilize strictly wood structures was considered but rejected due to the proximity of near stream structures (e.g., roads and buildings) and the tendency for large wood structures to snag debris and cause sedimentation. The preferred alternative would include some large wood structures in areas where facilities are not at risk. This alternative would not have accomplished the objective of minimizing in-channel maintenance, as increased numbers of wood structures would increase the amounts of sedimentation and debris snagged.
- A larger project alternative was considered proposing the restoration of additional stream channel, floodplain and riparian habitat south of the pedestrian bridge. This alternative did not meet project objectives due to the close proximity of private development to the creek and relatively low amounts of viable aquatic habitat that could be created within the GGNRA boundaries per unit cost. Adjacent private properties (e.g., Parkside Café) are directly along the creek bank.
- Activities focused on the pedestrian and automobile bridges crossing the creek within the project site were eliminated from further consideration. These structures constrict channel flow and prevent natural channel meandering. Optimally, these structures might be redesigned to better accommodate the creek's natural processes. However, removal, relocation or redesign of either structure would adversely affect present visitor access. Future studies to address the constriction of the channel and visitor use should be considered in future plans involving redesign of parking facilities.
- An alternative involving a seep as a water source was considered. A seep was investigated in the southern part of the project area that was originally the site of an historic 2.5-acre wetland known as Poison Pond. This source of fresh water was proposed to be diverted back into Easkoot Creek to increase the amount of water available to fish. This location drains through a series of culverts where it eventually empties onto the beach. This concept was rejected at this time because rerouting the water may preclude the possible future restoration of Poison Pond.
- An alternative involving the removal and integration of the entrance road bus-turnaround and associated kiosk into the restored riparian habitat area was considered. The concept was later rejected for potential impacts to traffic patterns and visitor service needs.
- A revised road design alternative was considered that allowed an increase in the riparian corridor while providing for a regional transit bus turnaround and bus stop. This concept was dismissed because of minimal gains in quality riparian habitat per unit of cost. A similar design may be considered as part of a larger Comprehensive Transportation Management Plan.

3.0 AFFECTED ENVIRONMENT

3.1 Geologic Resources

Soils and Geology
The topography of the Easkoot Creek watershed reflects the ancient erosion of hard bedrock and the recent deposition of sand dunes. Topographic relief in the watershed ranges from sea level to over 600 feet. The topography changes from sea-level beaches to the flat-topped bedrock ridges inland. The project stream, Easkoot Creek, drains the east end of the Bolinas Lagoon watershed. Easkoot Creek descends rapidly from Bolinas Ridge and flattens onto a plain before entering the lagoon. The Marin County area is underlain with sandstone, shale, greywacke, greenstone, and gneiss and serpentinite of the Mesozoic-age Franciscan assemblage.

Easkoot Creek watershed begins in the bedrock western slopes of Mt. Tamalpais. Easkoot Creek originates near the Bolinas Ridge above Stinson Beach and flows as three small tributaries called Black Rock, Laurel and Fitzhenry Creeks. These tributaries join above Highway 1 near the fire station, and flow through town until reaching Bolinas Lagoon. In the Stinson Beach area, younger deposits and sand dune deposits of the late Pleistocene and Holocene cover these older rocks. The sand deposits are part of one of the most extensive coastal sand dune deposits in California.

Lower Easkoot Creek is located behind the foredune of this coastal sand beach deposit. The elevation of lower Easkoot Creek is about 10 feet above mean sea level. Easkoot Creek flows northward discharging into a large marsh at the south end of Bolinas Bay and drains a watershed of 1062 acres (Wahrhaftig 1971).

Bolinas Bay came into existence between 5,000 and 7,000 years ago, during the post-glacial sea-level rise (Wahrhaftig, 1971). The 1,100-acre Bay, approximately one mile wide and 3 1/2 miles long has a watershed of 16.7 square miles (10,500 acres) with maximum dimensions of three miles in width by nine miles in length (Wetlands Research Associates, et al., 1996). The San Andreas Fault runs southeast to northwest through the Bay (Bergquist, 1979). The Bolinas Bay waters, mudflats, and marshes are biologically rich and diverse, supporting a myriad of invertebrate species, several fish species including at one time coho and steelhead trout, macroinvertebrates, and shorebirds, wading birds and waterfowl (Calif. Dept. of Fish and Game 1970).

Extensive grading during the construction of parking lots and the grading of debris flow material resulted in artificial fill materials covering the majority of the project area, including the streambed and embankments. The drilling log from core sampling obtained in 1958 as part of an automobile bridge replacement project indicates several feet of fill materials overlying organic matter, native clay, sand and gravel deposits. The fill material consists of various types of mudflow deposit, road base material, angular rocks, brick fragments, etc. Fill embankments along both sides of the stream control the action of the stream. A small area of over-bank floodplain exists along the western portion of the project area. Artificial fill materials to a depth of several feet also overlie this area. Below the fill material occur native mud and sand deposits.

3.2 Hydrology and Water Resources

The Easkoot Creek watershed has a temperate maritime climate characterized by cool wet winters and foggy summers. Annual maximum and minimum temperatures are seldom above 27 degrees (Centigrade) or below 4 degrees due to the marine influence. The mean annual temperature is about 14 degrees. Mean annual precipitation is around 21 inches, of which 19-inches fall during

the rainy season from November to April. In spring and summer the watershed can experience strong prevailing winds that blow out of the west / northwest from the Pacific Ocean, usually in the afternoon and at more than 17 knots. In both winter and summer, the Easkoot Creek watershed normally experiences excellent air quality. Fog often blankets the watershed during the late spring-summer and fog drip is a significant addition to precipitation amounts. Coastal fog causes significant reduction in rates of evapotranspiration. The maximum influence corresponds to a reduction in evapotranspiration of about 35 percent. Areas affected by coastal fog would also have relatively low seasonal fluctuations in evapotranspiration (National Weather Service 1999).

Rainfall records for 1978-1989 at Stinson Beach show the expected seasonal nature of precipitation within the project area with the maximum rains falling from November through March. The construction window based on the absence of rainfall would be from May to October with June to September being the preferred construction period.

Stream Channel

Watershed Science prepared a longitudinal profile of Easkoot Creek within the project area. The current stream profile along the thalwag is depicted in Figure 6. This profile indicates the absence of large pools. The project reach is characterized by low sinuosity (1.2), flat gradient (1.2% slope), artificial confinement, a gravel/cobble bed, and mixed riparian (exotic invasive and native) vegetation. Development occurs on terraces on both sides. The park development consists of roads, picnic area, bridges, landscaping, and parking lots while the town development consists of streets and buildings.

The project reach has been significantly altered by human and geologic activity. Extensive grading during the construction of parking lots and the grading of debris flow material resulted in artificial fill materials covering the majority of the project area, including the streambed and embankments. The drilling log from core sampling obtained in 1958 as part of an automobile bridge replacement project indicates several feet of fill materials overlying organic matter, native clay, sand and gravel deposits. The fill material consists of various types of mudflow deposit, road base material, angular rocks, brick fragments, etc. Artificial fill materials to a depth of several feet also overlie this area. Below the fill material occur native mud and sand deposits.

Maintenance dredging has occurred in the last few decades over the entire the reach to maintain channel capacity. Dredge spoils were placed along the top of bank on both sides to create, in effect, levies. These artificial levies have prevented access to the floodplain, particularly downstream of the car bridge where a low-lying area, considered a wetland, exists adjacent to the channel just beyond the east bank

Human structures are evident along the channel. Hardened revetments made of concrete and gabions line the north bank. Pedestrian and car bridge cross the channel through the Project Reach. The pedestrian bridge constricts cross-sectional area with concrete wing walls.

There is a distinct lack of large woody material in the channel, most likely the result of post-flood channel clearing activities. Because of these activities, few pools for fish and other aquatic life are present. Protracted runs of 250 or more feet are present without significant pools.

Figure 6: Current Stream Profile

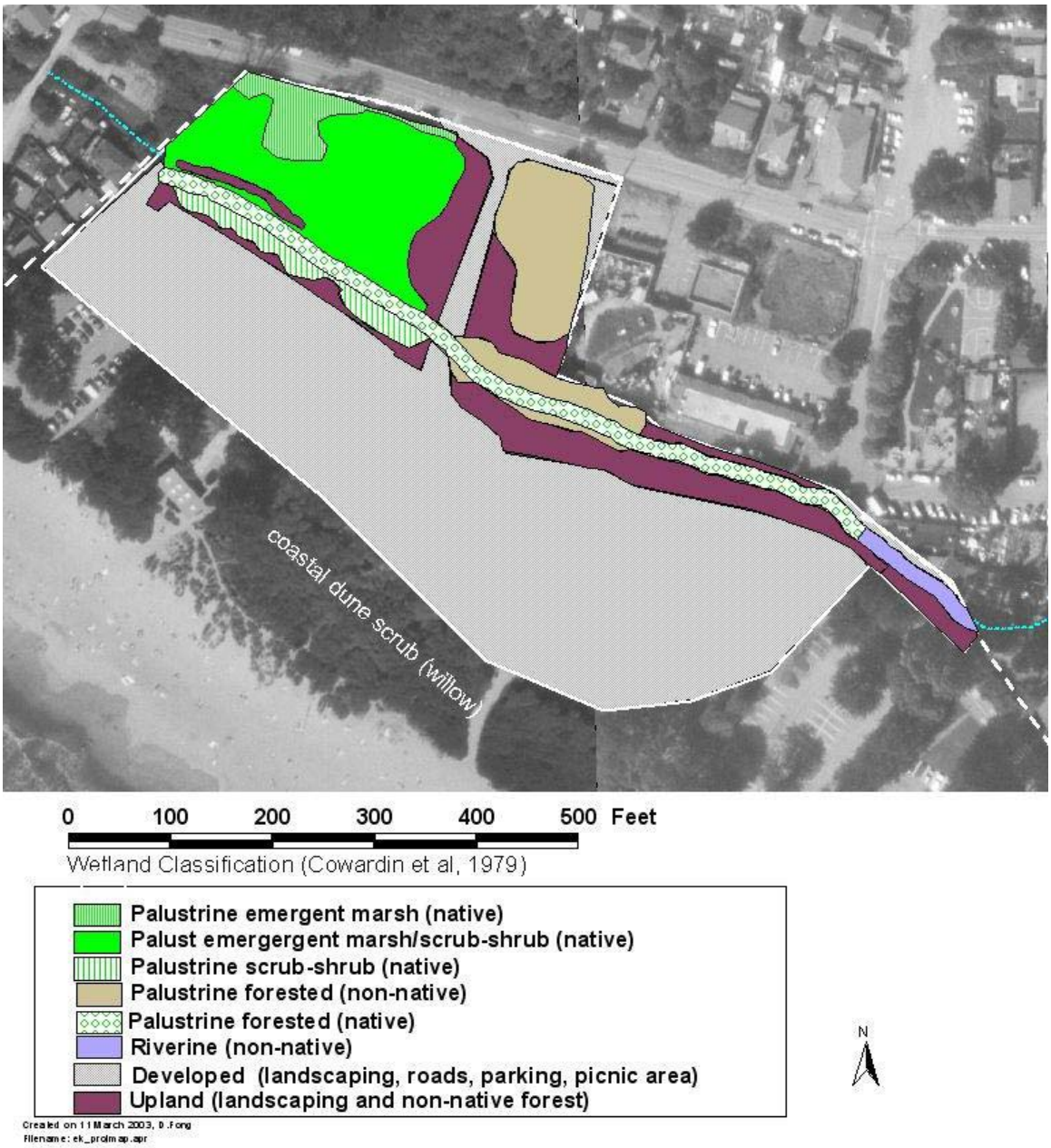

Figure 7: Project Area Habitat Types

Flow

Limited information exists for the Easkoot Creek area regarding historical characteristics of surface water resources. Changes to topography, vegetation, watercourses, and land uses have altered the discharge and groundwater aquifer recharge characteristics of the lower Easkoot Creek area. Maintenance of sufficient summer and fall instream flows are of great importance for fishery resources. The headwaters of Easkoot Creek are a source of potable water for the Stinson Beach County Water District. Mortality of juvenile steelhead in October 1999 associated with water withdrawals have resulted in modification of operations to protect instream flows for fish.

The NPS Water Resources Division along lower Easkoot Creek within Stinson Beach Park established a stream gauging station in May 1999. Flow information to date indicates perennial flow at the gauging station during the period of record. However, late summer base flows were typically around 0.01 cfs. Just upstream of the gauging station, the stream becomes disconnected at less than 0.3 cfs. The resulting dry reach occurs from just above the Arenal Bridge to just below the Parkside pedestrian bridge. In 2000, flows were connected through July.

The project area is currently within a FEMA 100-year flood hazard designation area (FEMA 1986). The project area is found on Flood Insurance Rate Map panel number 060173 0419B (map revised Nov 19, 1986). Most of project area is mapped as Zone A0 (areas of 100 year shallow flooding where depths are between 1 and 3 ft.

Water Quality

NPS conducted a literature review to identify critical water quality parameters that would affect fish well-being and to identify any established water quality criteria. No regulatory water quality objectives were available for any stream tributaries to Bolinas Lagoon (RWQCB 1995). This information was used to identify appropriate “red flags” or parameters to monitor. Based on controlled laboratory experiments on juvenile coho and steelhead trout from scientific literature, NPS used sub lethal dissolved oxygen threshold of 5-mg/l and water temperature of 20^{o}C as additional “red flags."

GGNRA initiated sampling to determine if water quality conditions were suitable for aquatic life. Water quality conditions are mostly acceptable for sustaining aquatic life, except for brief, stressful periods of low dissolved oxygen availability. Stream water temperatures in summer 1999 and 2000 were suitable for growth and survival of juvenile steelhead trout at the two sampled sites in the Easkoot Creek watershed (Tables 3-1, 3-2). Dissolved oxygen concentrations within lower Easkoot Creek were low throughout summer and fall 2000 (Fong 2002). In general, dissolved oxygen concentrations declined from July through October (Fong 2002). About 30% of the sampled days had dissolved minimum dissolved oxygen levels less than 5 mg/l. Dissolved oxygen concentrations from July through the end of October ranged from to 8.1 to 2.4 mg/l. (Table 3-1).

Temperature readings at the Easkoot station indicate that summer and fall stream flow might result more from subsurface and bank contributions than surface flows. In fact, the reach from Arenal Bridge to below the Parkside pedestrian bridge has been dry for most of the summer from 1997 to 2000. However, surface flows are present downstream (Fong, 2000).

Table 3-1
Summary, Dissolved Oxygen and Water Temperature Differences, 2 Easkoot Creek sites

Month	# Days	# Days Min DO < 5 mg/l	Mean Max - Min DO (mg/l) (S.D.)	Mean Max - Min Temp (^{o}C) (S.D.)
EASKOOT CREEK STATION				
July	19	7	1.40 (0.64)	2.73 (0.83)
August	19	5	1.11 (0.39)	1.77 (0.90)
September	17	4	1.28 (0.65)	2.04 (0.94)
October	25	8	1.57 (0.57)	1.64 (0.51)
Grand Mean			1.34	2.05
LAUREL CREEK STATION				
July	19	0	0.47 (0.20)	1.99 (0.65)
August	19	0	0.36 (0.19)	1.61 (0.85)
September	30	0	0.49 (0.18)	2.23 (0.90)
October	25	0	0.49 (0.23)	2.15 (0.91)
Grand Mean			0.45	2.00

Table 3-2
Easkoot Creek Gauging Station, Air and Water Temperature, 1999

Month	# Days	Mean Max Air	Mean Max H20	Mean Min Air	Mean Min H20
April	27	19.3 (2.3)	14.0 (0.1)	7.8 (2.1)	11.1 (0.8)
May	31	21.3 (3.0)	14.6 (1.3)	8.8 (1.9)	12.1 (1.1)
June	30	21.4 (3.0)	15.7 (0.7)	10.6 (2.1)	13.5 (0.8)
July	31	21.7 (2.3)	15.6 (0.5)	10.2 (1.3)	14.0 (0.5)
August	16	23.1 (2.0)	16.1 (0.3)	11.3 (1.7)	15.0 (0.1)

3.3 Natural Resources

Wildlife

The project area environment is comprised of aquatic and wetland habitat, native and non-native plant communities, and adjacent developed areas. Urban development and human activity limit the presence of animals on the project site. Most animals found in the Easkoot Creek corridor are generalists, capable of adapting to small islands of open space surrounded by developed land uses. However, remnants of the former Easkoot Creek ecosystem are relatively intact and support greater diversity in wildlife species.

Birds potentially occurring on the project site include resident and migratory species, as well as occasional vagrants. Easkoot Creek is within the Pacific Flyway, the major corridor for movement by migratory shorebirds, raptors, and other birds along the West Coast of North America. In California, movement of migratory birds returning from breeding grounds to the north is concentrated in two primary branches, the Bay/coastal area and the San Joaquin Valley. Within the Bay/coastal area, one of the most heavily traveled migratory routes is over the Marin Headlands. Woodland and scrub habitats and perennial surface water in Easkoot Creek may attract migrating birds such as Cooper's hawk *(Accipiter cooperii),* red-tailed hawk *(Buteo jamaicensis),* yellow warbler *(Dendroica potechia browsteri),* and semipalmated plover *(Charadrius somipalmatus).* These species use the creek and adjacent habitats as a staging area (transient feeding and resting) during annual migrations.

Several resident birds forage and roost in woodland and scrub habitats of the project site such as house wren *(Troglodytes aedon),* scrub jay *(Aphelocoma coeruiescens),* Steller's jay *(Cyanocitta stelleri),* California towhee (Pipilo *fuscus),* rufous-sided towhee (Pipilo *eiythrop-hthaimus),* white-crowned sparrow *(Zonotrichia loucophm),* California quail *(Callipepla colifornica),* northern flicker *(Colaptes curatus),* and acorn woodpecker *(Molanorpes formicivorus).* Many of these species may also nest and breed in trees or shrubs on the project site.

On April 4, 2002 a bird survey (Appendix E.) was conducted along Easkoot Creek in the town of Stinson Beach between the hours of 8:15 am and 11 am. A total of 26 species were recorded in the strip of riparian forest and scrub between the Stinson Beach Parking Lot and Highway 1. An additional 14 species were noted either flying over or in the immediately adjacent areas. No special status species were observed in the project area. The location and shape of the riparian strip, fragmented and surrounded by human activities makes the site sub-optimal for birds specialized to riparian habitats. Six aggressive generalist bird species (including two introduced species) typical of urban areas were observed in the riparian strip twice as frequently as birds specialized to native woodlands. Invasive plants appear to be responsible for the existence of marginal habitat at this site.

Easkoot Creek provides several habitat features for mammals, including perennial surface water, cover, forage, roosting sites (bats), and breeding and denning sites. Raccoon *(Procyon lotor)* and striped skunk *(Mephitis mephitis)* may forage for terrestrial and aquatic invertebrates and small amphibians in several habitats of the project site. Rodents feed on grass seeds, pine nuts, berries, acorns, and other vegetative materials. Characteristic species include valley pocket gopher *(Thomomys bottae),* and western harvest mouse *(Reithrodontomys megalotis),* deer mouse *(Peromyscus maniculatus),* gray squirrel *(Sciurus griseus),* and ornate shrew *(Sorex ornatus).* California ground squirrel *(Spermophilus beecheyi),* pocket gopher, and California mole *(Scapanus latimanus)* dig underground burrows within the area for cover and to raise their young. A coyote *(Canis latrans*) has been seen in the creek area since 1999 and river otter *(Lutra canadensis)* were seen downstream of the Park in the winter of 2000 capturing steelhead (Fong pers. comm., 2000). Historically, bat species recorded in riparian habitats of Easkoot Creek include Mexican free-tailed bat *(Tadarida brasiliensis)* and California myotis *(Myotis californicus).*

Several amphibians and reptiles may occur in streamside habitats of the project site, including arboreal salamander *(Aneides lugubris),* Western toad *(Bufo boreas holophilus),* California newt *(Taricha torosa),* and northwestern fence lizard *(Sceloporus occidentalis).* These taxa forage and breed in a variety of habitats within the corridor. The aquatic environment of Easkoot Creek supports a variety of invertebrates species, including water boatmen (Corixidae), water striders (Gerridae), dragonflies (Odonata), and predaceous water beetles (Dytiscidae).

Vegetation
The vegetation communities (Figure 7) within the Easkoot watershed are characterized by their proximity to urban areas. Open spaces near homes have a large component of non-native vegetation including French broom (*Genista monspessulana*), pampas grass (*Cortaderia jubata, C. selloana*), and cape ivy (*Delairea odorata*). The riparian corridor along Easkoot Creek has the largest numbers of non-native plants when compared to streams of other east-side Bolinas Lagoon tributaries.

The inner gorges are dominated by forests of coast redwood (*Sequoia sempervirens*) and Douglas fir (*Psuedotsuga menziesii*). Much of the convex slopes are dominated by native chaparral species such *as Baccharis, Rhamnus, Ceanothus, Adenostoma, Toxicodendron diversilobum,* (Poison Oak). Grassland areas have a strong native component, with stands of *Nassella pulchra* and *Danthonia californica*, among others.

Historically, extensive areas of native willow and alder shrub-scrub habitat dominated the vegetation in the project area. The vegetation community is much different now. Because of human activity, the once extensive willow and alder habitat is now isolated remnants. Core logs for the entrance road bridge (near the creek) construction show up to 5 feet of artificial fill over saturated organic material. Old photos from the 1950's show grading and filling activities by the California State Parks to create parking and road facilities. Much of the riparian corridor consists of non-native plants. The planting palette for the prior Stinson Beach State Park contained ornamental trees and shrubs (e.g., Myoporum). Appendix A lists the vascular flora of the Easkoot Creek project site found during plant surveys. Appendix B lists the current planting palette with associations for the project area..

Special Status Resources
Literature reviews, contacts with local biologists and resource agencies, and field surveys were conducted to evaluate the potential occurrence of special-status resources on the project site. The U.S. Fish and Wildlife Service provided a list of federally threatened, endangered, and proposed species and any designated or proposed critical habitat (letter,1-1-00-SP-1415, from U.S. Fish and Wildlife Service dated April 6, 2000). For purposes of analysis, special status resources are biological communities, plants, and animals that are: 1) identified by state and/or federal agencies as rare, threatened, or endangered or candidates for such designations, or 2) considered sensitive by recognized monitoring agencies and conservation organizations (e.g., California Department of Fish and Game, California Native Plant Society, U.S. Fish and Wildlife Service). Table 3-3 contains the special status species that may be found near the project area and their associated habitats.

Sensitive Plants
GGNRA botanists reviewed the list of sensitive plants to determine habitat needs and potential occurrence in the project area. Because of the disturbed nature of the project site, it was considered unlikely that any sensitive plants would be found. Plant surveys in the project area were conducted in January 2000, June 4 and July 6, 2000. The list of plants identified during field surveys is provided in Appendix A. No special status, listed or proposed plants were found during a survey conducted in June 2001 (Elliott, personal comm.). The Stinson Beach dunes just outside the project area were surveyed on June 5, 2002 (Faden 2002). No special status plants were found in the dunes, although presence of pink sand-verbena *Abronia umbellata* ssp. *Umbellata* was noted.

Sensitive Terrestrial Species

No special status terrestrial species were observed in the project area during a survey conducted in April 2002. No special status terrestrial species listed on state or federal listed threatened/endangered are likely to be found in natural areas on the project site because of the degraded conditions and proximity to urban activities. Federally threatened northern spotted owls and western snowy plover may be found in adjacent habitats outside the project area.

While nearby monarch butterfly over wintering sites are by strict definition out of the project area (Table 3-3), the butterflies utilize the project area extensively Sept -March for nectar, water and sunning (M. Monroe, pers. comm., 2003). Observations during the winter of '02 indicated that the project area was utilized on sunny days following significant storms.

Sensitive Aquatic Species

Special-status fish are species that are legally protected under the state and federal Endangered Species Act or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Steelhead trout *(Oncorhynchus mykiss)* populations have declined in California by over 90% since the 1950's and the Southern California population has declined by 99% since the turn of the century. In addition, they have been extirpated from at least 23 streams and their historic range of distribution has been significantly reduced. The Department of Fish and Game (DFG) *Steelhead Trout Restoration and Management Plan for California (The Steelhead Trout Plan)* identifies the major cause in the decline of steelhead trout populations as freshwater habitat loss and degradation. Fish are an important public resource with significant economic, environmental, recreational, aesthetic, and educational values. The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act declare that it is the policy of the State of California to increase the state's salmon and steelhead trout resources. This is to be accomplished by improving and protecting stream habitat (DFG 1996).

The threatened steelhead trout occurs in Easkoot Creek. Steelhead trout closely resembles rainbow trout. They are an anadromous species: born and reared in freshwater streams, as juveniles they migrate to estuaries, adjust to saltwater and then migrate to the ocean to mature into adults. As they begin to sexually mature they return to the streams of their birth to spawn and then, attempt to return to the ocean to repeat the cycle. The juvenile steelhead trout reside in streams and rivers from 1 to 3 years and require cool, clean water year round to sustain themselves. Steelhead trout, like all salmon, need clean, cool water with plenty of oxygen and low amounts of suspended solids and contaminants. They also need gravel substrates for spawning. Steelhead trout and coho salmon also require large woody debris and deep pools, which provide refuge from predators and resting places during storms.

The threatened coho salmon (*Oncorhynchus kisutch*) has also been found in Easkoot Creek. Thus far, one of three year classes of coho has been observed. Most coho exhibit a three-year life cycle (1.5 years in both stream and ocean), with minimal breeding with coho born in other years. Causes of coho salmon decline in California include poor land-use practices such as logging and urbanization, loss of wild stocks, introduced diseases, over harvesting, and climatic changes (P. Moyle *in litt.* 1993). Like steelhead, coho salmon are also an anadromous species. For small, coastal streams, most coho return to freshwater systems to spawn in fall and winter months (Moyle 1976). Spawning occurs in small to medium-sized gravel at well-aerated sites, typically near the head of a riffle (Moyle 1976). These streams have summer

Table 3-3
Threatened and Endangered Species of West Marin County
Special Status Species Potentially Occurring near the Project Site

Common Name	Scientific Name	Federal/State Status	Habitat	Habitat Present?	Notes
PLANTS					
Sonoma alopecurus	*Alopecurus aequalis var. sonomensis*	FE,-	Freshwater marshes and swamps; riparian scrub; wet meadows	YES	Rare in Point Reyes marshes
Tiburon mariposa lily	*Calochortus tiburonensis*	FT, ST	Serpentinite areas in valley and foothill grassland	NO	
Tiburon paintbrush	*Castilleja affinis ssp. neglecta*	FE,-	Serpentinite areas in valley and foothill grassland	NO	Known only from Tiburon peninsula. Nicasio area
Sonoma spineflower	*Chorizanthe valida*	FE, SE	Sandy areas in coastal prairie	NO	
soft bird's-beak	*Cordylanthus mollis ssp. mollis*	FE, SR	Coastal salt marsh	NO	Found in Bolinas Lagoon
Baker's larkspur	*Delphinium bakeri*	FE, SR	Coastal scrub	NO	
Marin dwarf-flax	*Hesperolinon congestum*	FT, ST	Serpentinite areas in chaparall, valley and foothill grassland	NO	Found in Presidio, Nicasio, and San Francisco Water District areas
Santa Cruz tarplant	*Holocarpha macradenia*	FT, ST	Clay soils in coastal prairie and valley and foothill grassland	NO	
beach layia	*Layia carnosa*	FE, SE	Coastal dunes	NO	Extensive dune habitat adjacent to project along Stinson Beach
clover lupine	*Lupinus tidestromii*	FE, SE	Coastal dunes	NO	Extensive dune habitat adjacent to project along Stinson Beach
white-rayed pentachaeta	*Pentachaeta bellidiflora*	FE, SE	Serpentinite areas in valley and foothill grassland	NO	CNDDB notes general Oakwood Valley location
Tiburon jewelflower	*Streptanthus niger*	FE, SE	Serpentinite areas in valley and foothill grassland	NO	

Common Name	Scientific Name	Federal/State Status	Habitat	Habitat Present?	Notes
showy Indian clover	*Trifolium amoenum*	FE, -	Valley and foothill grassland; coastal bluff scrub; sometimes on serpentine soil; open, sunny areas; swales	No	Historic locales at Stinson Beach and Olema from 20 to 200 feet above sea level. Last seen 1969.
INVERTEBRATES					
Monarch butterfly	*Danaus plexippus*	- , -		Yes	One of the largest wintering sites for monarch butterflies is present within the town of Stinson Beach. The roost trees are located outside the project area. During the winter, up to 10,000 monarch butterflies can be found at the in-town roost site (NPS 2000). None of the large trees within the project area are used as wintering sites.
California freshwater shrimp	*Syncaris pacifica*	FE,SE	low gradient, perennial streams where banks are structurally diverse with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation	Maybe	Lagunitas Creek watershed. Not found in invert surveys. Unlikely to be present.
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	FE, -	Coastal dunes, scrub, and grassland	No	
Ricksecker's water scavenger beetle	*Hydrochara ricksecker*i	SC, -	Larvae must hold prey above water to feed; thus they are found in relatively calm, shallow water	Yes	Not found in surveys.
San Francisco fork-tailed damselfly	*Ischnura gemina*	- , -	Associated with small seeps, shallow ponds, and sluggish streams in the San Francisco Bay Area (Hafernik and Mead 1992). Most individuals move little as adults (Hafernik and Mead 1992).	Yes	Not found in surveys.
Tomales asellid	*Caecidotea tomalensis*	- , -	Usually associated with shallow waters, less than a meter deep, and under rocks, vegetation, and debris	Yes	Not found in surveys. Found within Bolinas Lagoon watershed
Fish					
Tidewater goby	*Eucyclogobius newberryi*	FE, -	While generally found in coastal embayments, gobies are also known to occur in streams.	Maybe	Not found in surveys. Upstream from brackish habitats.

Common Name	Scientific Name	Federal/State Status	Habitat	Habitat Present?	Notes
Pacific lamprey	*Lampetra tridentata*	SC, -	Spawning and juvenile rearing habitat in flowing streams	Yes	Not found in surveys
Coho salmon	*Oncorhynchus kisutch*	FT,SE	Streams draining to bay/ocean with migratory corridors, spawning and juvenile rearing habitat	Yes	One year class observed in Easkoot Crk. Two-year classes in Pine Gulch Crk.
Steelhead trout	*O. mykiss*	FT, -	Streams draining to bay/ocean with migratory corridors, spawning and juvenile rearing habitat	Yes	Present. Resident and anadromous forms possible.
Reptile/Amphibian					
Western pond turtle	*Clemmys marmorata*	SC, -	Resident at both permanent and seasonal water bodies. Turtles may winter up to 250 meters from a watercourse seeking estivation or over-wintering sites in leaf litter or under logs (Holland 1991).	No	Likely present historically, habitat no longer present.
California red-legged frog	*Rana aurora draytonii*	FT, -	Adult require a dense, shrubby or emergent riparian vegetation closely associated with deep (>0.7 meters) still or slow-moving water.	Maybe	The closest known breeding locality for the frog is located a couple miles north near Wilkins Gulch. Likely present historically.
Foothill yellow-legged frog	*Rana boylii*	SC, -	Shallow streams with rocky substrates	No	Observed on Marin Municipal Water District Lands
Birds					
Western snowy plover	*Charadrius alexandrinus*	FT, -	Sandy spits/beaches	No	Observed on Bolinas Lagoon spit
California black rail	*Laterallus jamaicensis coturniculus*	-, ST	Tidal marsh with pickleweed, freshwater and brackish marsh	Maybe	Isolated palustrine emergent marsh. Unlikely to be present. Not observed.
California clapper rail	Rallus longirostris obsoletus	FE,SE	Tidal salt marsh and brackish marsh	No	Observed in Bolinas Lagoon
Northern spotted owl	Strix occidentalis caurina	FT, -	Northern spotted owls typically live in mature, undisturbed Douglas fir and mixed conifer forests.	No	No known breeding habitat is within 0.5 miles of project area

KEY: FE- federally endangered, FT-federally threatened, SE-state endangered, ST-state threatened, SC-federal species of concern, SR-state rare.

temperatures seldom exceeding 21° C. The first year is spent in freshwater. Emergent fry utilize shallow near shore areas, whereas optimal habitat conditions for juveniles or parr seem to be deep pools created by rootwads and boulders in heavily shaded stream sections (P. Moyle, Univ. of Calif., Davis, *in litt.*, 1993).

A general invertebrate survey on November 8, 1995 by the GGNRA aquatic ecologist did not find evidence of the endangered California freshwater shrimp (*Syncaris pacifica*). In January 2001 the NPS conducted a presence/absence survey for the shrimp. None were found during that survey.

Wetlands and Riparian Communities

Wetland and riparian communities are communities identified by Holland *(1986)* as declining on a regional and local basis in California**.** These communities were once extensive along rivers and freshwater channels of California but have been reduced by development and flood control activities. Native riparian and wetland communities occurring along Easkoot Creek would be considered sensitive by resource agencies.

Wetlands in the project area were classified using two different methods: the U.S. Army Corps of Engineers wetlands delineation and the Cowardin wetland classification. The NPS Director's Order NPS-77-1 (Wetland Protection) requires NPS units to "conduct park-wide wetland inventories (or will obtain such inventories from appropriate sources such as the National Wetlands Inventory) to help assure proper planning with respect to management and protection of wetland resources." Furthermore, NPS-77-1 requires NPS units to use Cowardin et al. (1979) as the standard for defining, classifying, and inventorying wetlands.

The National Wetland Inventory map produced by the U.S. Fish and Wildlife Service considers Easkoot Creek and adjacent areas as PSSC (Palustrine Scrub-Shrub, seasonally or temporarily flooded) (Peters and Browers 1991). However, mapping was done from 1:65,000 color infrared photos taken in April 1985 with no ground truthing (Peters and Browers 1991). Wetland inventory work by Point Reyes National Seashore (PORE) found that the existing NWI maps missed 33 percent of the wetlands identified by Park-wide vegetation mapping and subsequent field work.

Surveys were conducted in 2001 and 2003 to determine Cowardin wetland types in the field. The distribution of wetland types is illustrated in Fig 7. A total of 1.64 acres of Cowardin wetland types were identified (Appendix F). Non-native trees or understory dominated almost 30% of the mapped wetlands. The palustrine emergent wetlands were characterized by hydrophytic plants such as giant horsetail *(Equisetum telmateia)* (FACW), chamisso's hedge nettle *(Stachys chamissonis)* (OBL), California blackberry *(Rubus ursinus)* (FAC+), *Athyrium filix-femina* (FAC), and water parsley (*Oenanthe sarmentosa)* (OBL). Young red alder (Alnus rubra) and willows (Salix spp.) dominated Palustrine scrub-shrub habitats.

The northern area of the Easkoot Creek project site is a groundwater depression wetland. The area likely served as a floodplain for the creek; however there is a raised berm of fill material separating the creek from the wetland site. Soil in the berm was very dry and had a high gravel content. The entire extent of the wetland area had saturated soil, and the drainage ditch along Highway 1 contained flowing water during the dry season month of July. The Marin County Soils Survey describes the soil as Blucher-Cole complex, which is "somewhat poorly drained". The soil at the wetland pit qualified as hydric by having a low chroma. The soil in the upland pit had a higher chroma and no other hydric soil characteristics.

A wetland delineation was conducted to identify wetland and "other waters of the U.S." that are under the jurisdiction of the U.S. Army Corps of Engineers. Fieldwork was completed in 2001. A full description of wetland survey methods and results is provided in Appendix F. The extent of jurisdictional wetlands at the Easkoot Creek site is 0.8 acres. This includes the small area surrounding the wetland core on the East side of entrance road into the Park. The extent of additional potential wetland area on the East side is 0.3 acres. There are 0.12 acres of stream channel regulated as "waters of the U.S", for a total 0.92 acres of known wetlands. The maximum acreage under Corps jurisdiction is 1.22 acres.

Air Quality

The Bay Area Air Quality Management District is the agency with jurisdiction over air quality matters in the San Francisco Bay Area. The BAAQMD CEQA Guidelines (BAAQMD, 1996) state that particulate matter (PM_{10}) is the pollutant of primary concern for construction emissions. The Guideline*s* state further that the BAAQMD evaluates the significance/insignificance of air pollutant emissions from construction projects according to the mitigation measures that would be employed to reduce PM_{10} emissions, rather than on the basis of specific emission threshold quantities.

The primary source of air pollution in lower Easkoot Creek originates from neighboring roads and parking lots, which generate carbon monoxide and other exhaust products. High traffic volumes and congestion occur frequently on Shoreline Highway 1 and the entrance road to the Stinson Beach facility, potentially introducing pollutants into the project area. Levels of these air pollutants may exceed state and federal standards if periods of traffic congestion coincide with stagnant weather conditions.

3.4 Cultural Resources

Cultural resources are protected primarily through the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470 et seq.) and its implementing regulations (found at 36 CFR 800). Other pertinent legislation ~~covering~~ to this project includes the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§ 469 – 469c), the Native American Graves Preservation and Repatriation Act of 1990 (25 U.S.C. 3001), and the Archaeological Resources Protection Act of 1979 (16 U.S.C. §§ 470aa – 470mm).

History

The Easkoot Creek watershed was originally within the territory of native peoples referred to as the Coast Miwok. The Coast Miwok territory centered in present day Marin County and extended north to Sonoma County and Bodega Bay. Shelters were conical-shaped and covered with grass. Villages included sweathouses and ceremonial chambers. Seines, rafts, and weirs were constructed from tule balsa for fishing, and intricate baskets were woven for household uses. Subsistence was based on hunting, fishing, and gathering. A variety of large and small mammals were hunted, and fish, eels, and shellfish were taken from the ocean, lakes, and rivers. Vegetal staples included acorns, seeds, and kelp. Groups were generally organized without political leaders, yet large villages had a nonhereditary chief (Kelly 1978). Coast Miwok population is estimated at about 2,000 people before 1775; few Coast Miwok individuals survived the events of the 18th and 19th centuries in California. By the 1930s, only a handful of individuals with predominantly Coast Miwok ancestry were alive (Kelly 1978). The Coast Miwok tribe affiliated with the project area is the Federated Indians of Graton Rancheria. Now listing over three hundred registered descendants, the tribe has recently gained federal recognition. Ethnohistorical records indicate that a Coast Miwok village called "Bauli-n" existed on the eastern shoreline of Bolinas Lagoon (Kelly 1978, Kroeber 1925).

The probability that prehistoric cultural resources are present at Easkoot Creek is considered high because of the perennial water source and the high foraging and hunting potential of the location. Environmental conditions along Easkoot Creek would have been favorable for hunting camps and permanent habitation areas. Shifting sand dunes along with human activities (e.g., grading, landscaping) may have obscured any existing prehistoric cultural deposits. Although no prehistoric sites are recorded for Easkoot Creek, the area was probably a favorable locale for prehistoric cultural activity because of the perennial source of potable creek water, probable abundance of terrestrial animals and plants, and access to marine resources. The Easkoot Creek corridor is considered an "Archeologically Sensitive Area." Ground disturbing activity along Easkoot Creek must conform to NPS *Managment Guidelines* and the historic preservation statutes cited above.

Archaeological Resources

Relatively few archaeological investigations have been undertaken in Marin County. The earliest occupation sites currently recognized are shell middens that date to approximately 3,000 years BP (Gerike et al. 1996). Other excavations have focused primarily on the protohistoric or historically recognized villages of Coast Miwok (Dietz 1976). Although little archaeological research has been undertaken in the area, existing and potential archaeological sites could nonetheless become significant sources of cultural data.

There are no presently known archaeological resources at the Easkoot Creek site. The soils proposed for excavation at Easkoot Creek were determined to be recent sediment deposits and therefore are not likely to contain any archaeological resources. Construction activities will be coordinated with park archeologists to provide archeological monitoring as necessary. If any archaeological resources are unearthed during construction, construction would be halted, the Federated Indians of Graton Rancheria would be consulted and the SPHO would be notified as reqired under the terms of the "Programmatic Agreement, Operation & Maintenance, Golden Gate National Recreation Area"of June 26, 1992.

3.5 Visitor Use and Experience

Visitor Attendance

Stinson Beach is the largest beach in Marin County and is a popular location for recreational activities. More than a million visitors per year visit this coastal attraction. Stinson Beach offers walking trails, picnicking areas, scenic viewing areas, beach areas, and educational areas.

The lower Easkoot Creek project area is not commonly used for recreational purposes. The thick exotic vegetation and lack of access prevent most casual visitors from entering the riparian corridor. Developed areas of the project area consist of asphalt parking lots, roadways, embankments, roadway bridge, pedestrian bridge, entrance kiosk, siren tower and bus stop.

Adjacent land-uses

Adjacent land uses consist of commercial, residential and recreational facilities. Commercial buildings occur immediately adjacent to Easkoot Creek along the majority of the eastern border of the project area. These businesses occur along Camino Del Mar and Arenal Avenue consisting of the Parkside Café, U.S. Post Office, Stinson Beach Realty, Off The Beach sports shop, Willow Camp Catering and Shakespeare at Stinson (a theatre facility). Single-family residences adjacent to the stream are present at the northern end of the project area.

3.6 Socioeconomic Environment

Public Services and Utilities

Utilities were located at the site by Underground Services Alert and, within the project area, serve the entrance kiosk. Utility lines consist of an underground telephone and an underground electrical line. An off-site utility pole is located at the intersection of Camino Del Mar and Arenal Avenue adjacent to the Parkside Café pedestrian bridge. This pole contains telephone and electrical power lines as well as a streetlight. While this utility pole is outside of the project area, an anchor pole (connected to the utility pole) is located along the north bank of Easkoot Creek within the project area..

Two storm water drains discharge to Easkoot Creek within the project area. The storm drain at the pedestrian bridge will not be disturbed during project activities. A storm drain discharges from the north parking lot to Easkoot Creek at the northern Park boundary. This drain has a gate to prevent reverse water flow into the storm drain. The drain and gate may be relocated to the new edge of the channel.

Aesthetic and Visual Resources

Easkoot Creek is a unique and important scenic resource within the Stinson Beach facility, providing both scenic views and more contemplative surroundings to visitors (please see photos in Figures Chapter). Currently, a vista of the stream can be obtained from the entrance road and northern parking lots. From this vantage, the view shed includes a limited view of the stream, riparian vegetation and commercial businesses along Camino Del Mar and Arenal Avenue. A vista of the stream can also be obtained from the pedestrian bridge and public windows at the Parkside Café. From this vantage, the view shed includes a limited view of the stream, riparian vegetation, and parking lots to the west. Dense patches of willow trees and stands of exotic trees provide a green corridor alongside Easkoot Creek. As it is the only natural stream in the Stinson Beach area, the setting is a valuable visual resource. Birds are numerous and area near the densely vegetated bank provides an opportunity for quiet contemplation.

Noise

Sound magnitude is commonly measured in decibels (dB), which are logarithmic. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies that comprise a sound. A weighting factor is applied that reflects the fact that human hearing is less sensitive to low and extremely high frequencies than to the frequency mid-range. This is called "A" weighting, and the measured decibel level is called the A-weighted sound level, or dBA. The duration of noise and the time period at which it occurs are important values in determining the impact of noise on sensitive land uses. Noise is generally more disturbing at night than during the day, and noise indices have been developed to account for the varying duration of noise events over time as well as community response to them. The Day-Night Average level (DNL or Ldn) is such an index. The Ldn adjusts noise levels during the night (10 p.m. to 7 a.m.) by 10 dB to account for the increase in sensitivity of people to noise after dark. Appropriately weighted hourly noise levels are combined over a 24-hour period to result in an Ldn.

Noise-sensitive land uses in the vicinity of the project site include residences on Arenal Avenue and north of the project area. Ambient noise levels in the residential neighborhoods near Easkoot Creek are generally low. Primary noise sources in the project area are relatively constant and include traffic from roadways and parking lots, the adjacent commercial and residential neighborhoods, and the surf at Stinson Beach. A noon-time siren sounds once per week.

Environmental Justice

It is required under Executive Order 12898 that all federal agencies evaluate the impact of proposed actions on minority and low-income populations. According to U.S. EPA's Office of Environmental Justice, environmental justice is the "fair treatment…of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws….Fair treatment means that no group of people…should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies" (U.S. EPA, 1998). For environmental justice impacts to occur, significant environmental impacts attributable to a project must fall disproportionately upon environmental justice populations with the affected area. No residences are located within the Easkoot Creek Restoration project area but the project is of interest to adjacent and downstream property owners. Property owners adjacent to the project area are commercial and retail. These property owners are not considered to be part of a low-income or minority population.

4.0 ENVIRONMENTAL CONSEQUENCES

Impact Evaluation Methodology

It is required by the National Environmental Policy Act that Environmental Assessments disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and adverse environmental effects that cannot be avoided if the proposed action is implemented. This section analyzes the environmental impacts of the proposed project on natural resources, cultural resources, visitor use and experience, and the socioeconomic environment. NEPA requires consideration of context, intensity, and duration of direct impacts, indirect impacts, cumulative impacts, and measures to mitigate impacts. NPS policy also requires that "impairment" of resources be evaluated in all environmental documents. The following definitions were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives:

Context is the setting within which an impact is analyzed, such as the affected region, the affected interests, society as a whole, and/or a locality. In this environmental assessment, the intensity of impacts are evaluated within a local (i.e., project area) context and the intensity of the contribution of effects to cumulative impacts are evaluated in a regional context, for example park-wide.

Intensity is a measure of the severity of an impact. The intensity of an impact may be:

- ***Negligible***, when the impact is localized and not measurable or at the lowest level of detection;
- ***Minor***, when the impact is localized and slight but detectable;
- ***Moderate***, when the impact is readily apparent and appreciable; or
- ***Major*****,** when the impact is severely adverse or exceptionally beneficial and highly noticeable.

Duration is a measure of the time period over which the effects of an impact persist. The duration of impacts evaluated in this EA may be:

- ***Short-term***, when impacts occur only during construction or last less than three years; or
- ***Long-term***, when impacts last three years or longer.

Type of Impact**.** Impacts were evaluated in terms of whether they would be beneficial or adverse. Beneficial impacts would improve resource conditions and adverse impacts would negatively alter or deplete resources.

Impacts to natural resources considered significant are those that would:

- Violate any environmental law or regulation designed to protect wildlife, fisheries, plant species, or habitat areas.
- Effect a special status species or cause a net change to the habitat of the species.
- Change the ability of any resident or migratory fish or wildlife species to move.
- Cause measurable changes in species composition or abundance of a community with special status.
- Cause damage to the project site or adjacent property from existing or potential geologic hazards including landslides, erosion, or slope instability.

Impacts to cultural resources would be considered significant if they would:

- Conflict with resource protection measures established by local, state, or federal regulatory programs.
- Cause direct or indirect adverse effects to prehistoric or historic archaeological sites listed or are eligible for listing on the National Register of Historic Places or the California Register of Historic Resources, or that contribute to a National Historic Landmark District.
- Interfere with established recreational, educational, religious, or scientific uses of the project site.
- Disturb any human remains.
  Project related impacts to visitor use and experience would be significant if visitor attendance was estimated to decrease in the long-term or altered in some fashion. Project-related impacts to the socioeconomic environment would be significant if utility demands would exceed the capacity of existing or planned facilities or if project implementation would substantially disrupt service to local utility users (electricity, potable and wastewater systems to local residents and the beach park).

Cumulative Context
The Council on Environmental Quality (CEQ) regulations implementing NEPA define a cumulative impact as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (CEQ Section 1508.7).

Impairment of Park Resources
NPS Management Policies (NPS 2001) and NPS Director's Order-12, *Conservation Planning, Environmental Impact Analysis, and Decision-Making*, require decision-makers to consider impacts, and determine in writing, whether a proposed action will not lead to an impairment of park resources and values before approving the action.
The Management Policies state that "The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that would otherwise be present for the enjoyment of those resources or values." The Management Policies further provide specific guidance for NPS managers to use in analyzing whether a proposed action would result in impairment. The Policies state that "…an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

➢ Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
➢ Key to the natural or cultural integrity of the park or to the opportunities for enjoyment of the park; or
➢ Identified as a goal in the park's general management plan or other relevant National Park Service planning documents." (NPS 2001, p.12).

The 2001 Management Policies states that the "park resources and values" that are subject to the no-impairment standard include:

➢ The park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic

features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;

- Opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing any of them;
- The park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- Any additional attributes encompassed by the specific values and purposes for which it was established.

Impairment can result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination of impairment is made for each natural and cultural resource impact topic.

No Action Alternative

Impacts of the No Action Alternative

The No Action alternative would result in continued existence of poor quality habitat for salmonids utilizing the creek. This would result in a continuation of the current lack of complexity in the creek, lack of viable rearing pools and lack of floodplain connectivity. The No Action alternative would result in moderate, long-term, adverse impacts to resident salmonid populations. In the future, continued expansion of non-native riparian vegetation would preclude the development of native shrubs and trees which would maintain instream habitat. This continued degradation would result in reduced numbers and biomass of salmonids in the project area. The No-Action Alternative would not be consistent with the general NPS Management Policies 2001 related to preserving and enhancing natural resources within park areas and federal / state requirements relating to threatened species.

Soils and Geology

No grading is planned under the No-Action Alternative. Therefore the No Action Alternative would result in the status quo relating to on-going impacts to Geologic Resources.

Conclusion

No project related impacts would occur under this alternative. The No Action Alternative would not result in impairment of park resources or values related to geologic resources.

Hydrology and Water Resources

Under the No Action Alternative, the current lack of complexity in the creek and lack of floodplain connectivity would continue. Surface flow would remain unchanged. The existing channel would continue to lack meanders and pools. The risk to property from flooding would remain essentially unchanged. Water quality would remain unchanged.

Conclusion

The No Action Alternative would result in moderate long-term adverse effects to the hydrology of Easkoot Creek. This alternative would not result in impairment of park resources or values related to hydrology.

Natural Resources

No direct impacts would occur to natural resources of the project site under the No-Action Alternative. Native plant populations would continue to decline as they are out-competed by

invasive, exotic plants. The further loss of native wildlife species would likely result under this alternative including the steelhead trout. Opportunities for the natural re-colonization of species with special status that once may have occurred in the area would be limited as a result of competition with aggressive, non-native plants.

Conclusion
The No Action alternative would result in the status quo relating to on-going impacts to Natural Resources. The continued inability of salmonids to utilize this portion of Easkoot Creek could contribute to possible future declines in salmonid populations within the park.

Cultural Resources
No impacts to cultural resources would be expected under the No-Action Alternative because neither excavation nor vegetation management activities would be performed.

Conclusion
No project related impacts would occur under this alternative. The No Action Alternative would not result in impairment of park resources or values related to cultural resources.

Visitor Use and Experience
The No-Action Alternative will not change the existing visitor use and experience and no impact would occur.

Conclusion
This alternative would not result in impairment to park resources or values.

Socioeconomic Environment
No impacts to public services, utilities or infrastructure would be expected under the No-Action Alternative. None of the potential adverse effects of the No-Action Alternative would fall disproportionately upon environmental justice populations, and therefore this alternative would have no environmental justice impact

Conclusion
This alternative would have no direct, indirect or cumulative environmental justice impacts.

Cumulative Impacts of the No Action Alternative
The No Action Alternative would result in on-going impacts to native populations, flora and fauna, that could be increased by other projects in the watershed.

Preferred Alternative

4.1 Geologic Resources
Soils and Geology
Grading and excavation would be conducted to reconfigure the creek to the desired grade. Details regarding volumes of excavated materials and extent of activities are provided in Section 2.4. Most of the excavated materials would be reused onsite to reconstruct the new banks, streambed, and berm. Excess materials would be stockpiled for possible reuse for GGNRA maintenance repair projects and any unwanted materials would be disposed at a sanitary landfill. Slopes adjacent to the stream are gradual and no current slope stability concerns are noted. No excavation or grading is planned north of the pedestrian bridge, where buildings abut the stream. The existing concrete retaining walls

would not be disturbed. Since no major changes in streambed elevation are planned, the impact of the proposed action on erosion, soils, landslides or slope stability is considered minimal. The preferred alternative would have almost no effect on native soils since the area is within the active channel and banks which consist of artificial fill or mudflow deposits. The preferred alternative would have no beneficial or adverse impact on the effects of seismic characteristics at this GGNRA site.

If paleontological or geological resources exist and are encountered during construction, the preferred alternative could have adverse impacts through construction. With mitigation, disturbance would be minimized and impacts would be negligible.

Soils and Geology Conclusion
The preferred alternative would not result in impairment to park resources and values related to Geologic Resources. The actions would improve the long-term health of a resource that is "key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park NPS Management Policies 2001, Section 1.4.5)."

4.2 Hydrology and Water Resources

Stream Channel

This alternative would likely result in localized channel constrictions (from placement of instream structures) and localized increases in velocity. A concern has been raised about the rock vortex weirs behaving as check structures that would cause aggradation. Properly placed rock vortex weirs do not flatten the grade because they do not impound water (Zembsch 2003). Rather, they hold a straight reach 's cross-sectional grade and stable dimension by focusing highest velocity through he middle of the cross-section. Rock vortex weirs would maintain sediment transport through this critical portion of a flat gradient, high sediment supply channel. Installation of weir structures is expected to have a beneficial impact by increasing scour pool habitat and increasing dissolved oxygen levels.

The pool-riffle morphology of the restored channel would consist of meander and riffle reaches designed to dissipate energy while maintaining a high sediment transport corridor (Zembsch 2003). The model design was developed based on 1) field observations of channel configuration at a representative, albeit unnatural, reach downstream of the project area, and 2) existing channel geometry.

Standing water volume would increase in the creek as new pools form and collect water. This action would increase available habitat size for aquatic life. Frequency, depth, and duration of floodplain inundation would be increased which would result in moderate, long-term beneficial impacts. Increased flooding of an adjacent wetland would promote the establishment and growth of wetland and riparian vegetation, enhancing the biological value for native plants and animals. The anticipated increase in meanders and pools would be a beneficial impact of the proposed alternative. No beneficial or adverse impacts on the quantity of surface water flow would result from this alternative. It is unlikely that artificial fill removal would have a significant impact on groundwater recharge by surface water.

Flow

Hydraulic computations were conducted for the model restoration reach using U.S. Army Corps of Engineers HEC-RAS simulation program for a typical slope of 1.2% under bankfull and 100-yr flow conditions (Zembsch 2003). The bankfull, or channel forming, flow is the frequent flow event that forms the typical channel geometry and is used to determine structural stabilization.

The 100-yr discharge is considered in order to evaluate channel performance (i.e., excessive erosion or aggradation) and flooding potential at this infrequent, but significant, flow. The analysis indicates the proposed channel restoration would positively impact flooding characteristics of Easkoot Creek, particularly for properties immediately downstream. In particular, this alternative would have a minor reduction in water surface elevations during flood events for properties downstream. The wetland area adjacent to the creek would experience a minor increase in water surface elevations during flood events. This is a desired characteristic of the project as increased flooding in this wetland area would increase the functionality of the natural floodplain area and provide fisheries benefits by providing increased habitat during flooding conditions. A berm constructed along Highway One would protect the road from the temporary increased water levels.

The flood discharge analysis consisted of two parts:
1) Calculation of 100-year flood flows
2) Calculation of water surface elevation (WSE) at 100-year and bankfull flows

The 100-year flood flow was calculated using the rational method:

$Q=CiA$

where Q = discharge in cubic feet per second (cfs)
C = runoff coefficient
i = rainfall intensity in inches/hour
A = drainage area in acres

The following values were chosen based on known and estimated watershed characteristics:

C = 0.30	APWA Publication *Practices in Detention of Stormwater Runoff*
i = 3.80 in/hr	Pt. Reyes Rainfall Station
A = 1468 Acres	

Q = (0.30)(3.80 in/hr)(1468) = 1673 cfs

The 100–year WSE was calculated using the U.S. Army Corps of Engineers HEC-RAS program. Inputs for the analysis consisted of pre- and post-project (design channel) channel characteristics including

1) Cross-section geometry for stations 0+70 (downstream) and 1+62 (adjacent to wetlands)
2) Channel slope
3) Channel roughness
4) Computed flood discharge

The results (Table 4-1) indicate a reduction in WSE for the 100-year and bankfull flow at the lower end of the project reach. This reduction is most likely due to:

1) Improved channel hydraulic capacity
2) Enhanced floodplain function due to removal of the existing berm along the west bank of the channel
3) Desired increase in water surface elevations within the existing wetlands during flood events (Table 4-2**)**

Table 4-1 100-year Flood Flow Water Surface Elevation Values for Existing and Post-Project Conditions

Station	Water Surface Elevation Existing Conditions	Water Surface Elevation Design Channel
0+70	15.20’	14.85’
1+62	16.07’	16.09’

Table 4-2 Bankfull Water Surface Elevation Values for Existing and Post-Project Conditions

Station	**Water Surface Elevation Existing Conditions**	**Water Surface Elevation Design Channel**
0+70	13.00'	12.63’
1+62	13.62'	13.88'

Water Quality

The preferred alternative would not adversely impact surface flows within the project reach. Minor benefits to the natural hydrology may occur as a result of the removal of hardened surfaces adjacent to the channel and by allowing more bank storage and release of water to the stream. Separate from this project, GGNRA is working with the Stinson Beach County Water District to maintain sufficient flow conditions to protect aquatic life.

Proposed restoration actions are unlikely to adversely effect long-term instream water temperatures. To the extent possible, construction activities would avoid removal of existing native trees and shrubs. In areas where removal of non-native trees and shrubs are proposed, near stream native shrub and trees species would be replanted.

Temporary bank disturbance and erosion could occur from grading activities resulting in minor disturbance to the banks and desirable vegetation. Sedimentation from newly weeded areas could temporarily increase turbidity in surface water of the creek. Instream activities could temporarily affect downstream benthic invertebrate communities, and indirectly, steelhead and coho salmon growth. All bare areas would be mulched with either a seed free rice straw or on-site materials. Erosion control measures such as silt fences would be expected to minimize erosion and sedimentation in the channel and offset the potential for significant impacts. These impacts are considered minor with the implementation of erosion control measures.

Contaminant discharge during construction could occur under the preferred alternative. Short-term impacts to water quality could result from discharge of construction-related materials (fuels, lubricants, solvents, and cleaners). However, the staging area for storage and filling of vehicles and equipment would be outside of the riparian zone in developed areas. Drip pans or absorbent materials would be placed under equipment in he staging areas. The creation of the buffer strip at the north end of the project area would reduce the intensity of current parking lot run-off into Easkoot Creek. This buffer area would act as a filter to reduce the amount and concentration of fluid run-offs associated with parking lot activities. This reduction is considered a long-term beneficial impact.

The preferred alternative would disturb the ground surface; therefore, project actions would require standard erosion control measures to prevent detachment and transport of soil.

Construction will occur in de-watered areas only. The proposed mitigation measures should minimize the production of fine sediments to downstream areas. Mitigation Measures specific to erosion and sedimentation are listed in Appendix D (measures WQ1-13)

Hydrology and Water Resources Conclusion
The preferred alternative would not result in impairment to park resources and values related to Hydrologic Resources. While short-term minor adverse water quality impacts are anticipated, long-term moderate beneficial impacts related to water quality are expected.

4.3 Natural Resources

Wildlife

Implementation of the preferred alternative would result in the temporary loss of wildlife habitat. Proposed construction activity such as grading and excavation would result in minor temporary habitat disturbance to birds, fish, and other wildlife. Following implementation of the preferred alternative and without mitigation, erosion of graded slopes could increase turbidity in aquatic habitats of the creek, adversely impacting aquatic invertebrates and fish. Without mitigation, grading and excavation could result in the mortality of organisms restricted to aquatic habitats of the creek and terrestrial animals that are too small or slow to abandon the area. More mobile species such as birds, larger mammals, and those animals on the borders of the project site would be temporarily forced into adjacent territories.

Mitigation measures will require the removal of vertebrate species from the project and relocation outside the work area. Such actions would reduce the likelihood of mortality of organisms that would be unable to move away from grading and excavation activities. However, displacement of animals into surrounding open space areas would result in increased competition for resources (water, food, nesting and denning areas). Because the area of the project site to be graded is minimal and existing habitat values are limited, direct impacts to natural resources would be considered adverse but minor. Further, habitat loss would be offset by proposed revegetation of the project site with native species. Long-term beneficial impacts would be expected once the revegetated areas develop.

Nesting and foraging sites for birds would be lost temporarily due to the removal of trees. The proposed action would be implemented outside the breeding or nesting period of special-status bird species using the project site.

While nearby monarch butterfly overwintering sites are by strict definition out of the project area (Table 3-3), the butterflies utilize the project area extensively Sept -March for nectar, water and sunning. Observations during the winter of ‘02 indicated that the project area was utilized on sunny days following significant storms. As the construction is not scheduled during the winter rainy season, no direct impacts are expected.

The preferred alternative would result in beneficial impacts to wildlife. Enhancement of the site with native vegetation and an increase in diversity of plant species would provide additional resources for native animals occurring in the region. Expansion of the creek channel would increase the area of aquatic and riparian habitat available for use by wildlife. Through improving riparian vegetation, future opportunities for birdwatching opportunities could be enhanced. Expansion of the floodplain area would enrich the habitat diversity of the creek corridor.

Vegetation
Grading and filling activities would occur in upland (0.39 acre) and wetland (0.62 acre) habitats. Key native trees in these areas would be flagged for protection from construction activities. Native herbs and shrubs would be salvaged prior to construction. Grading, exotic plant removal and revegetation would have temporary impacts on desirable plants such as willows, which are found among the exotic species to be removed. Loss of vegetation, particularly those near the stream, may result in increased water temperature fluctuations, reduced inputs of terrestrial plant and invertebrate foods into creek, decreased water storage capacity, reduced filtration capacity, and increased erosion potential. These impacts, if they occur, would be temporary.

Implementation of the proposed revegetation plan would have beneficial effects. Project actions would result in an overall increase in the area of native wetland habitats and a decrease in developed or upland habitats (Table 4-3). Also, non-native plant removal, particularly cape ivy, would assist in the long-term recruitment of native, woody riparian species. Removal of artificial berms would allow establishment of woody flood-tolerant plants, including arroyo willow and red alders. Removal of asphalt would increase the overall acreage of the natural riparian areas. These actions would assist in the long-term beneficial impacts for riparian habitat for fish, songbirds, and small mammals.

Impacts to habitat would occur primarily to non-native communities. These communities are composed predominantly of species non-native to the region of the project site, and are not considered sensitive by regulatory agencies or recognized natural resource groups. Proposed revegetation activities would substantially increase the area and diversity of native plant communities along Easkoot Creek. The restoration of native plant communities would enhance habitat for birds and wildlife, with benefits increasing over time as habitat complexity and quality increase in an estimated three to five years.

Table 4-3: Projected Project Area Habitat

Habitat	Existing (sq. m)	Existing (acre)	Proposed (sq. m)	Proposed (acre)
PEM-native	534	0.13	465	0.11
PEM/PSS-native	2606	0.64	2555	0.63
PSS-native	462	0.11	827	0.20
PFO-non-native	1697	0.42	0	0.00
PFO-native	1170	0.29	3107	0.77
Riverine-Intermittent, not forested	205	0.05	0	0.00
Developed	13768	3.40	13673	3.38
Upland	2796	0.69	2611	0.65
TOTAL	**23238**	**5.74**	**23238**	**5.74**

Key-Palustrine emergent (**PEM),** Palustrine scrub-shrub **(PSS),** Palustrine Forested **(PFO)**

Special Status Resources

Sensitive Plant Species

No special status plant species are known to inhibit or utilize the project area. Therefore, the preferred alternative would not result in impacts to any special status plants. No special-status plants are proposed for introduction at the project area.

Sensitive Terrestrial Species

No special status terrestrial species are known to inhibit or utilize the project area. Therefore, the preferred alternative would not result in impacts for any sensitive terrestrial species. The existence of restored native riparian vegetation may have a future, indirect, beneficial impacts if sensitive terrestrial species would begin utilizing the area.

Sensitive Aquatic Species

To determine the effects of the preferred alternative on listed salmonid species and designated habitat, NPS assessed the effects of project actions on the essential features of critical habitat. These include substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage (NMFS 1997). The details of these considerations are provided in the NPS Biological Assessment (BA) for this project. Copies of the BA are available from the NPS upon request.

The preferred alternative is expected to have beneficial impacts on the steelhead trout and coho salmon populations by enhancing instream and riparian habitats. The preferred alternative would beneficially affect cover/shelter resources for salmonids. Returning adults require large pools for holding and undercuts and woody materials for cover. Proposed restoration actions should increase these features long-term. Currently, artificial berms prevent flows from spreading out onto the floodplain during winter high flow conditions resulting in a lack of refugia for juvenile steelhead and coho. Proposed restoration actions would remove these artificial berms and allow for natural floodplain functioning.

The preferred alternative would place large woody materials for cover and for formation of scour pools to increase habitat value for juvenile salmonids and other aquatic life. The riparian revegetation component would encourage the development of woody riparian vegetation and would also contribute to the long-term development of cover and shelter for fish.

The preferred alternative would beneficially affect food resources for steelhead juveniles by restoring riparian areas to support production of terrestrial insect foods. Proposed actions would increase the amount of summer and winter rearing habitat.

In-water construction activities could temporarily impair downstream passage of coho and steelhead smolts. Smolt trapping activities on Redwood Creek in Spring-Summer 1996 and review of literature indicate that most out-migration is concluded by July (Fong 1997b, Shapovalov and Taft 1954). No impacts to out-migration are expected. In-water construction activities are not expected to occur until after September 4.

The proposed construction work would occur during a critical portion of the summer/fall. Under average conditions, instream dissolved oxygen levels are typically at their lowest levels during the proposed work windows. Short-term disturbances would cause an adverse affect to juvenile steelhead in the affected area. Because of extreme low flow conditions, it is unlikely that disturbed fish could leave the affected area. Therefore, all fish would be removed from the project site and relocated outside the project area or temporarily stored

until construction activity ceases. When possible, work would progress from downstream to upstream.

Without mitigation, the preferred alternative would result in short-term disturbances to listed salmonids and their habitats. Mitigation measures (BIO 5-13, Appendix D) would be implemented during and after construction to reduce these short-term impacts to a minor to negligible level. There may be slight modification of these mitigation measures following issuance of NMFS Biological Opinion for this project.

No evidence of the California red-legged frog has been found at Stinson Beach during recent surveys for eggs and individuals. Although not considered critical habitat for the frog, potential occurrence cannot be ruled out. Potential breeding habitat, though degraded, is present. A narrow ditch adjacent to Highway One contains perennial, non-moving water and wetland plants that could serve as egg attachments sites are common. The adjacent riparian area may also serve as aestivation sites. Aestivation is a physiological state of dormancy during a period of the year which is too hot or dry for the normal maintenance of life. No filling in the ditch is proposed, so no impacts to larval frogs are anticipated. Grading activities could result in injury or mortality if aestivating frogs are present in the riparian area. Mitigation measures (Bio-15, Appendix D) would be implemented to reduce potential adverse impacts to frogs. The overall project should increase the value of riparian habitats for the frog.

Wetlands and Riparian Communities

Grading (Figure 5) and excavation would temporarily adversely impact approximately 0.62 acres of Cowardin wetlands. The project would result in an long-term net gain in the quality and area of wetlands. A flood control berm would be placed in an existing wetland (PEM/PSS habitat), resulting in a conversion to an upland site. However, the removal of an upland berm along the creek and removal of asphalt would counterbalance this. The project would result in a gain of 0.07 acres of Cowardin wetlands (1.65 acres currently, 1.72 acres proposed). The value of the wetlands would be increased through the removal of non-native vegetation. Restored floodplain function and flooding would benefit adjacent wetlands.

Air Quality

The preferred alternative would generate some emissions of air pollutants during the construction from construction vehicles and equipment. The primary control measures listed in the *Guidelines* that would be applicable include controlling dust due to grading and earthmoving activities, covering haul tracks, water-sweeping the site, and proper equipment maintenance throughout the construction period.

Construction-related emissions are generally temporary, transient and intermittent, but may cause short-term adverse air quality impacts in some cases. General construction emissions are included in the emissions inventory for the BAAQMD that is the basis for regional air quality plans. Therefore, such emissions are not expected to impede progress toward attainment or maintenance of the ozone and CO standards, respectively. PM_{10} emissions due to the actions proposed would result from removal and transport of sediment and from operation of diesel and gasoline-fired equipment and vehicles.

Construction activities and exotic tree removal could generate dust by heavy machinery operation on unpaved surfaces, earthmoving and grading, and wind erosion of unpaved areas and uncovered stockpiles. Proposed construction activities and exotic tree removal could generate particulate matter and diesel fuel combustion products such as NOx, CO, and SO2. To avoid violation of air

quality standards during project construction, NPS would require construction contractors to use equipment that adheres to strict emission standards for nitrogen oxides (NO3), and to use water or other effective dust palliative to control particulate matter.

Implementation of the proposed action would not significantly increase the amount of emissions. Traffic-related emissions and emissions from routine landscape maintenance are expected to be minor and similar to current levels. Because operation-related emissions are not expected to increase over existing conditions this impact is considered less than significant. During construction there would be an increased level of pollutants in the air from construction equipment exhaust (excavators, dump trucks, etc.) and fugitive dust. Emissions from these sources would have very minimal and localized impacts on air quality and visibility. Following construction, there would be no long term or permanent source of air quality impact from the preferred alternative. .

Natural Resources Conclusion
The preferred alternative would have mostly beneficial impacts for most natural resources. Long-term beneficial impacts relating to terrestrial and aquatic species and hydrology are anticipated. Beneficial impacts for special status aquatic species are expected. Minor short-term adverse impacts related to vegetation are anticipated but long-term beneficial vegetation impacts are expected as well.

4.4 Cultural Resources

Grading activities would require the removal of a 6-foot portion of the northern parking area. These features were constructed after 1950s and do not represent historical features. The impact of the removing this small portion of the facility does not present a significant effect on the cultural resource.

Boring logs from the site suggest that excavation activities would encounter fill and debris flow material in the stream channel. It is unlikely the excavation activity would unearth or remove prehistoric and historic archaeological features and deposits along the creek. No disturbance of archaeological resources is expected; therefore impacts to cultural resources would be considered negligible. If cultural resources are unearthed during construction, construction would be halted and the NPS archeologist and the California SHPO would be notified.

Cultural Resources Conclusion
No beneficial or adverse impacts are expected as a result of implementing the preferred alternative.

4.5 Visitor Use and Experience

Changes in existing visitor uses are not anticipated as part of the preferred alternative. Project implementation is not anticipated to result in significant visitor use conflicts or inconsistencies with relevant plans and policies. No long-term impacts to visitor uses are anticipated. Short-term effects on traffic, parking and access are construction-related. . No long-term effects on traffic, parking and access are anticipated. There would be no change in the number of parking spaces available to Stinson Beach users.

Under the proposed action, signage explaining restoration activities would be provided. The project would improve the quality of the visitor experience at Easkoot Creek and increase passive recreational opportunities such as bird watching. There would likely be a positive impact on visitor education of riparian and creek resources through the installation of interpretive signage.

Changes in existing land use are not anticipated for the project area. Project implementation is not anticipated to result in significant land use conflicts or inconsistencies with visitor use plans and policies. No long-term impacts to recreation facilities or recreational opportunities are anticipated. A short-term impact may involve the temporarily closing of picnic areas where trees would be removed for use in the creek.

Enhancement areas may be temporarily fenced during the establishment of native plant communities. However, with the exception of uncontrolled access areas, trails do not currently exist in this area. Therefore, this temporary closure is not considered significant.

Visitor Use and Experience Conclusion
Short-term effects expected relate to traffic, parking and access are construction. The project would improve the quality of the visitor experience at Easkoot Creek and increase passive recreational opportunities. There would likely be a positive impact on visitor education of riparian and creek resources through the installation of interpretive signage. There would be no impairment of park resources or values related to Visitor Use and Experience.

4.6 Socioeconomic Environment

Public Services and Utilities

The preferred alternative could cause short-term adverse impacts from relocation or removal of existing utility lines servicing the entrance structure or other facilities at Stinson Beach park. The proposed action would not increase the demand for any utility service or impact utility service to neighboring residences or businesses. Prior to excavation for the stream channel and floodplain, utilities would be identified and protected from damage.

Two storm water drains discharge to Easkoot Creek within the project area. The storm drain at the pedestrian bridge would not be disturbed during project activities. Therefore, no adverse impact would occur to this structure. A storm drain discharges from the north parking lot to Easkoot Creek at the northern Park boundary. This drain has a gate to prevent reverse water flow into the storm drain. The drain and gate would be relocated to the new edge of the channel. Therefore, no adverse environmental impacts are

Aesthetic and Visual Resources

Removal of fill materials, removal of exotic trees and weeds, and the creation of a restored riparian corridor with interpretive features is proposed under the preferred alternative. Native willow riparian and oak woodland plant communities would be created. Passive recreation opportunities such as bird watching would increase in this improved habitat (this was under recreation, not a visual concern). These actions, as well as the enhancement of native plant communities over time, would improve the scenic resources in the project area. In addition, removal of mature, aging and potentially hazardous trees would benefit park visitor safety. These enhancements are considered beneficial to scenic resources.

Initial adverse effects on visitor scenic resources are likely during grading and other construction activities. Exotic plant removal would result in temporary adverse impacts to visual resources for an initial time period during the establishment of native plant communities. In particular, the entrance road may experience an adverse visual impact from vegetation removal. The impact would be temporary until replanted vegetation reaches sufficient height to re-establish the view of streamside trees.

The visual appearance of Easkoot Creek will change thus changing the visual experience of Park users. The creek will no longer be separated from the floodplain by a berm thus reducing the

visual impacts of creek observers. However, a berm would be constructed along the wetland boundary at Highway 1 to protect the road from flood waters during high water events. While this is considered a minor visual impact for users of Highway 1, the beneficial visual impacts are anticipated for the remainder of the project area.

Noise
Under the preferred alternative, the following construction activities would take place: the removal of 20 trees from the parking lot, the installation of 16 rock vortex weirs (consisting of rootwads, logs, and boulders), the grading of channel banks, the removal of a 6ft wide section of he asphalt parking lot, and the removal of a levee and accumulated creek bank.

Sounds from construction activities typically consist of noise emanating from equipment such as excavators and trucks. According to U.S. EPA studies of equipment types and activities, construction noise would range from approximately 70 dBA to 95 dBA at 50 feet from its source (U.S. EPA, 1971). Typical construction noise decreases 6 decibels with each doubling of distance from the noise source to the receptor.

The majority of construction would occur from September 5, 2003 through November 15, 2003. In-channel and bank work construction would be completed by October 31, 2003. Construction-related noise would occur sporadically during the construction period when general construction would raise ambient noise levels for several hours at a time, and periods when there would be relatively no construction noise emanating from the site. The high range of sound levels due to construction noise would substantially exceed the EPA's recommended guideline of 55 dBA outdoors. Therefore, construction noise would have a minor to moderate short-term adverse impact to nearby businesses, residences, and wildlife.

Under the proposed action, noise would be generated by the following activities: grading and excavation, removal of fill by trucking, utility work. Equipment used for this work may include excavators, bulldozers, chainsaws, front-end loaders, dump trucks, and jackhammers. Noise from these equipment types, used in combination for clearing, excavation, and demolition would range from 84 to 88 dBA at 50 feet, attenuating to 83 and 85 dBA at 100 feet (EPA, 1971). Construction will occur during normal business hours to reduce noise impacts to neighboring residences and recreational visitors. Sensitive noise receptors in the vicinity of the project site include residences and businesses along Easkoot Creek. Noise impacts would be considered significant if residences were exposed to project-generated noise exceeding 80 dBA.

Environmental Justice
No adverse disproportionate environmental, or human health impacts are anticipated for any population or economic class. The preferred alternative would not alter any private properties or propose any loss of land to any population or economic class.

Socioeconomic Environment Conclusion
Long-term beneficial impacts for visitor use and experience and socioeconomic environment are expected as a result of implementing the preferred alternative. Short-term adverse effects relating to visitor experience are also anticipated. No impacts relating to environmental justice are anticipated. There would be no impairment of park resources or values related to Socioeconomic Environment.

4.7 Cumulative Impacts

The Council on Environmental Quality (CEQ) NEPA regulations 1508.7 states "Cumulative impacts is the impact on the environment which results from the incremental impact of the action

when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Current and Ongoing Actions
The local community at Stinson Beach utilizes surface waters within the Easkoot Creek drainage for municipal purposes. Other local activities include bank protection and flood control activities. The County of Marin annually trims riparian vegetation and removes woody debris from streams such as Easkoot to prevent property damage from flooding. GGNRA is currently working with the Stinson Beach County Water District to maintain sufficient flow conditions to protect aquatic life.

Past Habitat Restoration/Protection Activities
Since 1998, several community-initiated habitat protection and enhancement activities have been completed. Following a recent fish kill in Laurel Creek associated with water appropriation activities (Fall 1999), Streamatrix, a community-based organization, initiated a flow monitoring program with assistance from the GGNRA. The intent of the monitoring program was to identify flow conditions that would maintain the connectivity of flow between pools. Dissolved oxygen data collected by the Park at West Union and Redwood Creeks clearly show relationship between low dissolved oxygen concentrations and pool connectivity. Such real-time flow data was used to modify water withdrawals from Laurel Creek to protect fisheries. Streamatrix also worked with the water district to ensure that the diversion on Fitzhenry Creek (tributary to Laurel Creek) was retrofitted with a “hole” to always allow a minimum bypass flow into the creek.

GGNRA and the National Marine Fisheries Service worked with Streamatrix to design and implement a fish passage and habitat enhancement project on Laurel Creek, above its confluence with Black Rock Creek. The design was intended to allow steelhead adults and juveniles to move upstream more easily, while also providing more rearing habitat than previously present. The implemented design included the creation of 4 new step-pools using excess 2-3 foot diameter boulders from the Marin County Public Works Department. Within a year, the created step pools provided essential summer rearing habitat for various steelhead age classes and supported the highest densities of aquatic animals within the surveyed Easkoot Creek watershed. As of February 2002, the created step pools are still intact.

Work parties assisted with the inventory of riparian plant species and especially, with removal of cape ivy and other invasive non-native plants along Easkoot and Laurel Creeks. Because non-native plant control requires a commitment by the community outside beyond GGNRA, several outreach activities were initiated including a riparian plant workshop and a door-to-door event that provided information about non-native plants to GGNRA neighbors.

Cumulative Impacts Resulting from Preferred Alternative
Beneficial cumulative impacts are expected with regard to salmonid habitat. Past efforts have created rearing habitat within the Easkoot Creek watershed and the preferred alternative should create additional rearing habitat for salmonids within the watershed. Beneficial cumulative impacts regarding native vegetation are also expected. The preferred alternative would continue the effort of removing non-native vegetation from the watershed and promoting growth of native species. An adjacent land-use, Shakespeare-at-Stinson is proposing to initiate a riparian habitat restoration project that would coincide with this project.

The impact of water diversions within the watershed within the project on salmonids is not clear. Displacement of juvenile salmonids from construction site may result in negative, cumulative impacts if water diversions are also impacting fish. NMFS has previously notified the water district of the need to ensure that their operations do not "take" listed salmonids. Compliance would ensure that no adverse, short-term cumulative impacts to listed salmonids occur. While temporary, minor, adverse water quality impacts are anticipated, these impacts would not have cumulative impacts due to the timing of the project. Water resources impacts from previous work within the watershed were all temporary in nature and thus the full recovery of water quality in previous project areas has occurred.

New restroom facilities at Stinson Beach are proposed for construction in Fall 2003. The preferred alternative would not adversely impact the water quality or quantity within Easkoot Creek. Initial alternatives for the restroom project indicate that the new facilities would use less water thus decreasing the NPS water demands from Easkoot Creek. A decrease in water pumped from Easkoot Creek coupled with the expected benefits in habitat from the proposed action could yield beneficial cumulative impacts for Easkoot Creek.

4.8 Irreversible and Irretrievable Commitments of Resources

The only irreversible or irretrievable commitments of resources associated with the selection of the preferred alternative would be the work and machinery used in the restoration. Under the No-Action Alternative, if riparian habitat and flood plain wetland habitat along Easkoot Creek are not protected and restored, and continue to be degraded, some plant and animal species could be extirpated over time, causing an irreversible and irretrievable loss of natural resources.

4.9 Short-Term Uses versus Long-Term Productivity

The preferred alternative would help maintain and restore long-term biological productivity of the complex riparian and estuarine ecosystem in Bolinas Lagoon and along Easkoot Creek. With implementation of the preferred alternative, the habitat would be protected and managed as a permanent part of the GGNRA that is dedicated to maintain the long-term productivity of the Easkoot Creek estuary and riparian habitats for fish and wildlife. The local short-term uses of the environment following implementation of the preferred alternative could include riparian and freshwater wetland habitat restoration. The resulting long-term productivity would include increased protection and management of migratory waterfowl, threatened and endangered fish and wildlife species, wading birds, shorebirds, migratory songbirds, and species of fish and wildlife. This protection and management could result in population increases for these species and particularly steelhead trout and coho salmon. The public would also gain long-term opportunities for wildlife-dependent recreation and education and enhanced quality of life.

5.0 CONSULTATION AND COORDINATION

Compliance and Authority for Action
This EA was prepared for the GGNRA pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4341 et seq.), as amended in 1975 by P.L. 94-52 and P.L. 94.83. Additional guidance Directors Order 12 which implements Section 102 (2) of NEPA and the regulations established by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR} 1500-1508). Numerous state and federal laws regulate activities which may affect the environment. Table 5.1 lists the pertinent environmental regulations that were considered during the preparation of this EA.

Natural Resource Management Guidelines
NPS has developed specific guidelines for the management of natural resources (NPS-77). These guidelines provide for management of native and non-native plant and animal species. They are designed to assist parks in developing resource management plans and action plans for specific park programs in park management zones: natural, cultural, park development, and special use zones as described in the NPS Management Policies and articulated in each park general management plan.

The NPS Management Policies (2001) direct the NPS to preserve natural resources, processes, systems, and values of units of the national park system in an unimpaired condition, to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them. Natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. The NPS will strive to understand, maintain, restore, and protect the inherent integrity of the natural resources, processes, systems, and values of the parks. The natural resources, processes, systems, and values that the NPS preserves are described generally in the 1916 NPS Organic Act and in the enabling legislation or presidential proclamation establishing each park.

Director's Order #77-1: Wetland Protection
The NPS, through Director's Order (DO) #77, has established policies, requirements and standards for implementing Executive Order (E.O.) 11990: "Protection of Wetlands" (42 Fed. Reg. 26961). E.O.11990 was written "to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative...." E.O. 11990 gives the NPS several directives, such as providing leadership and taking action to minimize the destruction, loss or degradation of wetlands.

DO #77 also dictates that a *Statement of Findings* must be prepared for activities that have the potential for direct or indirect adverse impacts on wetlands. *A Statement of Findings* documents the rationale of a preferred alternative with potential adverse impacts on wetlands, explains why no alternatives with less wetland impacts were practicable, and documents compliance with the policies and requirements/procedures of Director's Order #77. DO #77 also identifies certain activities that comply with E.O. 11990 but are excepted from SOF requirements. Excepted actions must satisfy a list of conditions issued in DO-#77.

NPS staff examined this project for compliance with DO-#77 and determined it to be an excepted action. The proposed project meets an exception for water dependent actions or other actions with minimal impacts, under Section 4.2, A. 1 (e) of the Procedural Manual #77-1. This exception is designed for "Actions designed specifically for the purpose of restoring degraded (or

completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes."

The proposed project will "avoid wetlands and minimize unavoidable wetland impacts, to the extent practicable" and plans to re-establish natural ecological functions of Easkoot Creek. The project clearly meets the definition in DO-#77 of a restoration project and will include the Best Management Practices (BMP)/Conditions for Exception listed in DO-#77.

Agency Coordination
The actions described in this document are the result of an extended public participation process. Public involvement began in 1999. Public scoping meetings discussed Easkoot Creek issues and included representatives from the public. Additional Easkoot Creek meetings occurred in 1999, prior to the start of the formal planning process for Easkoot Creek

The preferred alternative reflects the project sponsor's request for early consultation with federal, state, and local authorities. Initial responses were received from the following authorities: California Department of Transportation; United States Department of the Interior; U.S. Fish and Wildlife Service; and U.S. Army Corps of Engineers. Specific project elements were developed to reflect the regulatory requirements and concerns of those authorities that participated in early consultation. Ongoing consultation would continue throughout the construction phases of the Easkoot Creek project.

Consultation with the National Marine Fisheries Service (NMFS)
The NPS, as the lead federal agency, has determined the project may affect listed fish species and has initiated formal consultation with the NMFS. The formal Section 7 evaluation addresses: steelhead (*Oncorhynchus mykiss*), coho salmon (*O. kisutch*) and their designated critical habitat. A letter requesting initiation of formal consultation and an attached biological assessment were provided to NMFS on November 16, 2001.

Consultation with the U.S. Fish and Wildlife Service (USFWS)
On September 19, 2001, the NPS received concurrence from the USFWS that proposed activities to improve habitat for steelhead trout and coho salmon as well as improve the floodplain function would not likely adversely affect the California red-legged frog or adversely modify or destroy critical habitat.

California Coastal Commission
The NPS is submitting with this EA a request for concurrence that this project is consistent with the Coastal Zone Management Act. Discussions with Coastal Commission staff indicate that the project is consistent with the California Coastal Management Plan. A Consistency Determination would be attached to the FONSI.

United States Army Corps of Engineers
NPS policies require protection of water quality consistent with the Clean Water Act, Section 404 of this act authorizes the US Army Corps of Engineers to prohibit or regulate, through a permit process, discharge of dredged or fill material into U.S. waters, including wetlands. Temporary structures, work and discharges, including cofferdams, necessary for construction activities or access fills or de-watering of construction sites require a Nationwide Permit No. 33. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must be of materials, and placed in a manner, that will not be eroded by expected high flows.

The use of dredged material may be allowed if it is determined by the District Engineer that it will not cause more than minimal adverse effects on aquatic resources.

On October 31, 2001 the NPS sent a letter to the USACE requesting the issuance of Section 404 Nationwide Permits 27 and 33 for the activities at Easkoot Creek. (See correspondence section). A Section 404 permit is required since project area includes jurisdictional waters of the U.S. in Easkoot Creek. The Preferred alternative is expected to qualify for Nationwide permits 27 and 33 pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 10 of the U.S. Rivers and Harbors Act (33 U.S.C. 406) and the District of the Engineer of the U.S. Army Corps of Engineers. The required permit will be obtained prior to construction.

Regional Water Quality Control Board (RWQCB)
The NPS would submit an application for Water Quality Certification and/or Waiver of Waste Discharge Requirements to the Water Quality Certification to the San Francisco Bay Region, Regional Water Quality Control Board. NPS staff met with the Regional Board and staff regarding the scope of the project and applicable regulatory compliance. The NPS is currently coordinating with the RWQCB to receive the required certifications for the project. In a February 2003 communication with RWQCB personnel, the proposed Easkoot Creek restoration was considered a categorical exemption under CEQA and classified as a "minor land alteration".

State Historic Preservation Officer
In June 1992, the NPS, SHPO, and the Advisory Council on Historic Preservation (ACHP) entered into a programmatic agreement (PA) regarding the operation and maintenance activities within the GGNRA. The proposed work in this project falls under this existing PA. . On January 23, 2003, the project received certification for compliance with the NHPA through the Preservation Assessment (5X) Form (Certification No: GOGA-3-013)

Table 5
Applicable Environmental Statutes and Regulations

Federal Statutes
Archeological and Historical Preservation Act
Clean Air Act, as amended
Clean Water Act, as amended
Coastal Zone Management Act
Federal Endangered Species Act, as amended
Migratory Bird Treaty Act
National Historic Preservation Act
Nation Environmental Policy Act, as amended
Native American Graves Protection and Repatriation Act
Noise Control Act
Rivers and Harbors Act

Executive Orders, Memorandums
Floodplain Management (Executive Order 11988)
Federal Actions to Address Environmental Justice in Minority and Low Income Populations (Executive Order 12898)

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APPENDIX A
Vascular Flora of Easkoot Creek Project Site

Family	*Scientific Name*	Common Name	USFWS Riparian Type	Status
Fabaceae	*Lotus or Trifolium*	?	Non-riparian species	?
Polygonaceae	*Rumex species*	?	Non-riparian species	?
Solanaceae	*Solanum sp.*	Nightshade	Rp1SS7NS	?
Apiaceae	*Foeniculum vulgare*	Fennel	Non-riparian species	Exotic
Apocynaceae	*Vinca major*	Periwinkle	Non-riparian species	Exotic
Araceae	*Zantideschia athiopica*	Calla Lilly	Rp1EM7CL	Exotic
Araliaceae	*Hedera helix*	English Ivy	Rp1FO7EI	Exotic
Asteraceae	*Erectites minima*	Australian Fireweed	Non-riparian species	Exotic
Asteraceae	*Hypochaeris radicata*	Rough Cat's-ear	Non-riparian species	Exotic
Asteraceae	*Sonchus oleraceus*	Common Sow Thistle	Non-riparian species	Exotic
Brassicaceae	*Brassica species*	Mustard	Non-riparian species	Exotic
Brassicaceae	*Raphanus sativa*	Wild Radish	Non-riparian species	Exotic
Convolvulaceae	*Convolvulus arvensis*	Bindweed	Non-riparian species	Exotic
Convolvulaceae	*Ipomea alba*	Moonflower	Rp1SS8MF	Exotic
Cupressaceae	*Cupressus macrocarpa*	Monterey Cypress	Non-riparian species	Exotic
Geranaceae	*Geranium dissectum*	Splitleaf Geranium	Non-riparian species	Exotic
Geranaceae	*Geranium molle*	Cranesbill	Non-riparian species	Exotic
Iridaceae	*Crocosmia xcrocosmiiflora*	Crocosmia	Non-riparian species	Exotic
Myoporaceae	*Myoporum laetum*	Myoporum	Non-riparian species	Exotic
Onograceae	*Fuchsia species*	Fuchsia	Non-riparian species	Exotic
Papaveraceae	*Fumaria officianalis*	Fumitory	Rp1SS7FU	Exotic
Pinaceae	*Pinus radiata*	Monterey Pine	Non-riparian species	Exotic
Pittosporaceae	*Pittosporum sp*	Pittosporum	Non-riparian species	Exotic
Plantaginaceae	*Plantago lanceolata*	English Plantain	Non-riparian species	Exotic
Poaceae	*Avena barbata*	Slender Wild Oat	Non-riparian species	Exotic
Poaceae	*Briza maxima*	Rattlesnake Grass	Non-riparian species	Exotic
Poaceae	*Bromus hordeaceus*	Soft Chess	Non-riparian species	Exotic
Poaceae	*Erharta calycina*	Veldt Grass	Non-riparian species	Exotic
Poaceae	*Hordeum murinum*	Foxtail Brome	Non-riparian species	Exotic
Poaceae	*Lolium multiflorum*	Italian Ryegrass	Non-riparian species	Exotic
Tropaeolaceae	*Tropaeolum majus*	Nasturtium	Rp1SS8NA	Exotic
Apiaceae	*Oenanthe sarmentosa*	Water Parsley	Rp1EM7WP	Native
Asteraceae	*Baccharis pilularis*	Coyote Brush	Rp1SS7CB	Native
Betulaceae	*Alnus rubra*	Red Alder	Rp1FO6RA	Native
Brassicaceae	*Rorippa nasturtium-aquaticum*	Water cress	Rp1EM7WCr	Native
Caprifoliaceae	*Lonicera involuncrata*	Twining Honeysuckle	Rp1SS8TH	Native
Convolvulaceae	*Calystigia purpurata*	Morning glory	Rp1SS7MG	Native
Cucurbitaceae	*Marah fabaceous*	Wild Cucumber	Rp1SS7WC	Native
Cyperaceae	*Carex obnupta*	Slough Sedge	Rp1EM7SS	Native
Cyperaceae	*Carex species*	Sedge	Rp1EM7Ssp	Native
Cyperaceae	*Cyperus eragrostis*	Nutsedge	Rp1EM7NS	Native
Cyperaceae	*Scirpus microcarpus*	Bulrush	Rp1EM7BuR	Native
Dryopteridaceae	*Anthyrium filix-femina*	Lady Fern	Rp1EM7LF	Native
Dryopteridaceae	*Polystichum munitum*	Western Sword Fern	Rp1SS7SF	Native
Equisetaceae	*Equisetum telmateia ssp. braunii*	Giant Horsetail	Rp1EM6GH	Native
Fabaceae	*Vicia gigantea*	Giant Vetch	Rp1EM8GV	Native
Fagaceae	*Quercus agrifolia*	Coast Live Oak	non-riparian species	Native
Hippocastanaceae	*Aesculus californicus*	California Buckeye	Rp1F08BU	Native
Juncaceae	*Juncus effusus*	Common Rush	Rp1EM7CR	Native
Juncaceae	*Juncus patens*	Blue Rush	Rp1EM7BR	Native
Lamiaceae	*Stachys ajugoides var. rigida*	Hedge Nettle	Rp1SS7HN	Native

Family	*Scientific Name*	Common Name	USFWS Riparian Type	Status
Lamiaceae	*Stachys chamissonis*	Chamisso's Hedge Nettle	Rp1EM8CN	Native
Onograceae	*Epilobium ciliatum*	Willowherb	Rp1EM7WH	Native
Papaveraceae	*Eschscholzia californica*	California Poppy	Rp1SS7CP	Native
Pinaceae	*Pseudotsuga menziessi*	Douglas-Fir	non-riparian species	Native
Poaceae	*Bromus carinatus*	California Brome	Rp1SS7CBr	Native
Poaceae	*Elymus glaucus*	Blue Wild Rye	Rp1SS8WR	Native
Polygonaceae	*Polygonum punctatum*	Smartweed	Rp1EM7SW	Native
Ranunculus	*Delphinium californicum*	Coast Larkspur	Rp1SS7CL	Native
Ranunculus	*Ranunculus californicus*	California Buttercup	non-riparian species	Native
Rosaceae	*Potentilla anserina*	Cinquefoil	Rp1Em7CF	Native
Rosaceae	*Rubus parviflorus*	Thimbleberry	Rp1SS8TB	Native
Rosaceae	*Rubus ursinus*	California Blackberry	Rp1SS8CBl	Native
Salicaceae	*Salix laevigata*	Red Willow	Rp1FO6RW	Native
Salicaceae	*Salix lasiolepus*	Arroyo Willow	Rp1FO6AW	Native
Salicaceae	*Salix lucida ssp. lasiandra*	Yellow Willow	Rp1FO6YW	Native
Scrophulariaceae	*Mimulus guttatis*	Seep-Spring Monkeyflower	Rp1EM7SM	Native
Scrophulariaceae	*Scrophularia californica*	California Bee Plant	Rp1SS7BP	Native
Scrophulariaceae	*Veronica americana*	American Brooklime	Rp1EM7AB	Native
Urticaceae	*Urticus dioica*	Stinging Nettle	Rp1EM8SN	Native
Aizioaceae	*Carpobrotus edulis*	Iceplant	Non-riparian species	Noxious Weed
Apiaceae	*Conium maculatum*	Poison Hemlock	Rp1SS8PH	Noxious Weed
Asteraceae	*Carduus pynocephalus*	Italian Thistle	Rp1SS8IT	Noxious Weed
Asteraceae	*Cirsium vulgare*	Bull Thistle	Rp1SS8BT	Noxious Weed
Asteraceae	*Delairea odorata*	Cape ivy	Rp1FO6CI	Noxious Weed
Fabaceae	*Acacia sp*	Acacia	Rp1FO8AC	Noxious Weed
Fabaceae	*Genista monspessulana*	French Broom	Non-riparian species	Noxious Weed
Poaceae	*Bromus diandrus*	Ripgut Brome	Non-riparian species	Noxious Weed
Poaceae	*Holcus lanatus*	Purple Velvet Grass	Rp1EM8VG	Noxious Weed
Rosaceae	*Cotoneaster species*	Cotoneaster	Non-riparian species	Noxious Weed
Rosaceae	*Rubus discolor*	Himalayan Blackberry	Rp1FO8HB	Noxious Weed

APPENDIX B
Proposed Planting Palette, Easkoot Creek Project

Scientific Name	Common Name	Method	Revegetated Association[1]
Acer macrophyllum	Big Leaf Maple	Seed	MixFor
Acer negundo	Box Elder	Cutting	RalFor
Aesculus californicus	California Buckeye	Seed	MixFor
Alnus rubra	Red Alder	Seed	RalFor
Anthyrium filix-femina	Lady Fern	Division	FreWet, StrBan
Baccharis pilularis	Coyote Bush	Seed	RipScr
Bromus carinatus	California Brome	Seed	RipScr
Calystigia purpurata	Morning glory	Seed	RipScr
Carex obnupta	Slough Sedge	Seed	FreWet
Carex species	Sedge	Seed	FreWet
Cyperus eragrostis	Nutsedge	Seed	FreWet
Delphinium califorcicum	Coast Larkspur	Seed	RipScr
Elymus glaucus	Blue Wild Rye	Seed	RipScr
Epilobium ciliatum	Willowherb	Division	FreWet
Equisetum telmateia ssp. braunii	Giant Horsetail	Division	FreWet
Eschscholzia californica	California Poppy	Seed	RipScr
Juncus effusus	Common Rush	Division	FreWet
Juncus patens	Blue Rush	Division	RipScr
Lonicera involuncrata	Twining Honeysuckle	Seed	RipScr
Marah fabaceous	Wild Cucumber	Field Seed	RipScr
Mimulus guttatis	Seep-Spring Monkeyflower	Field Seed	FreWet
Oenanthe sarmentosa	Water Parsley	Seed	FreWet, StrCha
Polygonum punctatum	Smartweed	Division	FreWet, StreCha
Polystichum munitum	Western Sword Fern	Division	RipScr
Potentilla anserina	Cinquefoil	Seed	FreWet
Pseudotsuga menziessi	Douglas-Fir	Seed	MixFor
Quercus agrifolia	Coast Live Oak	Seed	MixFor
Ranunculus californicus	California Buttercup	Seed	RipScr
Rorippa nasturtium-aquaticum	Water cress	Field Seed	FreWet, StrCha
Rubus parviflorus	Thimbleberry	Cutting	RipScr
Rubus ursinus	California Blackberry	Cutting	RipScr
Salix laevigata	Red Willow	Field Cutting	WilFor
Salix lasiolepus	Arroyo Willow	Field Cutting	WilFor
Salix lucida ssp. lasiandra	Yellow Willow	Field Cutting	WilFor
Scirpus microcarpus	Bulrush	Division	FreWet
Scrophularia californica	California Bee Plant	Seed	RipScr
Stachys ajugoides var. rigida	Hedge Nettle	Division	RipScr
Stachys chamissonis	Chamisso's Hedge Nettle	Division	FreWet
Urticus dioica	Stinging Nettle	Seed	FreWet
Veronica americana	American Brooklime	Division	FreWet
Vicia gigantea	Giant Vetch	Seed	FreWet

[1] Associations: RalFor=Red Alder Forest, WilFor=Willow Forest, FreWetr=Freshwater Wetland, RipScr=Riparian Scrub, StrBan=Stream Bank, StrCha=Stream Channel, MixFor=Mixed Evergreen Forest

APPENDIX C
Easkoot Creek Vegetation Management Plan

Goals of Revegetation Plan

- Enhance habitat for salmonids by increasing canopy cover over stream banks and channel and providing sources for in-stream debris
- Increase canopy cover of native Wouldow Riparian vegetation community in project area
- Decrease canopy and ground cover of invasive exotic species in project area
- Minimize site maintenance needs after project year one

Considerations

- Project funding is minimal, and does not provide for maintenance after the initial construction and installation phase.
- Community volunteer resources are available for ongoing site maintenance, but in limited amounts.
- The vegetation community in the project area is severely degraded by invasive exotic plant species.
- The need to control invasive weeds by removing the top layer of soil, while expected to be effective, would increase the erosion potential on the new stream banks.
- Revegetation efforts are not expected to succeed unless invasive plant species are largely controlled in the project area.

Summary of the Revegetation Plan

In light of the project goals and considerations just mentioned, the revegetation plan would be simple and cost effective as possible. The focus would be on providing shade for salmonid species in the creek and eventually sources for debris in the stream rather than on native plant species diversity and vegetation community structure. The project areas and the four revegetation zones within it were chosen to minimize the ongoing maintenance needs of the site. As weeds are successfully controlled and native species established in the current project area, work can be expanded to adjacent riparian areas.

> One main objective in the first year of the project would be to control the dense infestations of invasive plant species, including Cape Ivy, Himalayan Blackberry, Moon Flower, and English Ivy. Because these weed species all sprout readily from crown, rhizome, or other underground structures, a main control strategy would be to remove the top 6 inches of soil from the project area. This would sharply decrease the chances of significant resprouting by removing the underground structures of the weedy species. Heavy mulching to further suppress resprouting and possible germination from the seed bank would follow soil removal. A 3 foot wide containment line would be cut down to mineral soil on the eastern edge of the revegetation zone to prevent re-infestation of these zones by invasive species still in adjacent areas. These methods should result in minimal follow up needs in the second and third years of the project. These follow up requirements would be of a suitable scale and intensity for work by community volunteers.

A second objective is to install wouldow cuttings (stakes) on site in a relative dense spacing. The majority of the cuttings would be Arroyo Willow, which is currently the dominant wouldow at Stinson Beach. Arroyo Willows are expected to grow quickly and to exhibit high survivorship barring significant drought or other climatological factor. These would be supplemented by small numbers of Yellow Willows and Red Alders to provide eventual sources of in-stream debris. In addition these two species, which are taller than Arroyo Willows, may eventually provide denser

cover over the center of the stream. Only after non-native invasive species have been sufficiently controlled would supplemental native plant species be outplanted to augment native plant diversity and vegetation community structure.

A problematic aspect of removing the topsoil layer is the chance of increase erosion on slopes. Erosion can be addressed initially by installing an erosion control matting on the creek banks and/or installing wouldow wattles at key points on the bank. Any erosion matting used should be fully biodegradable and safe for all wildlife.

Table of Actions

#	Action	Method	Project Year
1	Exotic tree removal	Chain saw, NPS approved herbicide if necessary. Trees would be mulched on site for weed control.	1
2	Initial exotic species removal	Heavy equipment where possible, hand removal where necessary. Living foliage and plant debris down to mineral soil would be removed. Material would be composted on site if possible; otherwise it would be taken to a landfill.	1
3	Soil scraping and removal for exotic species control	Heavy machinery supplemented by hand removal in sensitive areas. Top 6 inches of soil would be removed and either buried onsite under at least 2 feet of soil or taken offsite.	1
4	Weed control mulching	Mulch from exotic tree removal would be used as much as possible and applied to a depth of 4 inches. Other areas would be mulched with sterile rice straw to a depth of 6 inches. Mulch would not be applied in areas of potential flooding.	1
5	Erosion control	On stream banks, wouldow wattles would be used as much as possible where potential erosion could occur. Jute netting or other similar material would be used on areas where wouldow wattles are not appropriate.	1-2
6	Follow-up exotic species control	Hand removal.	2-5
7	Salvaging of native plant species before construction	Hand removal and division of existing natives immediately prior to construction. Salvaged natives would be potted and grown on in GGNRA nurseries for supplemental revegetation.	1
8	Initial installation of native tree species	Field cuttings of Salix species, outplanting of other tree species from containers. 1.5 meter on center, approximately 1500 trees. Cuttings would be gathered onsite or in watershed within 5 miles of the project area.	1
9	Supplemental revegetation with native species	Additional trees from cuttings and containers if necessary. Sub-shrubs and shrubs from field divisions and containers. Previously salvaged plants would be included in the supplemental revegetation. This action would occur only after exotic weeds have been sufficiently controlled as determined by NPS vegetation staff.	3-5
10	Baseline vegetation monitoring	GGNRA standard point intercept transect.	1
11	Photo monitoring	GGNRA standard photo point.	1-5
12	Follow-up vegetation monitoring	GGNRA standard point intercept transect.	1-5
13	Revegetation survivorship monitoring.	10% of each species marked and monitored for 2 years.	1-5

Action Timeline

#		Project year 1	year 2	year 3	year 4	Year 5
1	Exotic tree removal	X				
2	Initial exotic species removal	X				
3	Soil scraping and removal for exotic species control	X				
4	Weed control mulching	X				
5	Erosion control	X				
6	Follow-up exotic species control	X	X	X	X	X
7	Salvaging of native plant species before construction	X				
8	Initial installation of native tree species	X				
9	Supplemental revegetation with native species			X	X	X
10	Baseline vegetation monitoring	X				
11	Photo monitoring	X	X	X	X	X
12	Follow-up vegetation monitoring	X	X	X	X	X
13	Revegetation survivorship monitoring.	X	X	X	X	X

Planting Specifications

				Number				
Species	Common Name	Method	Vegetation Community	Zone 1	Zone 2	Zone 3	Zone 4	Total
Salix lasiolepis	Arroyo Wouldow	Field Cutting	Wouldow Riparian	535	235	180	225	1175
Salix lucida var. lasiandra	Yellow Wouldow	Field Cutting	Wouldow Riparian	70	30	25	30	155
Alnus rubra	Red Alder	Nursery Plant	Wouldow Riparian	35	15	10	15	75

APPENDIX D
Mitigation Table

MITIGATION MEASURES INCLUDED AS PART OF THE PREFERRED ALTERNATIVE

Topic	Mitigation Number/ Responsible Agency	Mitigation
HYDROLOGIC, GEOMORPHIC, WATER QUALITY, AND GEOLOGIC RESOURCES		
Flow Diversion	Mitigation Measure WQ-1/ NPS	If flowing water is present, flow will be diverted around the work areas. Standing water, however, may remain in the work areas due to the high water table at the sites. . See Mitigation Measure Bio-6
Erosion and Sediment Control	Mitigation Measure WQ-2 NPS	In-water work would cease on or before October 31. Work on the banks would cease on or before November 15.
Erosion and Sediment Control	Mitigation Measure WQ-3 NPS	The number of equipment access points to the channel will be minimized to reduce the effects of equipment access of channel banks.
Erosion and Sediment Control	Mitigation Measure WQ-4 NPS	Erosion control materials, such as mulch, jute netting, and/or native plant materials, will be placed on disturbed creek banks. Fiber rolls or silt fences would be installed above bankfull elevation to prevent detached soils from reaching the creek. Erosion control would be in place November 15. These materials would be monitored and maintained during the rainy season to ensure effectiveness.
Erosion and Sediment Control	Mitigation Measure WQ-5 NPS	Stockpiles of excavated sediment would be at least 100 feet from the creek and will be contained using silt fences, sand bags, straw bales, and/or other appropriate sediment catchment devices. Any stockpiles will be covered during the rainy season.
Erosion and Sediment Control	Mitigation Measure WQ-6 NPS	To prevent construction debris from entering the creek, appropriate best management practices set forth in the California Storm Water Best Management Practice Handbooks will be employed.
Erosion and Sediment Control	Mitigation Measure WQ-7 NPS	In upland work areas, barriers such as fiber rolls, gravel/sandbags, and silt fences will be placed between the construction area and the creek to prevent construction debris or surface runoff from entering the creek.
Erosion, Sediment, and Pollution Control	Mitigation Measure WQ-8 NPS	Potential contaminants and erodible materials stockpiled within 100 feet of the creek will be covered with tarps during construction, and potential pollutants (e.g., fuels, etc.) will be stored with proper containment and outside of areas where contact with stormwater runoff or creek waters could occur.
Erosion and Sediment Control	Mitigation Measure WQ-9 NPS	Water pollution and sedimentation prevention measures will be used during construction. Erosion control measures to prevent detachment and transport of soil will be used.
Erosion and Sediment Control	Mitigation Measure WQ-10 NPS	Temporary fills and coffer dams may be established to divert flow around areas where construction activities will occur. Materials used for coffer dams will be completely removed after construction. The fisheries biologist shall be present on site during installation and removal of any sandbag coffer dams. During this time, the fisheries biologist shall estimate the downstream extent of any turbidity that occurs by visual observation from the bank or dry portions of the channel bed. The fisheries biologist shall monitor the project on a weekly basis for the purpose of assessing any unanticipated adverse effects to salmonids and their habitat. The fishery biologist shall be empowered to halt work

		activity and to recommend measures for avoiding adverse effects to salmonids and their habitat.
Erosion and Sediment Control	Mitigation Measure WQ-12 NPS	The stream will be monitored for debris and deposition of sediment after major rain events. If flood control measures are needed, a flood control maintenance plan for the site shall be prepared that specifies the amount of woody debris that can be left in the stream for fish cover after flood control maintenance activities are conducted. This report shall be submitted to NOAA Fisheries prior to any flood control maintenance conducted during the summer of 2004. Any native vegetation removed to facilitate heavy equipment access shall be replaced at a 3:1 ratio.
Erosion and Sediment Control	Mitigation Measure WQ-13 NPS	During excavation activities, any sediment piles left overnight on the site will be covered completely with tarps or watered to prevent airborne migration as needed to prevent windborne dust.
BIOLOGICAL RESOURCES		
Wildlife Resources	Mitigation Measure BIO-1 NPS	A bird survey will be conducted within 5 days prior to construction, if necessary. If special-status bird species are observed nesting on the project site downstream of the pedestrian bridge, construction activities will be delayed until nesting is completed.
Wildlife Resources	Mitigation Measure BIO-2 NPS	A pre-construction herpetofauna survey by a qualified biologist will be conducted in areas of excavation and filling. The biologist will search the litter layer and downed woody cover for presence of herps. If found, individuals would be translocated to undisturbed, adjacent riparian sites
Riparian/Plant Resources	Mitigation Measure BIO-3 NPS	Construction activities will avoid removal of existing native trees and shrubs. In areas where removal of non-native trees and shrubs are proposed, nearstream native shrub and trees species would be replanted.
Special Status Species	Mitigation Measure BIO-4 NPS	In-channel construction activities will occur during the low-flow period between July 1 and October 31 to avoid spawning, adult in-migration, and juvenile outmigration. Riparian and other work outside the bed and banks of the creek may occur until November 15 as long as sediment control measures are installed at the site to prevent sediment entry to the creek during late fall rains.
Special Status Species	Mitigation Measure BIO-5 NPS	In-channel construction activities will occur during the low-flow period between July 1 and October 31 to avoid spawning, adult in-migration, and juvenile outmigration. Riparian and other work outside the bed and banks of the creek may occur until November 15 as long as sediment control measures are installed at the site to prevent sediment entry to the creek during late fall rains.
Special Status Species	Mitigation Measure BIO-6	The action area will be dewatered and no construction equipment shall enter flowing water during instream work. Where flowing water occurs in the action area, a culvert or pipe to transport these waters through the action area shall be installed during instream work. The pipe or culvert must be appropriate to allow juvenile salmonid movement downstream.
Special Status Species	Mitigation Measure BIO-7 NPS	The GGNRA fishery biologist shall monitor placement and removal of sandbag cofferdams used to dewater the work area or portions of it. Prior to cofferdam installation, the biologist shall capture any steelhead that may be in the area to be dewatered. Salmonids will be relocated to a suitable instream location upstream or downstream of the work space. To prevent overcrowding of off site release areas, the GGNRA may place some fish in sites where work has been completed if suitable sites upstream and downstream are unavailable. Water quality conditions in these areas (temperature, dissolved oxygen, turbidity) will be monitored to insure they are similar or better than sites away from the project where fish are being placed.

Special Status Species	Mitigation Measure BIO-8 NPS	During and after fish relocation, fish shall not be allowed to enter the work area. Block nets or the coffer dams themselves shall be set up at the upstream and downstream extent of the relocation area to prevent immigration of salmonids during relocation and project construction. If used, block nets shall be removed once coffer dams or other dewatering materials are fully in place.
Special Status Species	Mitigation Measure BIO-9 NPS	The GGNRA shall insure that a fishery biologist shall be on site during all relocation activities. The fishery biologist shall ensure that the proper number of trained individuals are present to conduct fish relocation in a timely manner at the site. Methods for removing fish shall be those that minimize impact to salmonids. Methods for removing fish shall be those that minimize impact to salmonids. Methods for removal such as seining shall be used and exhausted prior to the use of electrofishing methods. The use of electrofishing for moving or herding fish shall not be used. Further details regarding seining and electrofishing are provided in the Biological Opinion.
Special Status Species	Mitigation Measure BIO-10 NPS	A fishery biologist shall monitor the project on a daily basis for the purpose of assessing any unanticipated adverse effects to listed salmonids and their habitat. The fishery biologist will be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat.
Special Status Species	Mitigation Measure BIO-11 NPS	Work shall cease and NOAA Fisheries shall be contacted at once if more than 15 steelhead or 10 coho salmon are killed during relocation or other project activities.
Special Status Species	Mitigation Measure BIO-12 NPS	NPS shall prepare a biological monitoring report documenting project impacts to salmonids and their habitat. This report shall be submitted to NOAA Fisheries no later than 2 months following the completion of the project. If flood control work occurs in 2004, a similar report shall be prepared and submitted within the time frame described above. Reporting requirements are detailed in the Biological Opinion
Special Status Species	Mitigation Measure BIO-13 NPS	Just prior to construction, a biological monitor familiar with identification of the red-legged frog would search the project site and adjacent areas, for the presence of red-legged frogs and other herps. Should any frogs be observed, authorized take would be required to move individuals safely outside of the construction area to similar habitats. Construction activities will be temporarily suspended in the area of the observed frogs.
CULTURAL RESOURCE IMPACTS		
Cultural Resources	Mitigation Measure Cult-1 NPS	If paleontological resources are encountered during construction, work in the immediate vicinity of the find will be stopped and a GGNRA archaeologist will be called to inspect the finds. The recommendations of the archaeologist with regard to on-site preservation, recovery and/or documentation of the resources will be implemented before construction re-commences.
UTILITIES IMPACTS		
	Mitigation Measure Util-1 NPS	Prior to excavation for the stream channel and floodplain, utilities will be identified and protected from damage.
VISITOR USE AND EXPERIENCE IMPACTS		
Visitor Use	Mitigation Measure VUE-1	Re-stripe a section of parking spaces in North Parking Lot such that there is no significant impact to

	NPS	parking uses.
Visitor Use	Mitigation Measure VUE-2 NPS	To avoid potential accidents related to construction, public access to construction areas will be prevented.
Visitor Use and Experience	Mitigation Measure VUE-2 NPS	Signs will be placed at access points to the creek to inform park visitors about project-related construction activities.
Visitor Use	Mitigation Measure VUE-4 NPS	A public meeting will be held prior to implementation of the project to discuss proposed measures to minimize construction impacts and to provide the local residents a work schedule.
AIR QUALITY AND NOISE IMPACTS		
Noise	Mitigation Measure AQN 1 NPS	Construction activities will be limited to weekdays between 7 a.m. and 7 p.m.
Noise	Mitigation Measure AQN 2 NPS	Select equipment capable of performing the necessary tasks with the lowest sound level and the lowest acoustic height possible.
Noise	Mitigation Measure AQN 3 NPS	Operate and maintain construction equipment to minimize noise generation. Equipment and vehicles will be kept in good repair and fitted with "manufacturer-recommended" mufflers.
Air Quality	Mitigation Measure AQN 4 NPS	Cover trucks hauling soil, sand and other loose materials, or require haul trucks to maintain at least two feet of freeboard.
Air Quality	Mitigation Measure AQN 5 NPS	Sweep paved surfaces at the project construction site daily with appropriate sweepers; this mitigation would be required during dust-creating operations and in locations/routes where dust would be generated as a result of project construction. Surface debris shall not be swept into the creek.
Air Quality	Mitigation Measure AQN 6 NPS	Construction activities will cease if visible dust clouds form.
Air Quality	Mitigation Measure AQN 7 NPS	Trucks hauling or moving soil shall not idle for more than five minutes.

APPENDIX E
Bird Survey

4/12/02
Josiah Clark

Overview

On 4/12/02 a bird survey was conducted by Josiah Clark along Easkoot creek in the town of Stinson Beach between the hours of 8:15 am and 11 am. A total of 26 species were recorded in the strip of riparian forest and scrub between the Stinson Beach Parking Lot and Highway 1. An additional 14 species were noted either flying over or in the immediately adjacent areas. No special status species were observed directly in the work area. The location and shape of the riparian strip, fragmented and surrounded by human activities makes the site sub-optimal for birds specialized to riparian habitats. Six aggressive generalist bird species (including two introduced species) typical of urban areas were observed in the riparian strip twice as frequently as birds specialized to native woodlands. Invasive plants appear to be responsible for the marginal habitat at this site.

Assessment

The pending construction activities to the creek channel and banks should enhance the system for native birds and wildlife in the intermediate and long term. Riparian vegetation is adapted to re-grow quickly due to the expected dynamic winter flooding regimes typical in this habitat type. Riparian nesting birds have adapted to take advantage of the vigorous re growth that occurs after local disturbances (personal contact Geoff Gueple, Point Reyes Bird Observatory). In order to achieve the required growth that leads to primary productivity and structural diversity beneficial for nesting birds, invasive plants (particularly invasive climbing plants like Cape Ivy), must be controlled after the restoration activities. Placement of brush piles in cleared areas can assure cover for wintering birds, and may facilitate native re growth the season after construction. The optimal timing for this activity would be after peak breeding season.

Birds that could potentially nest in the existing understory conditions of the restoration area include Anna's Hummingbird, Allen's Hummingbird, Song Sparrow, Wilson's Warbler and Orange-crowned Warbler. All of these are species that were observed in the vicinity and nest close to the ground and in dense underbrush like that which lines Easkoot creek. If any nesting sites are disturbed in the effected area, conditions would likely become suitable within 1-2 years after the construction.

Monitoring Methods and Results

The observer walked the length of the site along Easkoot Creek where the restoration is slotted to take place for 2 hours and 45 minutes. The observer walked down both sides of the creek from the road, through the stream side vegetation, and down the middle of the watercourse. Immediately adjacent areas including the parking lot and town were also investigated.

Spot Mapping and Area Search monitoring methods were conducted at the Easkoot creek site. A standard five minute variable circular plot point count was also conducted at the Easkoot creek site. A second point count was conducted at a reference site of riparian by the Pelican Inn at Muir Beach. While the sites are comparable in elevation and overall vegetative community the understory of the Muir Beach site was notably more dense and impenetrable than Easkoot, with native plants comprising more of the vegetative cover. All monitoring methods are consistent with standards set by the Point Reyes Bird Observatory available on their web site.

Stinson recorded 13 species in five minutes with 6 of these being aggressive generalist species that benefit from human activities (i.e. American Crows, Common Raven, Brown-headed Cowbird, Brewer's Blackbird, House Finch and House Sparrow). The Muir Beach point recorded 17 species in five minutes with only 4 aggressive generalist species. The Muir site is considerably less trafficked

and fragmented by human features than the Easkoot Creek Site. The increased instance of aggressive generalist bird species at Stinson can likely be attributed to the abundance of food available through nearby human activities (restaurants, picnic areas, and trash).

Migrant riparian nesters of nearby areas that were notably absent from the study site were Warbling Vireo, Swainson's Thrush and Pacific-slope Flycatcher. Resident species of nearby areas that were absent from the study site included California Quail, Bewick's Wren, Wrentit and Spotted Towhee. The ladder two species were noted during observations at Stinson, but were away from the creek and in the strip between the beach and parking lot. (The area where the 2 previously mentioned species were seen is smaller than the strip along the creek but has more dense and impenetrable native cover. Cape Ivy does not yet dominate this strip.)

Vegetative Composition and Structure

The riparian vegetative composition along Easkoot creek is influenced by the town of Stinson Beach and is a mosaic of native and exotic vegetation. The dominant native vegetation includes a canopy of willows (*Salix lasiandra* and *S. laseolepis ssp*. *lucida*) and alders with a mixed understory of native and Himalayan Blackberry (Rhubus), invasive English and Cape Ivy and mixed herbaceous plants. Red Alder (*Alnus rubra*) has been identified as an important tree for breeding birds of the area (PRBO, Redwood Creek study) but mature trees of this species appear to be in decline in this area. The structure of the plant communities along the creek appear relatively poor for many cup nesting songbirds including warblers, vireos and flycatchers. Natural riparian systems are dynamic, relying on periodic floods and inundation to clear away older understory and allow new vigorous growth to fill in.

This new vegetative growth creates structural complexity that best enables birds to hide their nests. With a lack of major flooding events the vegetation along Easkoot creek appears to have climaxed into a mosaic of native and exotic vegetation, much of which is homogenous in structure. The presence of exotic invasive plants, in particular Cape Ivy, has limited the structural diversity and marginalized nesting sites.

Exotic-Invasive Vegetation

Escapee ornamental plants present along the watercourse that were likely transported there through bird droppings include Pitosporum, Myoperum, Himalayan Blackberry (Rhubus discolor) and English Ivy (Hedera helix. All of these species produce berries that are readily consumed by a number of migrant and resident birds including thrushes, waxwings and finches. While these exotic plant species provide food for native birds it should be noted that they can (especially English Ivy and Himalayan Blackberry) contribute to the deterioration of intact native plant communities. It should also be noted however that the thorny and impenetrable vegetation of Himalayan Blackberry often serves as a refuge to native ground nesting species in areas lacking refuges of native structure. California Blackberry can be substituted for Himalayan Blackberry but would need a structure on which to climb (brush feature) if it is to attain the same stature of the ladder species.

The area of Easkoot creek that was surveyed had a diversity of exotic plants that were distributed throughout the riparian strip. Of the exotic plants noted the following may have the most detrimental effect on the structural diversity favored by birds: Cape Ivy, English Ivy, Vinca, Purple-velvet Grass and Poison Hemlock.

Nest Predators and Edges

Sub-optimal nesting sites are at especially high risk due to the saturation nest predators in the area. Nest predators, (including Jays, Cowbirds, Rats and Raccoons) occur at higher densities in areas where food is artificially abundant as a result of human activities. Cup nesting species are particularly hard hit by nest predators. Cavity nesters are generally more secure. Areas with a high percentage of edge and low percentage of interior space like the Easkoot creek riparian strip, experience higher incidents of nest predation (Restoring North America's Songbirds, pg 110, Robert A. Askins).

Conclusion

While riparian forests in this region can be very diverse and harbor a number of species of concern (see list of riparian species located in appendix) the riparian strip along Easkoot creek in the town of Stinson Beach appeared largely dominated by aggressive generalist bird species such as crows, starlings and blackbirds that benefit from adjoining areas of human activity. Certain resident and migrant species that specialize in understory were notably absent from this survey. The presence of exotic invasive plants, especially Cape Ivy also appears to have compromised this already fragmented and constrained habitat. If done outside of breeding season the restoration activities to the creek should cause negligible negative impacts to nesting birds in the short term and effect only a few individuals of the mentioned species if any.

List of Identified Species

Great Blue	Mallard
Barn Swallow	Chestnut-backed Chickadee
Allen' Hummingbird	Bushtit
Anna's Hummingbird	American Robin
Downy Woodpecker	European Starling
Cedar Waxwing	Hairy Woodpecker
Orange-crowned Warbler	Steller's Jay
Yellow-rumped Warbler	Scrub Jay
Wilson's Warbler	American Crow
Common Raven	Tree Swallow

APPENDIX F
Wetland Delineation Data Sheets

APPENDIX G
Fish Data

NPS personnel assessed the suitability of existing steelhead habitat by looking at the National Marine Fisheries (NMFS) definition of essential habitat features (NOAA 2000). The NPS considered essential habitat types for steelhead to include the following: (1) juvenile rearing areas, (2) juvenile migration corridors, (3) areas for growth and development to adulthood, (4) adult migration corridors, and (5) spawning areas. Within these areas, essential features of critical habitat include: (1) adequate substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions.

Current Juvenile Steelhead Rearing Habitat

An assessment between historic and current conditions is shown in Table G-1. Lower Easkoot Creek supports young-of-the-year, 1+, and 2+ steelhead. Based on these scale readings from fish collected in August 2000, young-of-the-year were less than 113 mm (FL); 1+ ranged between 113 and 170; and 2+ greater than 170 mm in length. The age classes from scale readings are very similar to those created from interpreting the length-frequency distributions (Table G-1). Nevertheless, these ages should only be considered as estimates. Several studies have documented the problems with aging salmonids using scales including the frequent absence of a first year annulus, false annuli, and increased inaccuracies in aging older fish (Beamish and MacFarlane 1983, 1987; Rooper et al., 2000). Many of the larger 2+ fish were possibly resident trout. Several had heavy dark spotting, olive gold coloration, and lacked parr marks and throughout the body.

Size class distribution appears to be dependent upon pool availability and depth. During the summer 1998, young-of-the-year and 1+ steelhead were found in lower Easkoot Creek below the Park entrance road. Steelhead juveniles ranged from 40 mm to 170 mm. The sampled habitat was characterized as a mixture of wood-formed scour pools and shallow flatwater habitats.

EASKOTT CREEK PROJECT AREA	HISTORIC Conditions	CURRENT Conditions
Juvenile Rearing Area	LIKELY	YES, impaired
Juvenile Migration Corridor	LIKELY	YES, impaired
Areas for Growth and Development to Adulthood	UNLIKELY	NO
Adult Migration Corridors	LIKELY	YES
Spawning Areas	LIKELY	YES

This same area was sampled in the summer 1999. Just two steelhead young-of-the-year were found. This low number cannot be explained by poor recruitment for the year. Sampling activities just upstream (Laurel Creek) found large numbers of young-of-the year steelhead. The reduced number of fish and absence of 1+ and older steelhead juveniles may be due in part to the removal of woody material from the creek that helped maintain scour pools. Since the 1998 fish surveys, woody materials that formed scour pools were removed inadvertently by the local flood control district. These actions resulted in the conversion of scour pools into shallow flatwater areas during winter and spring high flow events. In the fall 1999, two bay root wads with their trunks were placed in the channel. Winter flows caused localized scour holes at these root wads and created new gravel bars immediately downstream that helped to narrow and deepen the low flow channel. By late summer 2000, the total density of fish (including young-of-the-year and 1+ steelhead) were using the sampled reach at higher densities than prior years (ANOVA, $p<0.05$, post-hoc Scheffe test) (Figure G-1, Table G-3).

Stream invertebrate data was collected in 1995 at the project site and at an upstream reference area (Laurel Creek) in order to characterize the health of the stream benthic invertebrate community. This data is also useful in characterizing the suitability of the project area as juvenile rearing habitat for steelhead. NPS personnel used simple, commonly accepted metrics- taxa richness, number of mayfly/stonefly/caddisfly taxa, number of predatory taxa, unweighted family biotic index, and number of long-lived taxa (>1 year freshwater) (Karr and Chu 1999; Plafkin et al., 1989). These metrics were chosen to mirror impacts that are believed to be present in the system- namely, fluctuations in water quantity in summer, habitat simplification because of past stream practices, and questionable instream water quality adjacent to streamside roads, businesses, and residences. Generally, taxon richness increases with water quality, habitat diversity, and habitat suitability (Plafkin 1989).

However, assessment of the health of the macroinvertebrate community may not necessarily reflect impairment that might be reflected on the organismal level (e.g., reduced growth), species level (e.g., abundance of species), or ecosystem processes (e.g., rate of detrital processing) (Carlisle 2000). The mayfly (Order Ephemeroptera), stonefly (Order Plecoptera), and caddisfly (Order Trichoptera) taxa are generally considered pollution sensitive and the number of "EPT" taxa generally increases with increasing water quality (Plfakin et al., 1989). To assess fluctuations in water quantity, the number of predatory taxa and long-lived taxa (semi- and merovoltine) were chosen as metrics. We assumed that long-lived taxa would be less common in streams that frequently went dry. Table See G-4.

Many of the taxa collected in the project reach are associated with slow water habitats including empidid and tipulid larvae. Of particular interest, a rat-tail maggot (*Eristalis* sp.) was collected from Easkoot Creek. Such an occurrence indicates the persistence of poor dissolved oxygen conditions within lower Easkoot Creek. No rat-tail maggots were found in Laurel Creek. Such information is consistent with existing water quality data. Invertebrate data also indicate more stable conditions in Laurel Creek, with this creek having higher number of predator taxa and taxa requiring more than one year in the stream. This data is consistent with NPS understanding of available stream habitats and flows. During the summer, roughly double the amount of flow is available within Laurel Creek versus downstream Easkoot. While riffle and flatwater habitats in Laurel may periodically go dry because of water appropriation, pool habitats are in greater abundance than downstream areas and may offer refuge during these events. The mean condition factor of steelhead juveniles in lower Easkoot Creek (North Parking Lot) is similar to upstream areas and is higher than a heavily shaded, reference stream in San Mateo County. When compared to West Union Creek, Easkoot Creek steelhead were in much better condition. To demonstrate, a hypothetical 150 mm steelhead caught in 1999 at West Union Creek would weight 30 g while at Easkoot Creek, a fish of the same length would be 41 g. See Table G-5.

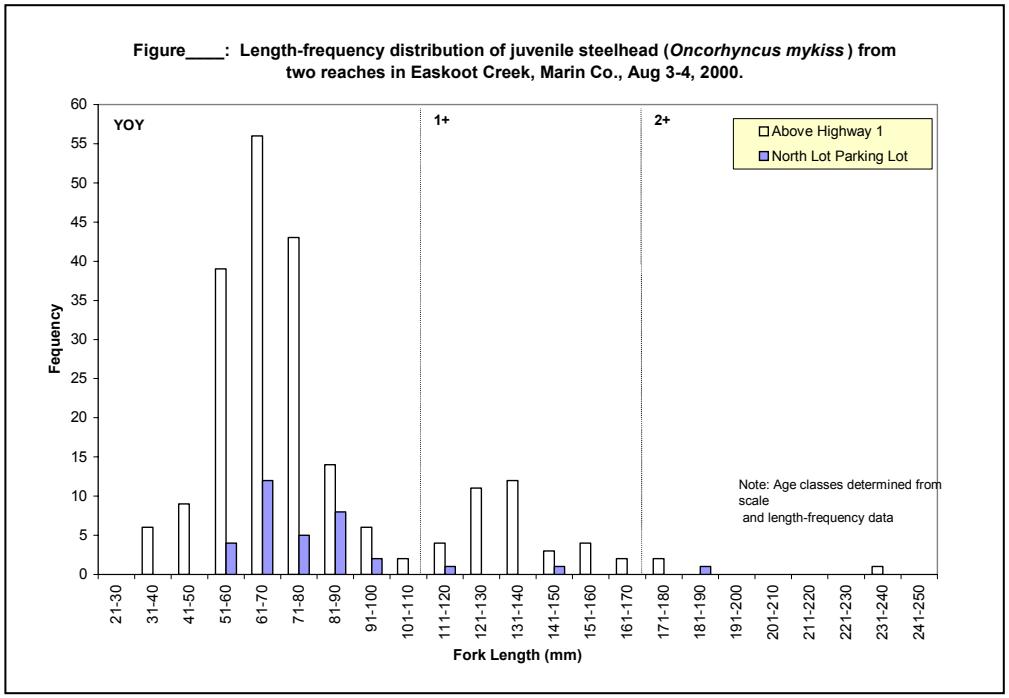

Figure G-1: Length frequency distribution of juvenile steelhead

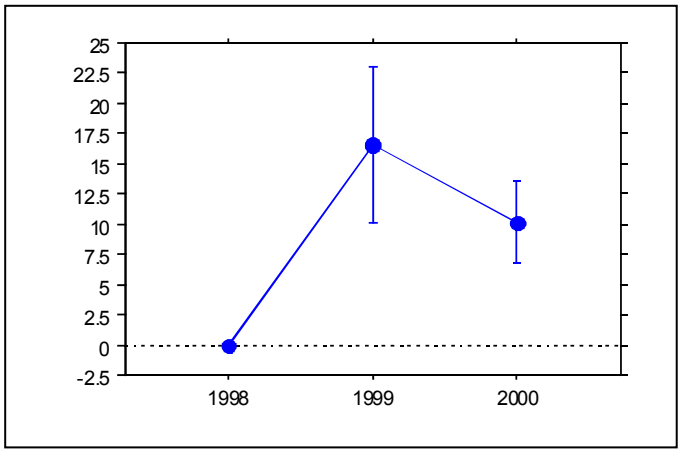

Figure G-2: Total density of fish, summer 1998-2000

	SH YOY	SH 1+	SH 2+	SB	SC	CGS
July 1998						
# fish per m (s.d.)	0.7 (0.7)	0.3 (0.6)	0	0.2 (0.4)	0.2 (0.2)	0
standing biomass (g/m)	4.7 (3.1)	2.8 (6.3)	0	0.2 (0.1)	1.5 (2.4)	0
# fish per sq. m (s.d.)	0.3 (0.4)	0.03 (0.06)	0	0.09 (0.19)	0.04 (0.04)	0
standing biomass (g/sq.	0.3 (0.4)	0.9 (2.0)	0	0.08 (0.07)	0.5 (0.8)	0
August 1999						
# fish per m (s.d.)	0.03 (0.05)	0	0	0.03 (0.03)	0	0
standing biomass (g/m)	0.1 (0.2)	0	0	0.02 (0.03)	0	0
# fish per sq. m (s.d.)	0.02 (0.03)	0	0	0.02 (0.01)	0	0
standing biomass (g/sq.	0.06 (0.1)	0	0	0.01 (0.01)	0	0
August 2000						
# fish per m (s.d.)	0.9 (0.7)	0.04 (0.06)	0.01 (0.03)	0.3 (0.1)	0.5 (0.3)	0
standing biomass (g/m)	5.2 (4.5)	1.1 (1.6)	1.0 (2.3)	0.1 (0.1)	1.8 (2.0)	0
# fish per sq. m (s.d.)	0.4 (0.3)	0.02 (0.03)	0.01 (0.01)	0.1 (0.1)	0.2 (0.2)	0
standing biomass (g/sq.	2.6 (2.0)	0.6 (0.8)	0.5 (1.2)	0.05 (0.03)	0.9 (1.0)	0

SH-steelhead, SC-sculpin, SB-threespine stickleback, CGS-California giant salamander, Std deviation in parenthesis
1998-survey distance was 55.8 m (5 habitat units); 1999-survey distance was 52.6 (3 habitat units); 2000-survey distance was 95.6 m (5 habitat

Figure G0-3: Estimated mean density and biomass of sampled aquatic vertebrates

METRICS	**LOWER EASKOOT**	**LAUREL**
EPT Richness	11	15
Total Taxa Richness	25	22
No. of Predator Taxa	2	5
No. of semivoltine or longer	3	5

Figure G-4: Comparison of stream invertebrate data

Juvenile Migration Corridor
Current conditions are less than ideal for movement of juvenile steelhead. During summer low flow conditions, portions of lower Easkoot Creek become detached. Under normal-slightly wet year conditions of the past two years, this has occurred during July and August. Under drier hydrologic conditions, the cessation of surface flows during periods of peak out-migration of steelhead smolts (May-June) would be very problematic.

Adult Migration Corridor
Adult steelhead upstream migration has typically occurred during the late winter through spring. For the most part, there are no unnatural barriers within lower Easkoot Creek that could impeded adult fish passage. However, cover and holding pool conditions are less than optimal because of the absence of large pools, undercut banks, and near-stream riparian vegetation.

Spawning Areas
Adult steelhead use the project area for spawning. Surveys conducted in Winter 1999 and 2000 found redds within the project area and at adjacent upstream sites. Gravel quality is relatively good. The simplified habitat conditions have resulted in large expanses of riffle and flatwater areas with large, angular gravels in the substrate.

EASKOOT LOCATION	Year	Power Function (R2) where w = weight (g), L= fork length (mm)	n	Mean Fulton's Condition Factor
North Parking Lot	2000	$W = 1.39 * 10^{-5} * L^{2.971}$ (0.98)	56	1.23
Above Highway 1	2000	$W = 1.27 * 10^{-5} * L^{2.990}$ (0.99)	105	1.23
West Union Creek (San Mateo Co.)	1999	$W = 1.78 * 10^{-5} * L^{2.863}$ (0.99)	69	0.99

Figure G-5: Steelhead condition factors