UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

RECEIVED
Point Reyes
National Seashore
APR 7 '04

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In response refer to:
151422SWR01SR802

SUPT.
SPEC. PK. USES
LAW ENFORC.
RES./SCIENCE
RANGE CONS.
FIRE MGT.
INTERP.
CULT. RES.
MAINT.
CONTRACTING
PERSONNEL
BUDGET

Mr. Don L. Neubacher
Superintendent
Point Reyes National Seashore
National Park Service
Point Reyes, California 94956

Dear Mr. Neubacher:

Enclosed is the National Marine Fisheries Service's (NOAA Fisheries) biological opinion for the National Park Service's (NPS) livestock grazing program on NPS lands in Point Reyes National Seashore (PRNS) and the Golden Gate National Recreation Area (GGNRA) in western Marin County, California (Enclosure 1). The biological opinion addresses the effects of the proposed project on threatened Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*), threatened California Coastal (CC) Chinook salmon (*O. tshawytscha*), threatened CCC steelhead (*O. mykiss*), and designated critical habitat for CCC coho salmon in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

The biological opinion concludes that the NPS' grazing lease program is not likely to jeopardize the continued existence of the threatened CCC coho salmon, CCC steelhead, or CC Chinook salmon, nor is it likely to adversely modify CCC coho salmon critical habitat. NOAA Fisheries expects the action is likely to result in take of CCC coho salmon, CC Chinook salmon and CCC steelhead. An incidental take statement is attached to this biological opinion.

The project site includes areas identified as Essential Fish Habitat (EFH) for various life stages of coho salmon and Chinook salmon, species Federally managed under the Pacific Coast Salmon Fishery Management Plan. Based on the best available information, NOAA Fisheries has determined that the proposed project is likely to adversely affect EFH. EFH Conservation Recommendations are provided in Enclosure 2.

Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act requires that NPS provide NOAA Fisheries with a detailed written response within 30 days to these EFH Conservation Recommendations, including a description of measures adopted by NPS for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR 600.920(j)).

In the case of a response that is inconsistent with NOAA Fisheries' recommendations, the NPS must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NOAA Fisheries over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

If you have any questions about this biological opinion or if you require additional information, please contact Mr. Eric Shott at (707) 575-6089.

Sincerely,

Rodney R McInnis

Rodney R. McInnis
Acting Regional Administrator

Enclosures (2)

cc: Mark Homrighausen, NPS-PRNS,
Jim Lecky, NOAA Fisheries
Penny Ruvelas, NOAA Fisheries

BIOLOGICAL OPINION

ACTION AGENCY:	National Park Service
ACTION:	The Continued Issuance of Grazing leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California
CONSULTATION CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
FILE NUMBER:	151422SWR01SR802
DATE ISSUED:	APR 5 2004

I. CONSULTATION HISTORY

On December 6, 2000, the National Park Service (NPS) sent the National Marine Fisheries Service (NOAA Fisheries) a letter to request consultation on the renewal of livestock grazing permits in Point Reyes National Seashore (PRNS) and the North District of the Golden Gate National Recreation Area (GGNRA) in Marin County, California. In response, NOAA Fisheries requested a biological assessment of the effects of livestock grazing permit renewal on salmonid species listed under the Endangered Species Act of 1973, as amended (ESA). On July 20, 2001, NPS sent NOAA Fisheries a biological assessment for the project. NOAA Fisheries asked for additional information (NOAA Fisheries 2001b). After receiving additional information and conducting a site visit, NOAA Fisheries began consultation on this project on January 9, 2002. As consultation progressed, it became apparent that additional information was needed on project impacts, and additional protection measures would need to be developed. NPS and NOAA Fisheries worked together to improve the analysis and project. Another site visit was conducted, and additional project description information was transmitted to NOAA Fisheries during 2002 and early 2003.

On July 9, 2003, NOAA Fisheries sent NPS a draft biological opinion for this project along with a request to work further on the measures to monitor incidental take. NPS responded by phone in late July 2003 to request additional information. NPS responded by letter with comments on the draft on February 26, 2004. Subsequent phone discussions and emails were used to finalize NPS's comments, including changes to their water quality monitoring program. NOAA Fisheries has incorporated most of NPS' comments into this biological opinion, including the new water quality monitoring approach proposed by NPS. NPS' expertise in current and historical conditions on their lands was very helpful to NOAA Fisheries during consultation and in finalizing this opinion.

II. DESCRIPTION OF THE PROPOSED ACTION

NPS proposes to continue to provide grazing leases in perpetuity on approximately 28,900 acres of park land in PRNS and GGNRA in Marin County, California (Figure 1). These lands are located mainly in the Lagunitas Creek watershed, and include Olema Creek, its largest tributary. There are also grazing leases on lands that drain to Drakes Estero. NPS has resource protection programs in place to minimize the impacts of livestock grazing on NPS lands. NPS will continue these programs as part of the proposed action and take additional steps in the next few years to further reduce impacts from the grazing lease program.

Approximately 6,350 cattle are grazed on these lands in PRNS and GGNRA, distributed among 25 ranchers who among them hold 44 leases[1]. Five leases are currently vacant of livestock. Most of the ranching done is beef cattle, only seven of the ranches are dairies. There are also a few horse pastures. Grazing includes water use for livestock, roads, fencing, barns and other common grazing infrastructure.

A. Leasing Program Resource Protection

NPS has standards and programs in place to protect sensitive habitats, identify adverse impacts to sensitive resources, evaluate them, and take appropriate action depending upon their severity. NPS proposes to continue these programs and will further develop them to improve their effectiveness in addressing the impacts of the grazing permits on sensitive resources, including listed salmonids.

Direct liaison with ranchers and management of ranching activities is the responsibility of the PRNS Rangeland Management Specialist, under guidance provided by the PRNS Rangeland Management Guidelines (1990). The guidelines identify a number of management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of livestock permitted, deferring grazing on seasonally vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive non-native plant species. In addition, an average of 1,200 pounds per acre plant cover is to be maintained on grazed areas. Lower levels of cover are permitted in identified high-impact areas, such as at water and feeding troughs, corrals, and adjacent to dairies. Such high-use areas are located or managed to minimize impacts on adjoining land. The plant cover standard is based on

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[1]The legislation establishing the two parks allows for continuation of traditional ranching activities on some of the lands contained in the parks. Two options were provided for this purpose. Ranchers could maintain a Reservation of Possession (ROP) which allowed continued ranching for up to 25 years in exchange for a reduction of the land purchase amount. Or, ranchers could receive the full purchase amount by selling their land to the Park and enter into renewable Special Use Permits (SUPs) for grazing. SUPs typically have a term of five years, which is the maximum term allowed under NPS guidelines. Several SUPs have terms of just one year. In practice, both options were utilized, and it has been NPS practice to allow ranchers whose ROPs have expired to enter into SUPs (National Park Service 2001).

University of California Cooperative Extension guidelines for minimizing erosion on grazing lands in coastal regions of California. Monitoring of ground cover takes place in September through October to insure that this standard is met prior to winter rains. Where this standard is not met, the duration of grazing or the allowed number of cattle is reduced (NPS 2001).

NPS monitors, and will continue to monitor, the condition of grazing lands and adjacent streams on a regular basis and use this information to adjust protection and restoration measures for anadromous salmonids and their habitats. This approach is described below, along with protection measures for listed salmonids and specific actions NPS will take within the next five years to address concerns identified by NOAA Fisheries during consultation.

1. Resource Monitoring/Source Identification

a. Uplands Monitoring

The PRNS Rangeland Management Specialist monitors the condition of uplands for grazing intensity, livestock distribution, and upkeep of water supplies, fences, and roads. Monitoring of grazing intensity and livestock distribution will be used to identify areas that could contribute sediment to streams during the rainy season, due to absence of ground cover or trailing. Livestock distribution and riparian condition monitoring will be used to help identify riparian problems likely caused by livestock, such as increased sediment in streams. Water supplies, roads, and fences in poor condition will be identified and corrected. NPS will continue this monitoring as part of the grazing lease program.

2. Water Quality Monitoring

The NPS implemented an ambient stream condition monitoring program in 1999 to assess conditions in the Lagunitas watershed (including Olema Creek) and tributaries to Drakes Estero to identify water quality problems (NPS 2001b). Fecal coliform, ammonia, conductivity, and total suspended solids are used as primary indicators of water quality degradation. Aquatic macroinvertebrates are also sampled. NPS will continue to use a modified version of this program to assess current aquatic conditions and identify pollution sources, including problems associated with dairy operations in PRNS (NPS 2001b, NPS 2004a). Sampling locations have been distributed by NPS throughout PRNS and GGNRA to better pinpoint the sources of pollution problems.

NPS has revised its monitoring approach based on NOAA Fisheries monitoring needs for the proposed project as described in the draft biological opinion (NOAA Fisheries 2003b) and on information obtained during the past several years of monitoring. The general monitoring approach is described below. A more detailed description is provided in NPS 2001b and 2004b.

1. Water quality sampling was initially done on a quarterly basis plus two unscheduled winter events (first flush and one other storm - NPS 2001b). NPS proposes to conduct future sampling

weekly for five weeks during the winter storms season and monthly for the remainder of the year (NPS 2004a).

2. A total of 11 stations are intended to characterize water quality conditions in streams draining ranch lands in PRNS. Previously, NPS had 30 monitoring stations on PRNS. Many of these stations were not in watersheds with livestock (Brannon Ketcham, NPS Hydrologist, personal communication, March 19, 2004). NPS intends to re-focus its monitoring effort on monitoring stations in livestock watersheds. NPS is reducing the number of sampling stations from 14 to 8 in Olema Creek based on information generated by sampling14 base monitoring stations in Olema Creek for several years (NPS 2004a). NPS has enough equipment and personnel (staff and volunteers) to sample all livestock water quality monitoring stations in 1-2 days. Three of the stations may not be sampled during some summers due to intermittent streams at these locations.

3. The following parameters will be sampled: fecal coliform, ammonia, conductivity, total suspended solids (TSS) or suspended sediment concentration (SSC), turbidity, temperature, pH, dissolved oxygen, percent oxygen saturation, and salinity.

4. NPS will attempt to develop correlations among TSS, SSC, and turbidity. In the interim, turbidity and TSS or SCC will be reported for each monitoring station.

5. NPS proposes that if the 90th percentile of measured turbidity does not remain below 100 nephelometric turbidity units (NTU) at each of the sampling stations, or a single event at any station exceeds 315 NTU, NOAA Fisheries will be contacted and NPS will develop a refined source-area sampling response to identify specific treatments to improve water quality performance.

6. New sampling locations will be added as necessary, based on sample results or new species localities.

3. Fish and Fish Habitat Monitoring

NPS initiated a five year Coho and Steelhead Restoration Project in 1997 to assist with the assessment and recovery of salmonids. Part of this effort involved the development of a long term fish and fish habitat monitoring plan to help identify factors that may be affecting anadromous salmonids and their habitats. Many of the monitoring components have been implemented since 1999. As part of the long term plan, NPS has been monitoring multiple freshwater life stages of salmonids in Olema Creek, Cheda, Redwood Creek, and Pine Gulch (neither Pine Gulch nor Redwood Creek contain lands under NPS grazing leases) on a yearly basis through out-migrant trapping in selected areas, adult coho spawner surveys, and summer index reach monitoring of juveniles. The scope of monitoring depends on resources available.

The methodologies used for adult spawner and carcass surveys, smolt trapping, and summer juvenile monitoring are described in the Draft Coho Salmon and Trout Restoration Monitoring Program (NPS 2002). Physical components of salmonid aquatic habitat are monitored by the use of index sections at somewhat regular intervals in each major creek in a watershed. (These index reaches are also the location for many of the water quality parameters sampled by the NPS, and the location of juvenile abundance and distribution surveys). At least three riffle pool sequences are included in each index section. Substrate composition, large woody debris (LWD), bank erosion, riparian condition, thalweg location, profile and cross sections, and residual pool depths will be measured. Specific methodologies are described in the Draft Coho Salmon and Trout Restoration Monitoring Program (NPS 2002).

B. Incorporation of Monitoring Information

The information obtained from the monitoring programs described above will continue to be used by NPS to help pinpoint any specific water quality or other habitat problems related to the grazing leases (and other activities). It will also be used to evaluate the overall effects of grazing (and other activities) on salmonids and their habitats in NPS watersheds. The NPS's Rangeland Management Specialist will conduct annual meetings with each rancher in which problems with ranch structures and practices are discussed. Input from other NPS resource staff will be solicited. If monitoring has identified conditions detrimental to salmonids and/or their habitat, NPS will develop a list of needed actions with the lease holder. All leases are reviewed and most permits renewed every five years at which time terms can be altered to address resource issues if needed. In especially sensitive areas a shorter permit term can be set. Where necessary to remove a threat to Federally-listed species or other natural resources, lease or permit conditions can be changed at any time. As part of the renewal process, a NPS project review is conducted. Reviewers, including a hydrologist and plant ecologist, are asked to concur in continuation of the permit or lease, and can make concurrence subject to conditions that become part of the lease permit. Needed work on ranches can be funded in several ways. NPS has identified a number of internal and external funding sources to complete needed habitat improvement projects

C. Salmonid Protection Measures

NPS will incorporate the following measures to protect listed salmonids:

1. <u>Stream buffers</u>

Riparian management measures will be adopted so that functional habitat characteristics, including channel form and structures, water quality, thermal range, and riparian cover are maintained or improved to assure long-term presence of high quality salmonid habitat. NPS intends to restore native riparian vegetation conditions that support salmonids appropriate to the particular stream reach that has been impacted. Channels with floodplains, such as the lower portion of Olema Creek, will have large portions of their floodplains restored. Livestock will be excluded from some floodplain areas as a first step in this process in order to increase vegetation in these areas. Upstream, salmonid spawning and rearing reaches will have the width of riparian woodlands increased to accommodate potential future stream course changes and provide better shade, sediment control, and wood recruitment than current exclusion distances. Where exclusion fencing is used it will vary from 15 to 30 meters (or greater) back from the channel banks in order to facilitate functioning riparian habitat and accommodate livestock shade and other needs. Upstream of salmonid spawning and rearing areas, fencing will be closer to channels if it is used. Other measures such as stocking requirements, seasonal grazing, upland watering, natural topography and the intermittent nature of many of these channels are expected to provide additional protection to headwater streams from livestock impacts.

NPS will work with the ranch operation involved to restore riparian areas based on the approach described above when degraded riparian conditions are identified. Options available, and currently used, include reduced stocking, protected planting of native vegetation, seasonal grazing, temporary fencing to allow native vegetation to re-grow, and permanent exclusion fencing. Where needed to improve habitat conditions, instream LWD will be placed. NPS and the lease holder will monitor the method chosen to assess its effectiveness and adjust it if necessary. Continued loss of vegetation to cattle will be cause for further measures (likely to include seasonal grazing, temporary exclusion fencing, or permanent livestock exclusion) to restore the riparian area.

2. <u>Roads</u>

When water quality and/or other fish habitat monitoring identifies sedimentation and turbidity from roads, NPS will work with the lease holder responsible for the road to correct the problems. Several options may be available depending upon road location and conditions including: outsloping, adding drainage or additional drainage, road seasonal closure, road removal, re-locating the road, upgrading road surfacing (rocking the road), *etc.* NPS and the lease holder will monitor the road after the implementation of the corrective measure to ensure that it is effective. NPS's intention is to disconnect road drainage networks from stream networks as much as possible. The NPS will use *Guidelines for the Maintenance and Management of Unpaved Roads in the Lagunitas Creek Watershed* (Marin Municipal Water District 2001) as the basis for road management on grazing leases.

3. <u>Specific Actions to be Completed by 2006</u>

As a result of their on-going resource monitoring program and work with NOAA Fisheries during consultation, NPS is proposing to undertake the following actions by 2006 to further reduce impacts to salmonids and their habitats identified in the areas affected by grazing leases (NPS 2002b, 2002c, 2002d). Several of these actions are already underway or have been completed. The general location of these actions is shown on Figure 1.

a. Lagunitas Creek Drainage

A wooded riparian corridor 30 to 90 meters in width prevents cattle access along 2000 meters of Lagunitas creek near the town of Point Reyes Station. However, approximately 300 meters of gravel deposits occur on an inside bend of the creek, with only a fringe of riparian trees along the creek's edge. This area is directly accessible to cattle, and NPS will evaluate whether access is impairing in-stream habitat quality in this section. Cattle use in this area is light, according to NPS, but will be monitored to ensure avoidance of bank trampling and riparian tree suppression. If needed, measures will be taken to reduce cattle access to stream banks. This area is the only ranch on NPS lands where cattle have direct access to the Lagunitas Creek mainstem.

Approximately 700 meters of Devil's Gulch, a tributary to Lagunitas Creek, has been fenced during the summer of 2002. The new fence is 30 to 90 meters away from the channel over most of its length (NPS 2002d).

b. Olema Creek Drainage

There are seven pastures on NPS land directly adjacent to Olema Creek (Figure 2). The Olema Flat Pasture is the largest and furthest downstream (closest to the confluence with Lagunitas Creek). Olema Creek has jumped its banks and flowed through this 36 hectare pasture. According to NPS, this condition is expected to continue, as Olema Creek seeks to return to its historical floodplain. When the pasture floods, water temperatures are high due to the lack of shade. Hiding cover for fish is mostly absent. Loss of aquatic habitat would occur if Olema Creek were dredged to prevent the pasture from flooding. NPS has permanently discontinued the permit for use of this pasture (NPS 2003b) and begun floodplain restoration actions described below in the "Environmental Baseline" section of this opinion. These restoration actions (planting the field with native vegetation and monitoring for success) are expected to continue as part of the proposed project.

Next upstream is Front Field pasture. The north corner of this pasture is opposite Olema Flat and frequently inundated by Olema Creek flood waters. Livestock will be mostly excluded from this area of the pasture although a fenced corridor will remain to allow the rancher to move livestock when necessary. NPS will either implement restoration actions or allow Olema Creek to naturally reclaim this area. Further upstream, the Olema Creek channel is more incised and an extensive floodplain either does not exist, or would be difficult to re-establish with livestock exclusion and riparian plantings alone. Fencing setbacks in most of these pastures appear adequate to NPS to protect most riparian functions in the short term. A livestock pasture in this area called Pittum Field, will be retired from grazing and allowed to naturally revegetate. Pittum Field is mostly 60-90 meters wide and is bisected by two intermittent drainages. No adequate buffers could be established that would provide a useable grazing area.

Some of the pastures along Olema Creek that will not be retired from grazing currently have livestock exclusion fencing that is between three to nine meters from the top of the creek's banks. These distances have been judged by NPS as insufficient to promote long term shade and sediment buffering. NPS and the ranchers will move these fences further back from the creek. In Home Flat[2] pasture, all fences will be at least 15 meters from Olema Creek. The resulting riparian area from which cattle are excluded will range from 15 to 23 meters wide, with some areas of 30 meters of exclusion width (tributary junctions). An intermittent tributary (Water Tank Gulch) to Olema Creek that runs along the north end of this pasture will be fenced from 6 to 15 meters from the top of its bank. In addition to the floodplain exclusion fencing in Front Field, the rest of this pasture will have fencing ranging from 15 to 30 meters back from Olema Creek. Olema pasture, opposite the town of Olema, is similar to Home Flat pasture with respect to riparian fencing. Fencing will be set back from the creek 15 to 23 meters with some areas of 30 meter exclusion.

Quarry Gulch (Figure 1), an Olema Creek tributary, currently has cattle access along 800 meters of stream. Access is limited to the late spring through early fall to prevent impacts during the wet season. Approximately half of the channel (400 meters) lacks riparian cover. This section was planted with willow in 2002. Cattle will be excluded by electric fencing from this area as needed to protect current and future plantings, and promote natural colonization by riparian plants.

Horses have direct access to Five Brooks tributary, but appear to have relatively light impacts on stream banks and riparian vegetation, according to NPS. The trail to the creek crossing used to access the pasture can become muddy and prone to erosion if used in the winter. NPS will fence the more accessible portions of the creek in 2003. Approximately 240 meters will be fenced and fencing will be a minimum of 15 meters back from the channel banks. NPS will also restrict use of the crossing to the dry season or improve the trail and crossing to control erosion.

Cattle also have access to 250 meters of Boundary Gulch and 200 meters of Horse Camp Gulch. While some limited spawning habitat is available, these tributaries are intermittent and no salmonid spawning has been observed in the 5 years prior to 2002. NPS monitoring found coho salmon in Horse Camp Gulch in 2002 (NPS 2002d). The coho salmon were found in a portion of the creek that is fenced off from cattle access. NPS is working with the Tomales Bay association to increase the fencing setbacks in this area to a minimum of 15 meters. Cattle impacts upstream in the unfenced area of Horse Camp Gulch are moderated by the provision of upland water and fencing directly adjacent to the other side of the creek opposite the pasture, preventing cattle crossing of the creek (NPS 2002d).

Cattle have access to 1,000 meters of potential spawning and rearing habitat in the John West Fork (Blue Line Creek) tributary above the current exclosure. NPS plans to monitor riparian conditions in this area to determine if habitat value could be improved by excluding or reducing

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[2] At Home Flat pasture Olema Creek is only bounded by pasture on its east side; to the west are extensive woodlands dominated by mature hardwood trees.

cattle use. A water trough adjacent to the current exclosure is about 27 meters from the creek and sediment from heavy livestock use of the area is likely to flow into the creek as riparian cover in this low lying area is sparse, and the area appears to drain directly to the creek. Willow and wetland plant species will be used to revegetate the fenced buffer (40 feet) between the watering trough and the creek.

Cattle also have access to portions of other Olema Creek tributaries (Randall Gulch, N. Hagmaier Gulch, S. Hagmaier Gulch, Eucalyptus Gulch, and Headwaters Gulch). The two Haigmaier forks and Eucalyptus Gulch are fairly heavily impacted by cattle because they have crossings that experience heavy use. Headwaters Gulch is less impacted by cattle because while they have access to the creek, there is no access to land across it. All these creeks are intermittent (NPS 2002d). Previously, NPS had proposed that repeated results above 50 milligrams per liter (mg/L) would trigger further action as described above to reduce sediment impacts. Based on additional evaluation of PRNS data, NPS is currently proposing 315 NTU as a trigger for further NPS action.

Currently, a seasonal grazing rotation is be developed and will be implemented in Randall Gulch once off channel water is supplied. Experimental plantings will be utilized to determine what riparian species are most appropriate to these intermittent tributaries. Based on the results, the other tributaries in this area will receive similar treatments.

c. Drakes Estero Drainages

Schooner Creek has 680 meters of unfenced pasture. Upland water sources are provided, and riparian vegetation is dense (willows and wetland plants) and appears relatively undisturbed by cattle. NPS had previously proposed that if monitoring at the mouth of Schooner Creek shows suspended solids repeatedly in excess of 50 mg/L, fencing will be extended upstream. As above, NPS is currently proposing that this threshold be set at 315 NTU.

Livestock have access to approximately 2 kilometers of Home Ranch Creek. Horses currently are seasonally grazed from April until December along 800 meters. Offstream water is available, and riparian vegetative cover is increasing in this area. Upstream, 8-12 bulls are kept on pastures along 1,200 meters of creek from April until December. Access to the creek is limited by steep banks. The most downstream pasture gets short term use by up to 25 heifers in the spring and fall. NPS will shift cattle away from the creek by developing alternate water sources in each pasture and excluding cattle access. These protection measures will be incorporated into the permit when it is renewed in 2004.

d. Headwaters

Most ranches in the Lagunitas and Olema Creek drainages have upland water that has been developed to minimize cattle use of tributaries for water supplies. Upland water development on two ranches will be improved by the NPS. In the Point Reyes streams cattle have no access to the headwaters of Home Ranch Creek (a designated wilderness area), slight impacts on Schooner Creek headwaters due to upland water sources (an impoundment downstream also likely limits the effects of cattle in the headwaters on downstream resources), and dense riparian vegetation in other areas.

e. Roads

NPS has identified four roads that may affect salmonid streams. Cattle are using one road to access John West Fork Creek. Fencing has been extended to eliminate cattle use of this road. A road on Lupton Ranch that runs up the bed of Parsons Gulch, a minor tributary to Olema Creek, will be moved out of the creek. The creek will then be re-contoured and planted with willows. A road running up Devil's Gulch currently has a failing culvert which, along with the road, is contributing sediment to the creek. NPS is working with Marin County within a road maintenance memorandum of understanding (MOU) to address this situation. A road that crosses Cheda Creek is in need of maintenance and repair to prevent erosion to Cheda Creek, a tributary to Olema Creek. The road MOU with Marin County will be used to set maintenance and repair standards for this road. NPS will continue to monitor ranch roads for potential erosion sites. Ranchers are required to maintain roads to prevent erosion throughout their ranches.

f. Vacant land

Where ranches are vacant, NPS will prepare comprehensive ranch management plans to protect salmonids while preserving the agricultural character of western Marin County.

D. Action Area

The action area for this project is the Lagunitas Creek watershed and tributary basins of Drakes Estero directly adjacent to, and downstream of, the livestock operations under lease with NPS (Figure 1). This area includes Lagunitas Creek from its mouth upstream to the tributary Devils Gulch, Olema Creek from its mouth upstream to portions of its headwaters, and Home Ranch and Schooner Creeks, tributaries to Drakes Estero. In each case, the action area is limited to the ranch lands in these watersheds and all streams which drain from them downstream to Tomales Bay or Drakes Estero. The action area also includes a small amount of NPS grazing lease lands that drain to Bolinas Lagoon or the Pacific Ocean from Bolinas Mesa. The watercourses on these lands do not contain listed salmonids (NPS 2002d), but are part of coho salmon critical habitat.

III. DESCRIPTION AND STATUS OF THE SPECIES/CRITICAL HABITAT

The proposed project occurs in the Lagunitas Creek watershed as well as tributaries of Drakes Estero on Point Reyes Peninsula and a few other small coastal tributaries. These waters are known to contain[3] Federally listed threatened CCC coho salmon, CCC steelhead and CCC coho salmon critical habitat. In addition, adult and juvenile Chinook salmon and have been observed in Lagunitas Creek in recent years (Eric Ettlinger, Marin Municipal Water District, personal communication Jan. 6, 2003). These Chinook salmon may be part of the CC Evolutionarily Significant Unit (ESU), due to the proximity of Lagunitas Creek to the range of this ESU. This opinion analyzes the effect of the proposed project on the following species and critical habitats:

- Steelhead (*Oncorhynchus mykiss*)- Central California Coast (CCC) ESU- Threatened (62 FR 43937, August 18, 1997).
- Coho salmon (*Oncorhynchus kisutch*)- Central California Coast (CCC) ESU - Threatened (61 FR 56138, Oct. 31, 1996).
- Chinook salmon (*Oncorhynchus tshawytscha*) California Coastal (CC) ESU- Threatened (64 FR 50394; September 16, 1999).
- Designated Critical Habitat for the Coho salmon Central California Coast (CCC) ESU - (64 FR 24049, May 5, 1999).

A. Species Description

1. Steelhead

Steelhead young usually rear in freshwater for one to three years (but they have been found rearing in freshwater for up to 7 years) before migrating to the ocean as smolts. Migration to the ocean usually occurs in the spring, where they may remain for one to five years (two to three years is most common) before returning to their natal streams to spawn (Busby *et al.* 1996). The distribution of steelhead in the ocean is not well known. Coded wire tag recoveries indicate that most steelhead tend to migrate north and south along the continental shelf (Barnhart 1986).

Only "winter" steelhead are found in the CCC steelhead ESU. The timing of upstream migration is correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. The minimum stream depth necessary for successful upstream migration is 13 centimeters (cm) (Thompson 1972). The preferred water velocity for upstream migration is in the range of 40-90 centimeters per second (cm/s), with a maximum velocity, beyond which upstream migration is not likely to occur, of 240 cm/s (Thompson 1972, Smith 1973). Steelhead may spawn more than one season before dying (iteroparity), in contrast to other species of the *Oncorhynchus* genus. Although one-time spawners are the great majority, Shapovalov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Among repeat spawners, the representation of each group declines as the number of spawnings increases. There is a sharp decline in numbers from second spawners (15.0 percent) to third spawners (2.1 percent). Fish spawning four or more times are rare (0.1 percent).

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[3]In some cases specific creeks may not currently contain coho salmon. Also, there are two small grazing lease areas that are part of coho salmon critical habitat, but do not currently contain salmonids.

Because rearing juvenile steelhead reside in freshwater all year, adequate flow and temperature are important to the population at all times (California Department of Fish and Game (CDFG) 1997). Emigration appears to be more closely associated with size than age. In Waddell Creek, Shapovalov and Taft (1954) found steelhead juveniles migrating downstream at all times of the year with the largest numbers of age 0+ and yearling steelhead moving downstream during spring and summer. Smolts can range from 14-21 cm in length. Emigration timing is similar to coho salmon.

Steelhead spawn in cool, clear streams featuring suitable water depth, gravel size, and current velocity. Mainstems, tributaries, and intermittent streams may be used for spawning (Everest 1973, Barnhart 1986). Reiser and Bjornn (1979) found that gravels of 1.3-11.7 cm in diameter and flows of approximately 4 cubic feet per second (cfs) were preferred by steelhead. The survival of embryos is reduced when fines of less than 6.4 millimeters (mm) comprise 20-25 percent of the substrate. Studies have shown a higher survival of embryos when intragravel velocities exceed 20 centimeters per hour (cm/hr) (Coble 1961, Phillips and Campbell 1961). The number of days required for steelhead eggs to hatch is inversely proportional to water temperature and varies from about 19 days at 15.6 degrees Celsius (°C) to about 80 days at 5.6°C. Fry typically emerge from the gravel two to three weeks after hatching (Barnhart 1986).

Upon emerging from the gravel, fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Older fry establish territories which they defend. Cover is an important habitat component for juvenile steelhead, both as velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles, and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. In winter, they become inactive and hide in any available cover, including gravel or woody debris.

Water temperature influences the growth rate, population density, swimming ability, ability to capture and metabolize food, and ability to withstand disease of these rearing juveniles (Barnhart 1986, Bjornn and Reiser 1991). Rearing steelhead juveniles prefer water temperatures of 7.2-14.4°C and have an upper lethal limit of 23.9°C. They can survive up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Research by Werner *et al.*, 2001, has documented correlations between stream temperature, size of juveniles, and heat shock protein expression. Heat shock proteins are involved in cellular protein homeostasis and repair, and provide a mechanism for organisms to reduce the deleterious effects of heat stress. This physiological coping mechanism not only helps to define a range of deleterious temperatures, but demonstrates the metabolic (and by inference - survival) costs of exposure to those temperatures.

During winter when water temperatures drop juvenile steelhead often exhibit hiding behavior by occupying areas of low water velocity at stream margins under larger substrate particles (10-25 cm). This may be an energy conservation strategy for the species (Bustard and Narver 1975).

Dissolved oxygen (DO) levels of 6.5-7.0 mg/l affected the migration and swimming performance of steelhead juveniles at all temperatures (Davis *et al.* 1963). Reiser and Bjornn (1979) recommended that DO concentrations remain at or near saturation levels with temporary reductions no lower than 5.0 mg/l for successful rearing of juvenile steelhead. Low DO levels decrease the rate of metabolism, swimming speed, growth rate, food consumption rate, efficiency of food utilization, behavior, and ultimately the survival of the juveniles.

During rearing, suspended and deposited fine sediments can directly affect salmonids by abrading and clogging gills, and indirectly cause reduced feeding, avoidance reactions, destruction of food supplies, reduced egg and alevin survival, and changed rearing habitat (Reiser and Bjornn 1979). Bell (1973) found that silt loads of less than 25 mg/l permit good rearing conditions for juvenile salmonids.

2. Coho Salmon

The life history of the coho salmon in California has been well documented by Shapovalov and Taft (1954) and Hassler (1987). In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple 3-year life cycle (Shapovalov and Taft 1954, Hassler 1987). Adult salmon typically begin the freshwater migration from the ocean to their natal streams after heavy late-fall or winter rains breach the sand bars at the mouths of coastal streams (Sandercock 1991). Delays in river entry of over a month are not unusual (Salo and Bayliff 1958, Eames *et al.* 1981). Migration continues to March, generally peaking in December and January, with spawning occurring shortly after returning to the spawning ground (Shapovalov and Taft 1954).

Coho salmon are typically associated with small to moderately-sized coastal streams characterized by heavily forested watersheds; perennially-flowing reaches of cool, high-quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates.

Female coho salmon choose spawning sites usually near the head of a riffle, just below a pool, where water changes from a laminar to a turbulent flow and there is small to medium gravel substrate. The flow characteristics of the location of the redd usually ensure good aeration of eggs and embryos, and flushing of waste products. The water circulation in these areas also facilitates fry emergence from the gravel. Preferred spawning grounds have nearby overhead and submerged cover for holding adults; water depth of 10-54 cm; water velocities of 20-80 cm/s; clean, loosely compacted gravel (1.3-12.7 cm diameter) with less than 20 percent fine silt or sand content; cool water (4-10°C) with high dissolved oxygen (8 mg/l); and an intergravel flow sufficient to aerate the eggs. The lack of suitable gravel often limits successful spawning in many streams.

Each female builds a series of redds, moving upstream as she does so, and deposits a few hundred eggs in each. Fecundity of coho salmon is directly proportional to female size; coho salmon may deposit from 1000-7600 eggs (reviewed in Sandercock 1991). Briggs (1953) noted a dominant male accompanies a female during spawning, but one or more subordinate males also may engage in spawning. Coho salmon may spawn in more than one redd and with more than one partner (Sandercock 1991). Coho salmon are semelparous, *i.e.*, they die after spawning. The female may guard a nest for up to two weeks (Briggs 1953).

The eggs generally hatch between 4 to 8 weeks, depending on water temperature. Survival and development rates depend on temperature and dissolved oxygen levels within the redd. According to Baker and Reynolds (1986), under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent. McMahon (1983) found that egg and fry survival drops sharply when fines make up 15 percent or more of the substrate. The newly-hatched fry remain in the gravel from two to seven weeks until emergence from the gravels (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, they often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). Chapman and Bjornn (1969) determined that larger parr tend to occupy the head of pools, with smaller parr found further down the pools. As the fish continue to grow, they move into deeper water and expand their territories until, by July and August, they are in the deep pools. Juvenile coho salmon prefer well shaded pools at least 1 meter (m) deep with dense overhead cover; abundant submerged cover composed of undercut banks, logs, roots, and other woody debris; preferred water temperatures of 12-15°C (Brett 1952, Reiser and Bjornn 1979), but not exceeding 22-25°C (Brungs and Jones 1977) for extended time periods; dissolved oxygen levels of 4-9 mg/l; and water velocities of 9-24 cm/sec in pools and 31-46 cm/sec in riffles. Water temperatures for good survival and growth of juvenile coho salmon range from 10-15°C (Bell 1973, McMahon 1983). Growth is slowed considerably at 18°C and ceases at 20°C (Stein *et al.* 1972, Bell 1973).

Preferred rearing habitat has little or no turbidity and high sustained invertebrate forage production. Juvenile coho salmon feed primarily on drifting terrestrial insects, much of which are produced in the riparian canopy, and on aquatic invertebrates growing in the interstices of the substrate and in the leaf litter in the pools. As water temperatures decrease in the fall and winter months, fish stop or reduce feeding due to lack of food or in response to the colder water, and growth rates slow down. During December-February, winter rains result in increased stream flows and by March, following peak flows, fish again feed heavily on insects and crustaceans, and grow rapidly.

In the spring, as yearlings, juvenile coho salmon undergo a physiological process, or smoltification, which prepares them for living in the marine environment. They begin to migrate downstream to the ocean during late March and early April, and out migration usually peaks in mid-May, if conditions are favorable. Emigration timing is correlated with peak upwelling currents along the coast. Entry into the ocean at this time facilitates more growth and, therefore, greater marine survival (Holtby *et al.* 1990). At this point, the smolts are about 10-13 cm in length. After entering the ocean, the immature salmon initially remain in nearshore waters close to their parent stream. They gradually move northward, staying over the continental shelf (Brown *et al.* 1994). Although they can range widely in the north Pacific, movements of coho salmon from California are poorly known.

3. Chinook salmon

Chinook salmon is the largest member of *Oncorhynchus*, with adults weighing more than 120 pounds having been reported from North American waters (Scott and Crossman 1973, Eschmeyer *et al.* 1983, Page and Burr 1991). Chinook salmon exhibit two main life history strategies: ocean-type fish and river-type fish (Healy 1991). Ocean-type fish typically are fall or winter-run fish that enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few weeks of freshwater entry. Their offspring emigrate shortly after emergence from the redd (Healey 1991). River-type fish are typically spring or summer-run fish that have a protracted adult freshwater residency, sometimes spawning several months after entering freshwater. Progeny of river-type fish frequently spend one or more years in freshwater before emigrating.

The low flows, high temperatures, and sand bars that develop in smaller coastal rivers in California during the summer months favor an ocean-type life history (Kostow 1995). With this life history, smolts typically outmigrate as subyearlings during April through July (Myers *et al.* 1998). The ocean-type Chinook salmon in California tend to use estuaries and coastal areas for rearing more extensively than river-type Chinook salmon. The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions.

Chinook salmon in the CC Chinook salmon ESU generally remain in the ocean for two to five years (Healey 1991), and tend to stay along the California and Oregon coasts. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return, and are referred to as jacks (males) and jills (females). Typically spawning occurs in the lower reaches of rivers and tributaries at elevations of 200 to 1000 feet.

Egg deposition must be timed to ensure that fry emerge during the following spring at a time when the river or estuary productivity is sufficient for juvenile survival and growth. Adult female Chinook salmon prepare redds in stream areas with suitable gravel composition, water depth, and velocity. Spawning generally occurs in swift, relatively shallow riffles or along the edges of fast runs at depths greater than 24 cm. Optimal spawning temperatures range between 5.6-13.9°C. Redds vary widely in size and location within the river. Preferred spawning substrate is clean, loose gravel, mostly sized between 1.3-10.2 cm (Allen and Hassler 1986). Embryo survival is strongly correlated with the proportion of substrates in the range of 0.85 mm to 9.50 mm. Survival decreases significantly as the percent of 0.85 mm material increases beyond 10 percent and as 9.50 mm material increases beyond 25 percent (Tappel and Bjornn 1983). Reiser and White (1988) indicated dramatic decreases in survival with fines (<0.84 mm) greater than 10 percent. Geometric mean particle size diameters of 8 mm to 15 mm also result in a marked reduction in survival of Chinook salmon embryos (Shirazi and Seim 1981, Tappel and Bjornn 1983). Gravels are unsuitable for egg and alevin survival when they have been cemented with clay or fines or when sediments settle out onto redds, reducing intergravel percolation (Allen and Hassler 1986). Minimum intergravel percolation rate depends on flow rate, water depth, and water quality. The percolation rate must be adequate to maintain oxygen delivery to the eggs and remove metabolic wastes. After depositing eggs in a redd, adult Chinook salmon guard the redd from 2 to 4 weeks before dying (Allen and Hassler 1986).

Chinook salmon eggs incubate for 90 to 150 days, depending on water temperature. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Maximum survival of incubating eggs and pre-emergent fry occurs at water temperatures between 5.6-13.3°C, with a preferred temperature of 11.1°C. Fry emergence begins in December and continues into mid-April (Leidy and Leidy 1984). Emergence can be hindered if the interstitial spaces in the redd are not large enough to permit passage of the fry. In laboratory studies, Bjornn and Reiser (1991) observed that Chinook salmon and steelhead fry had difficulty emerging from gravel when fine sediments (6.4 mm or less) exceeded 30-40 percent by volume.

After emergence, Chinook salmon fry seek out areas behind fallen trees, back eddies, undercut banks and other areas of bank cover (Everest and Chapman 1972). As they grow larger, their habitat preferences change. Juveniles move away from stream margins and begin to use deeper water areas with slightly faster water velocities, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. Fish size appears to be positively correlated with water velocity and depth (Chapman and Bjornn 1969, Everest and Chapman 1972). Optimal temperatures for both Chinook salmon fry and fingerlings range from 12-14°C, with maximum growth rates at 12.8°C (Boles 1988). Chinook feed on small terrestrial and aquatic insects, and aquatic crustaceans. Cover, in the form of rocks, submerged aquatic vegetation, logs, riparian vegetation, and undercut banks provide food, shade, and protect juveniles from predation.

B. Critical Habitat Description

In designating critical habitat, NOAA Fisheries considers the following requirements of the species: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NOAA Fisheries also focuses on known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation.

Defined critical habitat for CCC coho salmon is: "all waterways, substrate, and adjacent riparian zones [in an ESU] below longstanding, naturally impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years)" (64 FR 24049). NOAA Fisheries has excluded from critical habitat designation all tribal lands in northern California and areas that are above certain dams which block access to historical habitats of CCC coho salmon.

CCC coho salmon critical habitat corresponds to all the water, river bed and bank areas, and riparian areas within the ESU boundaries except as noted above. Waterways include estuarine areas and tributaries. Riparian areas are defined as "the area adjacent to a stream that provides the following functions: shade, sediment, nutrient, or chemical regulation, stream bank stability, and input of large woody debris (LWD) or organic matter" (64 FR 24055). In other words, riparian areas are those areas that produce physical, biological, and chemical features that help to create stream habitat for salmonids. Primary constituent elements for steelhead and coho salmon critical habitat (general, non-site specific criteria for properly functioning habitat) can be found in the species description above.

C. Range-Wide (ESU) Status and Trends of Species and Critical Habitat

1. Steelhead

Few estimates of historic (pre-1960s) abundance specific to this ESU are available: an average of about 430 adult steelhead in Waddell Creek in the 1930s and early 1940s (Shapovalov and Taft 1954), and 20,000 steelhead in the San Lorenzo River before 1965 (62 FR 43937).

In the mid-1960s, 94,000 adult steelhead were estimated to spawn in the rivers of this ESU, including 50,000 fish in the Russian River and 19,000 fish in the San Lorenzo River (Busby *et al.* 1996). The Russian River, the largest watershed in the ESU, once boasted steelhead runs ranked as the third largest in California behind only the Klamath and Sacramento rivers. Difficulties in assessing current run sizes in both rivers include the inability to distinguish the relative proportions of hatchery and wild fish. Based on the best data available NOAA Fisheries has estimated that Russian River steelhead currently number about 7,000 fish, including hatchery fish which are currently not considered part of the listed population (Busby *et al.* 1996, NOAA Fisheries 1997). San Lorenzo River steelhead are thought to number approximately 1,000 to 2,500 fish (Alley 2000), including hatchery fish, which are considered part of the listed population in this river. These estimates suggest that total abundance in these two rivers has declined to less than 15% of their abundance in the 1960s.

Abundance estimates for smaller coastal streams in the ESU indicate low but stable levels (NOAA Fisheries 1997), with recent estimates for several streams (Lagunitas Creek, Waddell Creek, Scott Creek, San Vincente Creek, Soquel Creek, and Aptos Creek) of individual run sizes of 500 fish or less (62 FR 43937).

Presence/absence data show that in a subset of streams sampled in the central California coast region, most contain steelhead (NOAA Fisheries 1997). Of streams in the ESU for which there is current presence/absence data on steelhead, 218 of 264 streams currently support steelhead (including the Russian River). Seventy-eight of those streams (36%) occur in San Francisco Bay (61 FR 56138).

Overall, the abundance of the CCC ESU has declined precipitously, from an estimated 94,000 returning adults in the 1960's to estimates between less than 5,350 in recent times (Busby *et al.* 1996, NOAA Fisheries 1997). These numbers represent over a 94% decline in the population of steelhead spawning in the ESU. Small and declining run sizes within the ESU are a serious concern, because small populations are at a greater risk of extirpation and extinction (Pimm *et al.* 1988). Small populations are more vulnerable to demographic and environmental fluctuations than are larger populations (Gilpin and Soule 1986, Pimm *et al.* 1988), while each small population also acts as a buffer against extinction of the species. The species' relatively broad distribution throughout the CCC ESU is a positive indicator (62 FR 43937) because species with broad distributions may allow a species to avoid environmental fluctuations and stochastic events as a whole (Pimm *et al.* 1988), even if they suffer local extirpation. In the Status Review Update for West Coast Steelhead from Washington, Idaho, Oregon, and California, NOAA Fisheries (1997) concluded that steelhead in the CCC ESU remain likely to become endangered in the foreseeable future.

2. Coho salmon

A comprehensive review of estimates of historic abundance, decline and present status of coho salmon in California is provided by Brown *et al.* (1994). They estimated that coho salmon annual spawning population in California ranged between 200,000 and 500,000 fish in the 1940s, which declined to about 100,000 fish by the 1960s, followed by a further decline to about 31,000 fish by 1991, of which 57 percent were artificially propagated. The other 43 percent (13,240) were natural spawners, which included naturally-produced, wild fish and naturalized (hatchery-influenced) fish. Brown *et al.* (1994) cautioned that this estimate could be overstated by 50 percent or more. Of the 13,240, only about 5,000 were naturally-produced, wild coho salmon without hatchery influence, and many of these were in individual stream populations of less than 100 fish each. In summary, Brown *et al.* (1994) concluded that the California coho salmon population had declined more than 94 percent since the 1940s, with the greatest decline occurring since the 1960s.

NOAA Fisheries' status review (Weitkamp *et al.* 1995) concluded that all coho salmon stocks south of Punta Gorda were depressed relative to past abundance, but there were limited data to assess population numbers or trends. Recent population estimates vary from approximately 600 to 5,500 adults (Brown *et al.* 1994). Brown *et al.* (1994) estimated average annual coho salmon spawning escapement for the period from the early 1980s through 1991 was 6,160 naturally spawning fish and 332 artificially propagated fish. Of 186 streams in the range of the CCC coho salmon ESU identified as having historic accounts of adult coho salmon, recent data exist for 133 streams. Of these 133 streams, 62 streams have recent records of occurrence of adult coho salmon and 71 streams no longer maintain coho salmon spawning runs (61 FR 56138).

The main stocks in this region have been heavily influenced by hatcheries, and there are apparently few native coho salmon left. The native populations that remain are very small and sometimes fragmented geographically from one another. Fragmentation increases the isolation of these populations, and reduces the chance that they can contribute to each other's fitness via interbreeding. Each small population may not have enough fish to survive natural and human caused environmental changes that will affect the number of fish completing the species life cycle. Each small population is unlikely to maintain genetic diversity (putting the populations at risk for inbreeding depression and fixation of deleterious mutations). In addition, many of the source populations needed to support the species overall numbers and geographic distribution have likely been lost. This suggests that natural populations are not self-sustaining and will continue to decline.

The NOAA Fisheries Southwest Fisheries Science Center completed a revised status review update for the CCC ESU of coho salmon on April 12, 2001 (NOAA Fisheries 2001). The review found that the limited data available strongly suggest that the ESU's population continues to decline. Declines are now also observed in several stream sub-populations previously considered stable. The review concludes that the CCC ESU is presently in danger of extinction and the condition of CCC coho salmon populations in this ESU is worse than indicated by previous reviews.

3. <u>Chinook salmon</u>

Although northern coastal California streams support small, sporadically monitored populations of fall-run Chinook salmon, estimates of absolute population abundance are not available for most populations encompassing this ESU (Myers *et al.* 1998). Trends in fall Chinook salmon abundance in those California streams that are monitored are mixed; in general, the trends tend to be more negative in streams that are farther south along the coast.

While population numbers are low and some populations in this ESU are in decline, the overall ESU remains well distributed throughout its range. In addition, escapement data from recent years shows an increase in returns to some streams in the ESU. These factors suggest that the overall ESU population, while at risk, is not in immediate danger of loss of genetic diversity, loss of source sub-populations (that support the long term viability of other sub-populations), and may be able to withstand some natural and human caused environmental changes.

More recent information for the status of CC Chinook salmon (NOAA Fisheries 2003a) continues to support this conclusion:

> "No information exists to suggest new risk factors, or substantial effective amelioration of risk factors noted in the previous status reviews save for recent changes in ocean

conditions. Recent favorable ocean conditions have contributed to apparent increases in abundance and distribution for a number of anadromous salmonids, but the expected persistence of this trend is unclear."

4. Factors Affecting Salmonid Populations: Changes to Habitat and Other Impacts

a. Status of Habitat Including Coho Salmon Critical Habitat

The condition of CCC coho salmon, CC Chinook salmon, and CCC steelhead habitat, including CCC coho salmon critical habitat, has been degraded from conditions known to support viable salmonid populations. For these listed species, NOAA Fisheries determined that present depressed population conditions were the result of following human induced factors (among others) affecting habitat and critical habitat[4]: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals and unscreened diversions for irrigation.

Numerous studies have demonstrated that land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation have significantly degraded salmonid habitat quantity and quality in these ESUs. Impacts of concern include alteration of stream bank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and LWD, degradation of water quality, removal of riparian vegetation resulting in increased stream bank erosion, increases in erosion entry to streams from upland areas, loss of shade (higher water temperatures) and loss of nutrient inputs (64 FR 24049, 62 FR 43937, NOAA Fisheries 1996, NOAA Fisheries 1998, As cited in 61 FR 56138: CDFG 1965, Bottom *et al.* 1985, California Advisory Committee on Salmon and Steelhead Trout 1988, CDFG 1991, Nehlsen *et al.*, 1991, California State Lands Commission 1993, Wilderness Society 1993, Bryant 1994, Botkin *et al.* 1995, Brown *et al.* 1994, McEwan and Jackson 1996).

Depletion and storage of natural river and stream flows have drastically altered natural hydrologic cycles in many of the streams in these ESUs. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage, stranding of fish from rapid flow fluctuations, entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids (64 FR 24049, 62 FR 43937, NOAA Fisheries 1996, NOAA Fisheries 1998, As cited in 61 FR 56138: California Advisory Committee on Salmon and Steelhead Trout 1988, CDFG 1991, CBFWA 1991a, Bergren and Filardo 1991, Palmisano *et al.* 1993, Reynolds *et al.* 1993, Chapman *et al.* 1994, Cramer *et al.* 1995, Botkin *et al.* 1995).

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[4]Other factors, such as over fishing and artificial propagation, have also contributed to the current population status of these species. All these human induced factors have exacerbated the adverse effects of natural environmental variability from such factors as drought and poor ocean conditions.

b. Critical Habitat trend

In listing these species as threatened under the ESA and designating CCC coho salmon critical habitat, NOAA Fisheries determined that the existing Federal and State regulatory mechanisms have not been adequately implemented to prevent the habitat degradation noted above (see for example, 61 FR 56143), due to a variety of factors. As Northern California continues to grow, both in population and economic fortune, the pace of many of the land use activities identified above is expected to increase. The State has made some effort to improve the implementation of State regulations for protecting salmonids and their habitats since the Federal listings. However, few, if any, State regulatory programs currently in place are adequate to prevent continued habitat degradation from urbanization, water use, logging, agriculture, road construction, mining, and recreation.

As each species was listed and CCC coho salmon critical habitat designated, the provisions of the Federal ESA took effect to prevent Federal actions from authorizing, funding, or carrying out actions that would jeopardize the long term survival and recovery of the species, and/or taking actions that would adversely modify critical habitat. In addition, both the State and Federal government are providing funding for habitat restoration projects in these, and other, ESUs. However, Federal agency actions affect only a subset of the habitat areas in each ESU. Funding for restoration has been increased since the late 1990s, but it may not affect a significant portion of degraded habitats for several decades. Thus, it is unlikely that current State management of land use, Federal agency responsibilities under the ESA, and State/Federal restoration efforts will reverse the overall trend of habitat degradation in each ESU, including the degradation of coho salmon critical habitat, in the near future.

D. Existing Likelihood of Survival and Recovery

These species have suffered significant population declines range-wide. Their declines have been attributed to long-standing human induced factors that exacerbate the adverse effects of natural environmental variability (61 FR 56138, 62 FR 43937, 64 FR 24049, 65 FR 7764). The outlook for CCC coho is especially grim based on current population status and condition of critical habitat. The CCC steelhead population is in better condition than CCC coho salmon because of better distribution in smaller coastal streams and some apparently stable populations. Similarly, CC Chinook are also likely more resilient than CCC coho salmon due to better distribution throughout their range. However, the poor condition of many freshwater habitat areas remains a serious risk to the survival and recovery of these species.

IV. ENVIRONMENTAL BASELINE

Lagunitas Creek flows from Mt. Tamalpais to Tomales Bay in Marin County, California. Four reservoirs (all upstream of the action area), Lagunitas Dam (1872), Alpine Dam (1918), Bon Tempe Dam (1948), and Peters Dam (1954), have been constructed in the first eight miles downstream from its headwaters. A fifth reservoir (also outside of the action area) is located on Nicasio Creek, a tributary of Lagunitas Creek downstream of Peters Dam. The climate is Mediterranean with a mean annual rainfall range of 30 to 55 inches. Soils and slopes are erodible and unstable. Lagunitas Creek flows into Tomales Bay at the San Andreas Fault (Marin Municipal Water District (MMWD) 1997, NPS 2001b, MMWD 1979). The action area is located downstream of Peters Dam and includes most of the Olema Creek watershed (Figure 1).

Olema Creek flows northwest along the San Andreas Fault, joining Lagunitas Creek in the estuarine zone of Tomales Bay. A 300 to 460 meter ridgeline (Inverness Ridge) separates Olema Creek from the rest of Point Reyes National Seashore to the west. To the east of Olema Creek, Bolinas Ridge separates this drainage from the Lagunitas Creek mainstem. On the other side of Inverness Ridge, the Point Reyes peninsula has a limited drainage area but a number of perennial creeks. Schooner and Home Ranch Creek, which drain to Drakes Estero, are known to contain steelhead (NPS 2001).

Approximately 91 percent of precipitation in the action area occurs between October and March. The ridgeline to the west of Olema Creek creates distinct precipitation zones. The peninsula receives an average of 25 inches of rain per year while the Olema valley receives up to an average of 40 inches. Air temperatures range between 32° and 4°C and fog is common during the summer (NPS 2001b).

A. Status of Listed Species Within and Near the Action Area

Within the Lagunitas Creek watershed there are several notable streams: Devil's Gulch, Cheda Creek, and Olema Creek, which historically supported runs of coho salmon and/or steelhead. Each of these streams is wholly or partially within the action area of the proposed project and currently contains salmonids.

CDFG reasons that between 3,000 and 5,000 coho salmon adults returned to spawn in Lagunitas Creek, prior to most of the land and water use changes in the watershed described above (CDFG 1986). Steelhead numbers were probably similar (CDFG 1986). As early as 1892, there were reports of declines in fish abundance within the streams of western Marin County[5]. Quantitative fish resource data from the end of the 19th Century through the first half of the 20th Century are essentially nonexistent. Interviews with former and present fishery managers and long time residents of the basin have been used to describe salmonid populations and trends during this time period. These interviews indicate that salmonid populations in the Lagunitas Creek watershed have been in decline since the beginning of the 20th Century, with large losses occurring until the 1950s (NPS 2001).

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[5] National Park Service archive. Marin Journal. 1892. Marin Trout Streams.

Quantitative data on steelhead and coho populations in Lagunitas Creek and its tributaries, including Olema Creek, have been gathered as early as 1948. However, this early effort was limited to one tributary, Devil's Gulch. More extensive data gathering efforts began in the 1980s and included the mainstem of Lagunitas Creek, Olema Creek, and several other tributaries. Estimation of population sizes and population trends for coho salmon and steelhead are difficult because several different agencies, organizations, and researchers collected this data, resulting in gaps (missing years) and differences in sampling protocols (NPS 2001).

Nevertheless, a variety of abundance and trend estimates have been made for coho salmon and steelhead (both adults and juveniles) (MMWD 1998, Trihey and Associates 1995, Bratovich and Kelly 1988, NPS 2001). NOAA Fisheries agrees with NPS (2001) that the evidence available supports anecdotal evidence of declining coho salmon and steelhead populations in the Lagunitas Creek watershed over the last 50 years (NPS 2001). Current population size estimates are less than 1,000 adults for both species (Busby *et al.* 1996, NPS 2002). Olema Creek, one of the largest tributaries, may currently provide habitat for as much as 20-30% of the salmonids in the drainage (NPS 2001a). NOAA Fisheries has determined that population trends cannot be reliably estimated based on the data available. Redd and juvenile counts done and/or compiled by NPS, NOAA Fisheries, and MMWD in recent years (NPS 2001, NPS 2002, MMWD 2001, MMWD 2001a, NOAA Fisheries 2001) appear to show small, relatively stable numbers of adults. However, a decline in juvenile coho may be occurring in the Lagunitas Creek mainstem and two of its tributaries (Devils Gulch and San Geronimo) (NOAA Fisheries 2001). Both species appear well distributed throughout the mainstem of Lagunitas Creek and Olema Creek in the action area, with use of several tributaries that are large enough to support fish. Much less is known about salmonid populations on the Point Reyes Peninsula. Only steelhead are expected to be present based on the survey information available (NPS 2001).

1. Chinook Salmon

In the Lagunitas Creek watershed, adult Chinook salmon have been observed sporadically over the last decade and in increasing numbers since 2000 (Eric Ettlinger, Marin Municipal Water District, personal communication Jan 6, 2003). During the 1990s, a total of three Chinook salmon adults and two adult carcasses were seen during coho spawner surveys. At least five adult Chinook salmon and three Chinook salmon carcasses were observed in 2000-01. During the 2001-02 spawner surveys, a total of 44 adult Chinook salmon and 28 Chinook salmon redds were observed. More than 30 adult Chinook salmon and 20 Chinook salmon redds were observed in 2002-03 (as of 1/1/03). None of the Chinook salmon spawners were observed to have clipped adipose fins, indicating they may not have been hatchery strays (however, not all Central Valley hatchery fish are marked). Two juvenile Chinook salmon in Lagunitas Creek in late spring 2002 were observed by staff of the San Francisco Regional Water Quality Control Board (Eric Ettlinger, Marin Municipal Water District, personal communication Jan 6, 2003). The increasing frequency of Chinook salmon observations may indicate the development of a self-sustaining Chinook salmon population in the Lagunitas Creek basin, but whether this will persist remains to be seen. Because these fish may be part of the CC Chinook salmon ESU, due to the creek's proximity to the southern boundary of the ESU, NOAA Fisheries is treating them as part of the listed population for the purposes of this consultation.

B. Factors Affecting Species Status and Critical Habitat in the Action Area

1. Habitat Conditions, Including Coho Salmon Critical Habitat

The condition of habitat for salmon and steelhead in the action area, including coho salmon critical habitat, varies from properly functioning conditions in some areas to poor habitat quality in others. Lagunitas Creek has been determined as water quality limited under the Clean Water Act's section 303(d) Water Quality Limited list for sediment, nutrients, and pathogens (NPS 2001b). Stream temperature is also a concern. Summer water temperatures are usually below lethal thresholds for salmonids, but can be high enough to retard growth. It was reported that juvenile salmonids in Lagunitas Creek did not show appreciable growth during the summer of 1984. It is believed that this lack of growth was due to the relatively high summer water temperatures that occurred during this time (Bratovich and Kelly 1988). More recently, NPS has documented water temperatures over the preferred range for salmonids in Olema Creek and one of its tributaries (NPS 2003). In Olema Creek this occurrence was limited to an area where the creek had jumped its banks and was flowing through a pasture (*i.e.*, shade from vegetation was not available).

Habitat assessments conducted by the NPS in the late 1990s noted that the quality of fish habitat ranged from poor to excellent, but on average was in fair condition throughout most of the Olema Creek watershed. These assessments found that fish habitat was limited in some areas by low habitat diversity and complexity, lack of pools and low pool quality, low amounts of LWD[6], inadequate stream flows, low channel complexity, lack of winter habitat, and stream channel sedimentation and embeddedness (NPS 2001a, unpublished). These conditions are likely responsible for the reduced amount of macro-invertebrates (salmonid food) found in Olema Creek and Drakes Estero in 1999 and 2000 (NPS 2001b).

Much of these current conditions are related to the legacy of historical impacts in these watersheds as described below. In some cases, local climate regimes and geology also have a strong influence on the quantity and quality of aquatic habitat for salmonids. For example, Drakes Estero is located on a peninsula of land directly exposed to Pacific storms. Streams are short in length and vegetation growth is limited by weather conditions. The aquatic habitat

[6]Recent information on the function of LWD in coastal California hardwood dominated streams indicates that LWD in these environments does not have the same influence on channel form as in conifer dominated systems (Opperman 2003). The smaller wood in hardwood dominated streams does not usually influence channel morphology and may create few pools. However, it remains important to salmonid habitat by creating cover in pools and along banks (in debris jams stabilized by living trees in the stream), and sites in pools for aquatic invertebrate growth (fish food). Shorter space between pools and cover available for fish was positively correlated with the number of LWD present (Opperman 2003).

typically found in larger, more sheltered coastal streams does not occur here. Olema Creek is located along an earthquake fault, which in combination with unstable and erodible slopes, has likely led to a propensity for high sediment loads in the channel.

The following factors are largely responsible for the condition of aquatic and riparian habitat in the action area. In many cases, these factors either exacerbate natural climate and geologic features or provide further stressors on salmonids in addition to natural conditions.

2. Land Use

European settlement in and near the action area began in the early 1800s, ending Coast Miwok hunting and burning practices. Settlers began large scale livestock grazing and other activities such as logging. A shift to dairy production in late 1800s allowed Marin County to become a State leader in this industry. During the mid-1900s, many dairy operations converted to beef cattle production. NPS began acquiring land in the Olema Valley in the mid 1970s and those dairy operations that had not already done so, converted to beef cattle production (NPS 2001b, NPS 2001a).

Historical logging, agriculture, and grazing activities within the action area have resulted in loss of native perennial grasses and riparian vegetation; soil compaction and loss; hillside trailing and gullying; the incision of swales and meadows; and stream channelization and clean out (NPS 2001b). Sediment inputs have increased and runoff patterns have changed, reducing the ability of the watershed to hold water to filter out and attenuate sediment laden runoff (CDFG 1986, NPS 2001b). The result of these activities, and others, has been a reduction in the quantity and quality of fish habitat from sedimentation, loss of aquatic habitat complexity, and loss of riparian function.

3. Lagunitas Creek Basin - Water Use

The use of dams to impound water in the upper basin has reduced the frequency of sediment flushing flows downstream, resulting in shallowing of pools downstream and sedimentation of riffles (CDFG 1986). Peters Dam on the mainstem of Lagunitas Creek and Seeger Dam on Nicasio Creek do not have fish passage facilities and have defined the extent of anadromous fish movement in the basin since 1954 and 1961, respectively (MMWD 1997, NPS 2001b). These dams have eliminated approximately two-thirds of the historic spawning and rearing habitat for anadromous salmonids within the Lagunitas Creek basin (NPS 2001b). The loss of anadromous fish habitat above these facilities is believed to be one of the most significant reasons for the decline in coho salmon and steelhead populations in the Lagunitas Creek basin (State Water Resources Control Board 1995, NPS 2001b).

The Lagunitas Creek basin is the major source of water for most of Marin County, California. The MMWD supervises and maintains the water distribution system (State Water Resources Control Board 1995, NPS 2001b). Prior to the construction of Peters Dam and Seeger Dam, three other dams were built upstream of Peters Dam. All five dams are part of MMWD's water system for Marin County. Pumps and pipelines connect the reservoirs behind the dams, allowing the water district to transfer water among reservoirs and to Marin County water users (CDFG 1986). Diversion operations were adjusted to improve the condition of fishery resources in Lagunitas Creek in 1982 and again in 1995 (State Water Resources Control Board 1995).

NOAA Fisheries reasons that flows within the Lagunitas Creek mainstem are most strongly influenced by water diversion and seasonal weather patters, and secondarily influenced by land use practices. Olema Creek does not contain major dams for water supplies. Here, flows are likely more influenced by climate and may be influenced by land use practices. Loss of native perennial vegetation, soil compaction, and hillside trailing by cattle can produce abbreviated hydrologic cycles in stream systems (Belskey *et al.* 1999). This altered cycle is characterized by higher peak flows during storm events; a rapid decline in flows during the spring; and a greater propensity for intermittent stream flow during low flow periods. NPS has found that many of the juvenile salmonids that rear in Olema Creek do so in an upstream intermittent section which routinely goes dry, leaving these fish stranded (NPS 2001). It is not known if this is related to historical ranching activities (*e.g.*, clearing vegetation). Mediterranean climates often result in streams that can become intermittent in the summer with or without management impacts.

4. Lagunitas Creek Basin - Urbanization

Development in the Lagunitas Creek basin ranges from single homes to small towns and municipal complexes. In the action area, a small amount of residential development occurs near the towns of Olema and Point Reyes Station. The other main, and larger, concentration of residential development is in the San Geronimo Creek drainage (outside the action area) and includes the towns of Lagunitas, Forest Knolls, San Geronimo, and Woodacre (CDFG 1986).

The limited number of roads, bridges, and residential development located within the Lagunitas Creek watershed has historically been supported by a process of stream channel maintenance. These channel maintenance activities included removal of LWD, armoring of stream banks with rip-rap, construction of gabions and engineered bank stabilization structures, and diking and rechanneling of natural stream channels. Although many of these activities have been minimal since the 1960s, the effects of these activities are still influencing salmonid populations within the basin. In the action area, little urbanization exists and the resulting channel maintenance activities have always been minimal. However, construction of Highway 1 resulted in the re-routing of several small tributaries to Olema Creek into one tributary drainage (Quarry Gulch). The result has been the continued downcutting of this drainage and delivery of sediment to Olema Creek as the channel adjusts to the increase in water (Brannon Ketcham, NPS Hydrologist, personal communication 2003). There are stream crossings in the watershed that are also barriers (complete or partial) to salmonid migration, including at least 7 in the action area (Ross Taylor and Associates 2003). In addition to the impacts caused by the physical manipulation of basin components, development within the stream corridor has likely resulted in periodic impacts to water quality in the form of contaminated runoff from paved lots and roads, and seepage from improperly designed and/or maintained septic systems.

5. Other impacts (non native fish species, fishing, hatcheries, predation, *etc.*)

a. Lagunitas Creek Basin - Fisheries Management Activities

Lagunitas Creek has a poorly documented history of purposeful fish introductions. The CDFG stocked Chinook salmon and eastern brook trout (*Salvelinus fontinalis*) into Lagunitas Creek during 1892 (California Commissioners of Fisheries 1893), and coho salmon and steelhead beginning in 1897 (Schofield 1899). Additional stocking of steelhead and coho salmon has occurred periodically over a number of years and was finally curtailed during the late 1980s. (Stan Griffin, Trout Unlimited, personal communication January 24, 2003).

Reservoirs and ponds within the Lagunitas Creek basin have sustaining populations of several nonnative fish species including common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), and mosquito fish (*Gambusia affinis*) (Brannon Ketcham, NPS, personal communication January 31, 2003; Leslie Ferguson, Regional Water Quality Control Board, personal communication February 5, 2003; Bill Cox, CDFG, personal communication, February 11, 2003)

The non-native fish species reported in the Lagunitas Creek watershed likely entered streams following winter overflow of reservoirs or ponds. Although infrequent observations of some non-native fish species have been reported within the basin, NOAA Fisheries reasons that aquatic habitat conditions are not suitable for these nonnative species to become numerous and well distributed. Nonnative fish species may predate upon or compete with listed salmonids, but these effects are unlikely to have significant impacts on the numbers and distribution of coho salmon and steelhead in the basin due to the limited number and distribution of non-native fish.

Hard *et al.* (1992) provides a thorough discussion of the risks associated with hatchery programs in streams containing ESA-listed salmonids. Hatchery activities can entail both minor short-term and substantial long-term effects - typical effects are ecological or genetic, and may affect the entire ESU. The introduction of eastern brook trout into Lagunitas Creek was unsuccessful. Data are not available to determine if the introduction of other salmonids was successful. The effects of salmonid artificial propagation on Lagunitas Creek stocks are also not known.

Currently all streams in the Lagunitas Creek basin are closed to recreational fishing (California Fish and Game Commission 2003). Therefore, NOAA Fisheries does not expect any effects from fishing.

b. Lagunitas Creek Basin - Predation (Land and Air Animals)

Data to determine rates of predation on adult and juvenile salmonids within the Lagunitas Creek basin has not been collected. Predation is believed to be relatively high during periods of low flow. Reduced flows and a lack of deep pools as well as concealment cover in many stream reaches expose spawning adults and rearing juvenile salmonids to increased risk of predation. Because minimum bypass flow requirements on Lagunitas Creek prevent severe low flows, this problem may be more acute on the tributary streams than it is on the mainstem.

6. <u>Lagunitas Creek Basin - Scientific Research</u>

Four permits authorizing intentional take of coho salmon from the action area basin have been issued by NOAA Fisheries. Table 1 shows the amount of intentional take of CCC coho salmon in the action area currently authorized by NOAA Fisheries research and enhancement permits. No research or enhancement permits have been issued for CCC steelhead in the action area. NOAA Fisheries has issued one section 4(d) limit to take prohibition to Salmon Protection and Watershed Network (SPAWN) for the rescue of unlimited numbers of stranded CCC coho salmon and CCC steelhead. No intentional lethal take has been authorized in the Lagunitas Creek basin (Table 1), however, research activities may cause mortality unintentionally or sublethal effects. The amount of take actually realized by permit holders likely will be much lower.

Table 1. The annual amount of intentional take of CCC coho salmon authorized to four permit holders with projects within the action area.

Type of Take	Life Stage		
	Juvenile	Adult	Carcass
Observe/Harass	46,500	3040	0
Capture, handle, release	3825	0	0
Capture, handle, tag/take tissue samples, release	5250	0	750
Capture, handle, transport, release	5,300	50	N/A
Capture, remove for broodstock	300	0	N/A
Intentional mortalities	0	0	N/A
Unintentional mortalities	296	0	N/A
Total take	61471	3090	750

C. Stream Restoration Projects in the Lagunitas Watershed

Restoration activities may cause temporary increases in turbidity, and alter channel dynamics and stability (Habersack and Nachtnebel 1995, Hilderbrand *et al.* 1997, Powell 1997, Hilderbrand *et al.* 1998); these effects may temporarily stress salmonids. Misguided restoration efforts often fail to produce the intended benefits and can even result in further habitat degradation. Improperly constructed projects typically cause greater adverse effects than the pre-existing condition. The most common reason for this is improper identification of the design flow for the existing channel conditions. However, properly constructed stream restoration projects likely increase available habitat, habitat complexity, stabilize channels and streambanks, increase spawning gravels, decrease sedimentation, and increase shade and cover for salmonids.

Since 1996, the National Oceanic and Atmospheric Administration (NOAA) Restoration Center has provided $378,000 through cooperative agreements, for five restoration projects within the action area. Types of projects funded include: sediment reduction projects, fish migration barrier removal, fish migration barrier passage, riparian restoration, corridor fencing, and sediment source and barrier inventories. Also, CDFG, other government entities, and private foundations have funded these and other types of restoration activities. MMWD (1997) briefly described some of the restoration projects undertaken by various government agencies and non-governmental organizations. Restoration projects included: sediment control, woody debris enhancement, riparian exclusion fences, modification to grazing strategies, fish passage improvement, rearing habitat enhancement, and watershed protection agreements with private landowners. The negative effects of habitat restoration activities on anadromous salmonid populations within the action area are probably temporary and minor. Overall, habitat restoration projects are expected to be beneficial to the restoration and recovery of coho salmon and steelhead in the action area.

1. <u>NPS Floodplain Restoration</u>

NPS has begun to restore a portion of the Olema Creek floodplain which has been a cattle pasture for decades. Livestock have been permanently excluded from this 90 acre pasture, and NPS has planted about 3000 willow cuttings in the area, which are leafing, indicating successful planting (NPS 2003b). As described in the "Description of the Proposed Action" section, this is the largest floodplain pasture on NPS lands in the action area, extending approximately 1 mile along the east side of Olema Creek. Within this floodplain area, NPS has also reduced a much smaller pasture (6 acres) to an upland area of one-half acre (NPS 2003b). NOAA Fisheries expects these actions will improve overwinter survival of salmonids in the action area in the future, once Olema Creek reclaims this portion of its floodplain.

D. Coho Salmon Critical Habitat Trend in the Action Area

As noted above, several positive steps are being taken to protect and restore habitat in the action area. Sediment reduction activities are being pursued, barriers to salmonid migration are being removed, and LWD is being placed in streams to provide cover. Other conditions (such as water use) have the potential to continue to degrade habitat in the action area. It will take many more years of trend data to determine if the current restoration programs are effective in minimizing and reversing the degradation of habitat that has occurred. NOAA Fisheries concludes that some aspects of habitat are improving in the action area, but others are likely holding at current levels of degradation or may be in decline.

E. Value of Coho Salmon Critical Habitat in the Action Area

Geographically, the Lagunitas Creek watershed and tributaries of Drakes Estero represent a relatively small portion of the CCC coho salmon ESU. However, their value to coho salmon remains significant given the current degraded condition of habitat throughout the ESU. As noted above, it is estimated that Lagunitas Creek basin currently supports approximately 10 percent of the remaining wild coho salmon stock within the CCC coho salmon ESU (Weitkamp *et al.* 1995).

Because degraded habitat conditions, and thus lowered carrying capacity, throughout the species' range are not expected to improve dramatically in the near future, remaining areas of habitat which appear to support relatively large sub-populations are judged highly important. This watershed is particularly significant to coho salmon, given the relatively large coho population it appears to support, and the current status of the CCC coho salmon ESU.

The populations of coho salmon that use the action area are critical in sustaining and recovering this species because they are likely to be relied upon as both natural and managed "source" populations for recovery. For example, CDFG may take coho salmon from the Lagunitas Creek watershed that may otherwise die from stranding and utilize them in an attempt to save the Russian River coho salmon sub-population (CDFG 2001, NOAA Fisheries 2001a). Therefore, further degradation of the Lagunitas Creek watershed (and tributaries to Drakes Estero) could appreciably affect the survival and recovery chances of this listed species by reducing the number of fish available to repopulate the species.

F. Likelihood of Salmonid Survival and Recovery in the Action Area

Both the coho salmon and steelhead populations that use the action area, while substantially reduced from historical numbers, appear to be relatively stable, although coho juvenile numbers may be declining. These populations are likely to persist with enough resiliency to rebound from limited impacts for the foreseeable future. However, due to their low numbers, the continuation of impacts from current baseline conditions to the population's numbers, distribution, or reproduction could limit their chance of survival and recovery. The recovery of these populations will depend upon programs that protect and restore the watershed and the continued reduction of impacts from land use and water withdrawal. As stated earlier, data needed to draw firm conclusions about salmonid population trends in the action area are lacking. Further data collection to determine current population trends and to link adverse impacts to protection and restoration efforts will be needed.

V. EFFECTS OF THE ACTION

The purpose of this section is to identify effects to threatened CCC coho salmon, CC Chinook salmon, CCC steelhead, and CCC coho salmon critical habitat that would result if the NPS continues to issue permits for livestock grazing (including dairy operations) in perpetuity. Specific steps NPS will take within the next five years are also analyzed below, and are analyzed separately as appropriate. Where quantitative data relating the affected area to coho salmon, Chinook salmon, steelhead and coho salmon critical habitat are available, these data were used as appropriate. Where data are sparse, the assessment of project effects focuses mostly on qualitative identification. This approach was based on a review of ecological literature concerning the effects of livestock grazing on habitat elements important to steelhead and coho salmon, including water, substrate, food, cover, and adjacent riparian areas; the primary constituent elements of critical habitat that will be affected. This information was then compared to the likely affects associated with this proposed project based on the best data available.

A. Overview of Livestock Effects on Salmonids and Their Habitats

Several literature reviews on the effects of grazing on salmonids and their habitats have been published in recent years (Spence *et al.* 1996, Larsen *et al.* 1998, Belsky *et al.* 1999, Rinne 1999, NOAA Fisheries 1999). There is general agreement that problems with study design (not experimental, insufficient replication, subjective descriptors such as "light" grazing, not enough time span), natural variability, prior grazing history, natural grazers and other outside effects in watersheds can make it difficult to draw broad generalizations ("all livestock grazing is bad for fish populations", "all livestock grazing has no effect on fish populations", as examples) about the effects of livestock grazing on fish populations. There is also agreement that more, and better designed studies, are needed. Less agreement is evident on how best to characterize, describe, and approach grazing management that promotes healthy aquatic ecosystems.

Although drawing broad generalizations on fish population impacts is difficult, much is known about the detrimental impacts that grazing can have on riparian and other watershed areas (Belsky *et al.* 1999, Larsen *et al.* 1998, Spence 1996, Platts 1991, NOAA Fisheries 1999). The importance of these areas to salmonids and their habitats is also well known and described (Spence *et al.* 1996, Hall and Lantz 1969, Karr and Schlosser 1978, Lowrance *et al.* 1985, Wesche *et al.* 1987, Gregory *et al.* 1991, Platts 1991, Welsch 1991, Castelle *et al.* 1994, Lowrance *et al.* 1995, Wang *et al.* 1997, Bilby and Bisson 1998, Naiman *et al.* 2000). This information can be used to make reasonable predictions about the impacts to salmonids and their habitats that can occur from livestock grazing when site specific data are not available.

Livestock operations can adversely affect salmonids and their habitats in a number of ways, including degradation of water quality, stream channel morphology, hydrology, riparian vegetation and soils, and instream vegetation. Belsky *et al.* (1999) summarize the effects of riparian grazing into five categories, which are described below:

1. Effects of riparian grazing on hydrology and channel morphology

As grazing intensity increases, more upland vegetation is lost and soil compaction occurs. Less water enters the soil and more flows directly into streams during storms, increasing peak flows. If increases in peak flows cause channel downcutting or incision, riparian plants can be lost if their roots become suspended in drier soils. An increased sediment load is also delivered downstream if the channel downcuts. The channel may widen as streambanks are disrupted by livestock and channel stability may decrease due to loss of riparian vegetation. Ultimately, gravels, LWD, pools, and other important components of fish habitat can be lost as disruption of the channel's banks increases (Belsky *et al.* 1999).

2. Effects of riparian grazing on biodiversity

Most studies show decreases in some species and increases in others. Native biological diversity, including game species, declines as the landscape becomes homogenized by grazing. Riparian specialists are lost. Habitat generalists and weed species often predominate. Weedy exotics usually increase because they benefit from the disturbance regime created by livestock. Sub-dominant species may be released if larger plants are eaten, and upland species that prefer drier conditions may be promoted. Neotropical birds and prairie water birds are variably affected. Neotrops that are restricted to riparian habitats are usually harmed. Cold water fish species such as salmonids decline in number and biomass, while warmer water species may increase (Belsky *et al.* 1999).

Cold water fish species can be lost due to the following factors (among others): higher water temperatures, greater turbidity, increased sedimentation, lower summer flows, low dissolved oxygen, damage to spawning beds, less protective plant cover, fewer insects and other food items, stream bank damage, and decreased hiding cover (Belsky *et al.* 1999).

3. Effects of riparian grazing on water quality

Livestock grazing can be a significant contributor of bacterial contamination to surface and drinking water. Livestock wastes can contribute nutrients which stimulate algal and aquatic plant growth that if excessive can lead to large algal blooms and die offs which result in loss of dissolved oxygen as the algae decomposes. Other detrimental water quality effects include increased water temperature and turbidity (Belsky *et al.* 1999).

4. Landscape and regional effects of riparian grazing

Intensive grazing in uplands can result in increased runoff and erosion in watersheds which can impact riparian communities downstream via sedimentation and increased bank erosion (Belsky *et al.* 1999).

5. Effects of riparian grazing in humid (wet) environments

Effects are similar and may be more or less damaging depending upon specific situations. Moist soils are more vulnerable to disturbance and compaction. Livestock may not congregate close to streams if wet conditions keep upland grasses plentiful (Belsky *et al.* 1999).

B. Overview of Livestock Access to Stream Reaches Used by Salmonids in the Action Area

The proposed project occurs in a large portion of the Lagunitas Creek watershed, drainages of Drakes Estero, a few drainages of Bolinas Lagoon, and a few small coastal drainages. Based on site visits, NPS data, and literature review, NOAA Fisheries concludes that many of the adverse effects that are likely to be caused by the proposed action are directly related to the ability of livestock to enter streams. Livestock with access to streams can remove riparian vegetation, trample stream banks, and add animal wastes to watercourses. These actions can result in loss of fish hiding cover, sedimentation and turbidity in fish habitats, loss of shade and higher water temperatures, and high instream nutrient loads (Belsky *et al.* 1999).

NOAA Fisheries has developed the following table (Table 2) in order to summarize livestock access to stream reaches known to contain salmonids in the action area. Table 2 shows that of the approximately 32,029 meters of lineal stream reach distance in the action area occupied by salmonids, livestock currently have access to about 16 % of the stream reach length used by salmonids. As noted above and described and analyzed below, not all of these areas suffer the same impact from livestock access. Some areas may have low amounts of riparian vegetation regardless of livestock access.

C. Loss of Riparian Vegetation Along Streams Reaches Used by Salmonids

The functional values of riparian corridors and the benefits they provide to aquatic systems in general, and stream fish populations in particular, are well documented (Hall and Lantz 1969, Karr and Schlosser 1978, Lowrance *et al.* 1985, Wesche *et al.* 1987, Gregory *et al.* 1991, Platts 1991, Welsch 1991, Castelle *et al.* 1994, Lowrance *et al.* 1995, Wang *et al.* 1997, Bilby and Bisson 1998, Naiman *et al.* 2000) and include: mediation and filtration of sediments and nutrients, bank stability, shade for cooler water temperatures, and creation and maintenance of instream habitat complexity. Filtration of nutrients is not analyzed below because NPS water quality monitoring has failed to detect nitrogen (expected from cattle waste runoff) in the mainstem of Olema Creek. Instead, fecal coliform and suspended sediment are used to locate water quality problems caused by livestock (NPS 2001b).

Impacts to listed salmonids expected prior to 2006 include sedimentation laden runoff from bare soils, increased summer water temperatures, and loss of habitat complexity from simplified channels lacking LWD for cover and pool creation. All freshwater life history stages may be affected, with most of the effects concentrated on eggs, alevins, fry, and juveniles. After the salmon protection measures described above in the *Project Description* are in place (no later than

Table 2. Livestock access to stream reaches known to contain salmonids in the action area.

Watershed Name	Salmonid use reach length bordered by grazing allotments	Salmonid use reach length accessible to livestock*.
Lagunitas Creek -Cheda Creek -Devil's Gulch -Nicasio Creek	13970 meters	300 meters
Olema Creek -Quarry Gulch -Boundary Gulch -Horse Camp Gulch -John West Fork -Randall Gulch -N. Hagmaier Gulch -S. Hagmaier Gulch -Eucalyptus Gulch -Headwaters Gulch	9479 meters	2250 meters
Drakes Estero -Schooner Creek -Home Ranch Creek	8580 meters	2680 meters
TOTALS	32029 meters	5230 meters

* Where livestock have not been excluded by fencing, riparian vegetation, and/or steep wooded canyons. Note that nearly all perennial stream reaches in the action area contain salmonids, except for a few streams as described above in the *Description of the Proposed Action*.

2006) adverse effects directly related to the loss of riparian vegetation are expected to decline until minimal as properly functioning riparian conditions are slowly re-established. In some cases, it may take as long as ten years after 2006 to establish fully vegetated riparian areas. Each effect from loss of riparian function, and its effect on salmonid life history stages, is described below.

1. <u>Sediment Entry to Streams</u>

High concentrations of suspended sediment can affect fish in several ways, including increased mortality, reduced feeding efficiency, and decreased food availability (Berg and Northcote 1985, McLeay *et al.* 1987, Newcombe and MacDonald 1991, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Substantial sedimentation rates could bury less mobile organisms (Ellis 1936, Cordone and Kelley 1961) that serve as a food source for many fish species, degrade instream habitat conditions (Cordone and Kelley 1961, Bjornn *et al.* 1977, Eaglin and Hubert 1993), cause reductions in fish abundance (Alexander and Hansen 1986, Bjornn *et al.* 1977, Berkman and Rabeni 1987), and reduce growth in salmonids (Crouse *et al.* 1981). Sediment laden waters are avoided by migrating salmonids, and high amounts of suspended sediment can delay migration to spawning grounds (Bjornn and Reiser 1991). Sedimentation of redds can kill both eggs and alevins (Bjornn and Reiser 1991).

a. Impacts before 2006

NOAA Fisheries visited grazing lease areas near streams in the field and noted some areas of bare soils caused by livestock on or near stream banks. Based on familiarity with similar amounts of soil disturbance near northern California streams, NOAA Fisheries has determined that these areas likely contribute sediment to the adjacent stream reaches during rainfall events, especially during the first large rainfall events of the rainy season. In order to assess the effect of these sediment inputs, NOAA Fisheries reviewed suspended sediment monitoring data available from NPS and compared this data with information from the scientific literature.

NPS has operated as many as 14 water quality sampling sites in Olema Creek and three more on other tributaries to Lagunitas Creek. Broad coverage can be helpful in characterizing the overall condition of suspended sediment in a creek or watershed, but it is unlikely to be able to detect all suspended sediment loads that could adversely affect listed salmonids nor sort out causes of elevated suspended sediment loads in all cases without further investigative work. In general, the sediment monitoring done by NPS in the Lagunitas Creek watershed (and Drakes Estero) shows average levels of suspended sediments that ranged between 6 and 161 mg/L, depending upon monitoring site when samples were taken after rainstorms in 2001 (NPS 2001b). Depending upon the duration of these levels (which is unknown), juvenile coho salmon could have experienced alarm reactions, avoidance behavior, and decreases in their feeding rates according to work reported by Newcombe and Jensen (1996). NOAA Fisheries expects similar effects to juvenile steelhead based on their similar physiology. Much of these suspended sediment levels may have been caused by natural slides or human impacts in the action area unrelated to the grazing leases (NPS 2001b).

There are only two NPS monitoring sites within 200 meters of stream reaches that currently are accessible to livestock. These sites, located in Olema Creek, show different levels of suspended sediment during first flush monitoring in 2001. Site OLM3 had a maximum concentration of 46 mg/L and site OLM4 had a maximum concentration of 294 mg/L (NPS 2001). The OLM3 concentration may have produced avoidance behavior and decreased salmonid feeding according to a study cited by Newcombe and Jensen (1996). The OLM4 concentrations may have stopped juvenile coho feeding, and could reduce juvenile salmonid growth rates if experienced for weeks according to a study cited by the same authors. No data are available on sediment concentrations upstream of the livestock access areas, so it remains unclear if these results are directly related to livestock access or to natural erosion further upstream.

Major sources of suspended sediment from two grazing lease operations have been discovered and addressed by NPS (NPS 2001b, NPS 2002b). The sources (one related to livestock grazing near streams, one unrelated) were pinpointed by NPS's monitoring program of field investigations triggered by elevated levels of water quality monitoring parameters, including suspended sediment and fecal coliform (livestock waste). Corrective measures were applied to better protect aquatic habitat (NPS 2001). Subsequent monitoring indicates that sediment levels have been reduced at these sites to levels within the range of averages described above (Brannon Ketcham, NPS Hydrologist, personal communication, April 29, 2003).

NPS had previously proposed to use several exceedences of 50 mg/L as the trigger for further investigation at certain sites as described above in the *Description of the Proposed Action* section. This trigger was set too conservatively in NPS's opinion (NPS 2004a). NOAA Fisheries agrees and notes that average suspended sediment levels measured in the Lagunitas Creek watershed and Drakes Estero ranged from 6 to 161 mg/L as described above. A trigger of 50 mg/L would likely be exceeded many times based on background conditions, leading to unneeded followup investigations. NPS has proposed setting the trigger for further investigation at 315 NTU for one time events and that the 90th percentile of measurements remain below 100 NTU. NOAA Fisheries expects that this will indicate large turbidity events and chronic turbidity levels that may be of concern. However, turbidity levels are not always easily correlated with suspended sediment concentrations. Turbidity may not be as reliable as suspended sediment concentrations for determining impacts to salmonids (Bash *et al.* 2001). NPS has proposed to attempt to develop a correlation between NTUs and TSS or SCC for the action area. In the interim, because NPS will also be providing TSS or SSC information, NOAA Fisheries expects that a general level of impact based on Newcombe and Jensen's 1996 work on suspended sediment concentration can also be determined. As proposed previously by NPS, if livestock operations are determined to be the cause of the elevated sediment levels, additional sediment prevention measures will be applied.

Although livestock have access to 16% of the stream reaches used by salmonids, NOAA Fisheries has observed many of the areas where livestock currently have access to streams and agrees with NPS's assessment of impacts in most cases. Suspended sediment and sedimentation from most of these areas are likely to be minimal and unlikely to harm salmonids. Livestock use of these areas is either seasonally restricted and/or clearly minimal, with few if any areas of exposed soils near or along creek banks. NPS ground cover requirements in upland areas are likely to prevent large amounts of sediment generation from livestock operations by preventing the occurrence of bare ground on hills lopes and fields near streams. Most unfenced areas are not directly adjacent to known salmon and steelhead spawning areas, further limiting any effects to migrating and spawning adult salmonids. Migrating adults are expected to avoid areas if high sediment loads occur (Newcombe and Jensen 1996, Bjornn and Reiser 1991). While their migration may be delayed, this may not always result in harm. NPS monitoring (NPS 2001b) shows overall levels of suspended sediment in streams in the action area that are unlikely to cause any but minimal delay.

Based on the data available, NOAA Fisheries cannot rule out adverse effects to salmonids from suspended sediment from livestock operations. However, in NOAA Fisheries' judgement, the information available indicates that sediment runoff from the proposed grazing lease program is likely to be limited to a few small localized areas. As described above, only a small number of adults are likely to be affected. Juvenile salmonids are likely to be widely distributed in the action area during October through March when most rains occur; and it is reasonable to conclude that only those in a few small localized areas are likely to be affected. An accurate number of juveniles and adults affected cannot be calculated because densities for juveniles and the number of redds (adult nests) in the Lagunitas Creek watershed vary from year to year, and not all estimates were made in the specific areas likely to be affected by sediment and turbidity.

b. Impacts after 2006

When livestock are excluded and/or steps are underway to ensure vegetation in riparian areas, NOAA Fisheries reasons that the adverse effects to listed salmonids from sediment and turbidity will decrease. When all bare riparian ground is vegetated within 15 to 30 meters of streams affected by grazing leases, NOAA Fisheries expects adverse effects from sedimentation and turbidity from livestock grazing near streams will be unlikely to occur. Current areas lacking vegetation are on flat or low gradient hill slopes and, as noted above, NPS requires vegetative cover to be left in uplands. This will minimize both sediment generation from livestock grazing, and the distance it can be transported by overland flow (Spence *et al.* 1996).

2. <u>Temperature</u>

Increases in stream temperature are a significant concern for salmon and steelhead, as stream temperature affects their metabolism, behavior, and survival rate (Bjornn and Reiser 1991, Spence *et al.* 1996). Many streams in California are already at or above temperature thresholds identified in the literature as harmful to salmon and steelhead (see, for example, North Coast Regional Water Quality Control Board 1998, State Water Resources Control Board 2003).

The data available (NPS 2001b, Brannon Ketcham, NPS Hydrologist, personal communication 2003) rarely show water temperatures higher than 16°C at well vegetated sites in Olema Creek, Lagunitas Creek, and Drakes Estero where water flows all year. These temperatures are within the ranges given in the literature as preferred for salmonids (Bjornn and Reiser 1991) and in NOAA Fisheries judgement are unlikely to result in harm to listed salmonids.

However, NPS data show that water flowing through areas lacking shade from riparian vegetation in Olema Creek is consistently hotter than water flowing through well vegetated sites. For example, water temperature data in May 2002 for the mainstem of Olema Creek in an area well shaded by riparian vegetation was 13.61°C. Water temperature in a portion of Olema Creek flowing across an open grassland (Olema Flat Pasture) was 24.7°C on the same day and time (NPS 2003). This is likely an extreme case, because the open grassland area was close to 1 mile in length. However, tributary temperatures are also higher in smaller areas lacking shade from riparian vegetation. In the John West Fork of Olema Creek, a well shaded area was 16.7°C while an unshaded area was 19.3°C (Brannon Ketcham, NPS Hydrologist, personal communication 2003). The higher water temperatures recorded at the sites lacking shade from riparian vegetation are at levels expected to cause reduced growth in salmonids (Sullivan *et al.* 2000). The stream temperatures documented in this unshaded area of John West Fork Creek (NPS 2003) equaled or exceeded (for two to three weeks) temperatures found to be prohibitive of coho salmon presence (Welsh *et al.*, 2001). In NOAA Fisheries judgement, temperatures found in unshaded portions of the Olema Creek watershed are high enough to cause harm to salmonids. However, NOAA Fisheries notes that adjacent sites with shade have lower temperatures, suggesting that unshaded areas are not causing pervasive temperature problems in Olema Creek.

These high temperatures occur downstream of steep canyon areas, which is also where most of the rearing fish concentrate in the watershed, as upstream canyon reaches are often dry. NOAA Fisheries has compared the known locations of coho salmon juvenile rearing in the Lagunitas Creek watershed with the grazing lease areas currently lacking riparian cover and determined that there are a few sites (about 7) where temperatures may be elevated above the range preferred by salmonids. These sites include the two noted above. In some cases, juvenile steelhead may rear upstream of coho salmon, and this fish may encounter other areas lacking riparian shade due to livestock grazing. However, given the intermittent nature of many of these small streams, it is likely that coho and steelhead distribution in Olema Creek is similar during the hottest days of the summer. Juvenile Chinook salmon are not expected to be present during mid to late summer, nor are they expected to be found far upstream in Olema Creek or Lagunitas Creek based on their life history strategy, making their exposure to high stream temperatures unlikely. Juvenile steelhead and coho salmon attempting to rear in areas without riparian shade are likely to be harmed by high water temperatures during the summer.

NOAA Fisheries cannot accurately predict the number of salmonids likely to be harmed by high water temperatures resulting from the proposed livestock grazing. The number harmed is expected to be minimal because unfenced areas without riparian cover are few, and most unfenced areas are small and are surrounded by areas with riparian cover which, according to the water temperature data available, have water temperatures unlikely to harm salmonids[7]. NOAA

[7]One area that is larger is Olema Flat Pasture. Currently much of the flow in Olema Creek runs through the pasture when smolts and juveniles are likely present. Most smolts are actively moving downstream and traveling at night (Groot and Margolis 1991) when temperatures cool, likely making impacts minimal. Juveniles will experience high temperatures and are likely to be harmed if they attempt to rear in Olema Flat pasture. As

Fisheries has observed that some of the sites where livestock have access to stream reaches contain vegetation which provides some shade, or are located in areas where the link between an absence of vegetation and livestock grazing cannot be clearly drawn. For example, gravel deposits on an inside bend of Lagunitas Creek could be excluding the establishment of vegetation with or without livestock access. In addition, NOAA Fisheries expects that listed salmonids will actively seek to avoid areas of high temperatures. This may result in the crowding of nearby habitats, which could result in increased competition and the reduction in the fitness of individual fish. These effects are expected to be confined mostly to small areas (with the exception of Olema Flat Pasture) based on the small areas likely to experience high water temperatures and the corresponding small number of fish that may crowd other cooler habitats. The effects from livestock grazing are expected to be temporary, lasting until NPS implements stream exclusion and other measures as described above. A return of vegetation and shade may take some time to establish, as long as ten years in some cases. Once these areas are re-vegetated and stream shade is provided, summer water temperature impact on listed salmonids from livestock removal of riparian shade is not expected to occur.

3. <u>Habitat complexity</u>

Juvenile salmonids prefer heterogeneous stream environments comprised of free-flowing riffle-pool complexes containing a mix of pools with ample cover and shallow, swift reaches supporting high production of freshwater invertebrates (Bjornn and Reiser 1991, Groot and Margolis 1991). The production of juvenile salmonids can be directly related to stream channel complexity (Fausch and Northcote 1992, Reeves *et al.* 1998, Horan *et al.* 2000). More structurally complex stream sections containing boulders, logs, and bushes have been shown to support higher salmonid diversity and larger numbers of coho salmon than simpler sections (Hicks *et al.* 1991, Bilby and Bisson 1998, Reeves *et al.* 1998, and Solazzi *et al.* 2000).

Riparian vegetation provides much of the habitat complexity needed by salmonids via the input of LWD and root systems along stream banks. Interactions among wood (including roots) water, and sediment create habitat features needed for thriving salmonid populations, including pools and riffles, undercut banks, and instream flow obstructions. These features provide hiding cover from predators, high winter flows and high temperatures, and can increase the productivity of stream invertebrates (salmonid food) (Bilby and Bisson 1998).

Much of the scientific work documenting the influence of instream LWD on channel form has been carried out in Pacific Northwest streams in coniferous forests. In other environments, instream wood may not influence channel morphology to as great an extent. Deciduous woody debris may not last as long in streams as coniferous debris (Bilby and Bisson 1998), and it can

noted above, NPS is restoring this pasture by excluding cattle and planting trees. Although this area is larger than other unshaded areas, it does not represent a large portion of the coho rearing habitat in Olema Creek. Temperature impacts to fish in this area will diminish as riparian vegetation grows taller in the floodplain/pasture.

often be smaller. In these cases, less impact on stream form is likely. Although impact on stream form may be less, the other habitat features (cover and food productivity) provided by woody debris appear consistent across a wide range of Northern California coastal streams in NOAA Fisheries judgement. Recent work by Opperman (2003) in hardwood dominated tributaries of the Russian River supports the importance of deciduous woody debris to fish habitat. As described above in the *Environmental Baseline* section, hardwood woody debris was found to provide important cover elements in streams through debris jams and live trees in stream channels. However, it was unlikely to provide the pool forming function of conifer LWD (Opperman 2003).

NOAA Fisheries has directly observed a variety of stream reaches adjacent to grazing leases, including areas with and without riparian vegetation. Some of the adjacent stream reaches lack the habitat complexity needed for healthy juvenile salmonid rearing. Instream wood is largely absent. These conditions are locally limiting the amount of juvenile salmonids that survive to smolt age. These conditions also impact any adults that may migrate and spawn in these areas. Adults need resting areas in streams, cover to hide from predators, and appropriately sized gravels in which to spawn, as noted above in the *Status of the Species* section of this opinion.

Harm to salmonids is likely to be minimal because stream reaches used by salmonids in the action area where the proposed livestock grazing is likely to retard and remove riparian tree growth and disrupt woody debris recruitment are few in number and small in size. The effects are expected to be temporary, lasting until NPS implements stream exclusion and other measures as described above.

A lack of fish cover in these reaches is likely to remain until riparian vegetation is returned and begins to recruit to the channel. It may take over a decade for habitat complexity to return to these areas. NOAA Fisheries cautions that streams are dynamic systems, and not all areas will have the same amount of habitat complexity at any given time. As riparian areas are revegetated, instream habitat complexity will begin to slowly improve, reducing the number of listed salmonids lost to poor habitat conditions. Conditions in areas that contain well established riparian vegetation but little instream wood will slowly improve as wood is recruited over several decades. NPS also plans to place LWD in some areas to speed the return of habitat complexity lost to past management practices (see below). Eventually, the impact of grazing leases to habitat complexity will be reduced by as riparian areas are re-vegetated.

D. Livestock Access in Perennial Stream Reaches Above Salmonid Use Areas

These areas are all in steep wooded canyons and livestock use is likely to be limited to a few areas where livestock are able to climb down canyons and cross streams. NOAA Fisheries reasons that salmonids are unlikely to be harmed by livestock use of these areas because the steep wooded ground is likely to preclude heavy use by livestock that could result in sediment and turbidity in salmonid use areas downstream. The use of these wooded areas by livestock is also unlikely to result in temperature or habitat complexity losses downstream as minimal livestock use is unlikely to remove current tree cover or retard the continued growth of trees in these areas.

E. Intermittent Streams and Uplands

As described briefly above, intensive grazing in upland areas can impact streams used by fish. Belsky *et al.* (1999) cite studies that show increasing runoff and erosion into streams from heavy livestock grazing in upland areas. Increased soil compaction, loss of vegetative cover, and livestock trails on hills lopes are the primary causes.

Livestock have access to intermittent tributary reaches above perennial reaches and salmonid use areas in the action area. Impacts are likely to be far reduced from those noted by Belskey *et al.* (1999) for the following reasons: (1) Many of these areas are steep wooded canyons that preclude heavy use by livestock, (2) NPS restricts the amount of livestock allowed on grazing lease land to maintain vegetative cover, (3) All of the ranches in Lagunitas Creek, Olema Creek, and on the Point Reyes Peninsula have developed upland water sources for their livestock which further minimize livestock use of intermittent streams, (4) NPS will require fencing to prevent livestock from accessing several intermittent tributaries that drain to Olema Creek on flat ground near Highway 1 on one grazing lease that has become vacant, and (5) Further upland water development is underway on the grazing lease with the least available upland water for cattle. These actions are consistent with many of the actions recommended by NOAA Fisheries in "An Ecosystem Approach to Salmonid Conservation"- Spence (1996), in order to reduce livestock impacts in uplands. Therefore, NOAA Fisheries expects that increasing runoff and sedimentation from cattle use in and near intermittent streams and upland areas are unlikely to occur in amounts that will cause harm to salmonids.

F. Long Term Adverse Effects

Once the NPS implements the actions described above, and continues resource monitoring and response, adverse effects to salmonids are expected to slowly reduce until in many cases they are minimal and unlikely to result in take. However, there are potential long term impacts from the grazing lease program that could result in harm to listed salmonids.

Based on the program, NOAA Fisheries expects that long-term adverse effects to listed salmonids will be minimal, but could occur. There remain a few areas where fencing is close enough to creeks that impairment of riparian function may occur. There remain a few areas of livestock access, including areas in rotational grazing. NPS's flexible approach to grazing may result in short-term localized impacts to stream reaches as different grazing approaches are implemented and evaluated. The long-term conversion of wooded areas to pasture lands may have resulted in other changes to instream habitat. These habitat impacts, if they occurred, would continue if the proposed project is implemented. This could harm individual salmonids by decreasing their chances of survival. However, current scientific understanding of such impacts (such as temperature changes- see below) does not provide the ability to accurately measure the magnitude of effect or quantify the number of listed fish that could be affected. Impacts could also result from livestock water use and ranch roads. NOAA Fisheries has evaluated these potential impacts below.

1. Riparian cover

The plant species composition and width of riparian areas established by NPS through livestock rotational grazing, riparian plantings, livestock exclusion, *etc*., can affect their ability to provide important habitat functions for riparian and aquatic organisms, including salmonids (Spence *et al* 1996). Riparian plant communities only 3 to 9 meters in width are unlikely to contain enough trees to adequately shade streams, provide sediment buffers, and maintain or improve habitat complexity, especially as streams may erode banks change their position relative to these small buffer areas. The NPS has adopted a goal of 15 to 30+ meters of riparian plant communities next to streams, with variation based on site specifics as discussed in the *Description of the Proposed Action*. In general, NOAA Fisheries reasons this approach is likely to assure that much of the riparian function needed to support aquatic habitat will be provided in the action area.

Numerous studies of riparian zones in conifer forests indicate that 30 meters of "no touch" buffers can produce 70- 90% of LWD recruitment (Bilby and Bisson 1998). Buffers of one site potential tree height can maintain approximately 90-100% of other functions such as bank stability, temperature control, nutrient inputs, small organic litter inputs, and sediment control (from riparian area surface erosion) (Spence 1996).

In most of the streams in the action area, trees are different species (non coniferous), and smaller in height. In general, LWD recruitment distances will be less (Opperman 2003), the distance needed for bank stability may be also be less (but could be more, depending upon tree root systems), the ability to provide shade from areas within or beyond 30 meters will be more limited by lower tree heights, sediment filtration will be similar or better due to low gradient streams and ground cover requirements outside of riparian areas, and nutrient input from leaf drop will be limited to areas closer to the stream (because tree height is lower). Therefore, NOAA Fisheries reasons that 15 to 30 meter buffers represents similar or better protection for these functions in the action area. NOAA Fisheries notes that less information is available on the effectiveness of riparian buffers in areas used for livestock grazing (Spence 1996, Opperman 2003). Monitoring will be needed to track the success of these measures.

2. Microclimate

Correlations between extent of disturbance in a watershed and warmer water have been established, but further research is underway to confirm the results in some cases (Beschta and Taylor 1988, Hatten and Conrad 1995, Welsh 2003). The historic conversion of wooded areas to grazing fields may have resulted in an overall increase in water temperatures, especially during the summer months. Some reduction in the survival of individual fish may be occurring due to this effect, and if so, would continue if the action area remains used for grazing. Based on the data available, including the status of coho salmon and steelhead in Lagunitas Creek and current temperatures in perennial streams, which appear to be mostly within the tolerances of these fish, NOAA Fisheries does not expect that this effect is limiting these populations chances of survival.

3. Allowing Livestock Access Once Riparian Areas are Revegetated

As part of its flexible approach, NPS proposes to temporarily exclude livestock from certain riparian areas to allow vegetation to re-establish. Once vegetation has re-established, livestock would be allowed in the riparian area. Upon their return livestock may remove new riparian vegetation and trample banks. These impacts, if they occur, may slow the attainment of better riparian conditions and lead to increased erosion in some areas. NOAA Fisheries expects that these occurrences will be limited by NPS to carefully monitored and controlled circumstances (based on their proposed monitoring and management program) and, therefore, will not significantly affect the long-term health of riparian vegetation and aquatic habitats in the action area. Harm to salmonids is likely to be localized to small areas and will be temporary given NPS's monitoring and response program.

4. Stream Flow Reduction

Reductions in downstream flow have the potential to strand fishes along stream banks, or they may cause fishes to become isolated in small pools or other marginal habitats. The adverse effects of rapid, artificial fluctuations in stream flows on fisheries resources are well documented (Cushman 1985). Risk of stranding is generally highest where the channel slope in areas subjected to dewatering is gentle or irregular. Those that are stranded in isolated pools become more vulnerable to predation, and they may be subjected to higher rates of mortality due to the effects of deteriorating water quality (*e.g.*, elevated temperatures and/or decreased dissolved oxygen concentration). Returning higher flows may provide respite from these conditions, but the fitness of fish that survive in these conditions has likely been reduced by the higher physiological costs of living in poor habitat conditions.

No water for livestock is obtained directly from salmonid streams in the Olema Creek and Lagunitas Creek drainages except for one intake on the John West Fork of Olema Creek and Hagmaier pond (described below). Water is taken from upland springs in these drainages. Streams on the Point Reyes Peninsula do provide direct watering for livestock (NPS 2002b).

NOAA Fisheries has analyzed the consumption of water by livestock currently on the NPS grazing lease lands. The summer months are of most concern, because stream flows are low and cattle water requirements are likely higher than at other times during the year. For this analysis in Olema Creek and Lagunitas Creek, NOAA Fisheries has assumed that the amount of water withdrawn from upland springs would result in similar reduction in the amount of water available to these creeks. This assumption may not be valid, as upland springs in the action area may not be directly connected to these creeks. If not directly connected, the loss of water from creeks related to upland spring withdrawal would be less than that described below.

In August of the years 1998-2001, data provided by NPS indicates that the daily average discharge in Olema Creek varied between 0.6 and 2.1 cfs (NPS 2001b). Cows consume between 6 and 18 gallons of water per day, depending upon season, and 490 cows are currently grazed in the Olema Creek watershed (NPS 2002b). Assuming an average daily discharge of 1 cfs results in an average daily discharge of 646,272 gallons per day (1 cfs * 60 seconds * 60 minutes * 24 hours * 7.48 the conversion factor). Four hundred ninety cows consume 8,820 gallons per day (490 * 18, the high consumption was chosen for the summer). Therefore, the cows consume approximately 1 percent of the average daily flows. This small amount of impact is unlikely to de-water habitat areas in Olema Creek. Fewer animals are grazed in Lagunitas Creek, which has more flow during the summer (NPS 2001, USGS http://waterdata.usgs.gov/ nwis/discharge 2002). Therefore, livestock water consumption is unlikely to de-water habitat areas in Lagunitas Creek.

Point Reyes Peninsula streams are directly accessible to cattle in some areas, and an on-stream impoundment exists on the West Fork of Schooner Creek. Stream gauge data are not available to estimate the impacts of water use. NOAA Fisheries expects that water use by livestock in these streams is unlikely to result in dewatering habitat areas used by salmonids because: (1) Home Ranch Creek only provides water for 15 cattle and horses, (2) a similar situation exists in the east fork of Schooner Creek, and (3) the west fork of Schooner Creek is accessible to salmonids and maintains water year round during most years as evidenced by dense willows and wetlands along its length (NPS 2001).

The water intake on the John West Fork of Olema Creek provides water for one stock trough. The NPS, using the NOAA Fisheries approach described above, estimates this trough removes approximately 1.1% of the surface flow in Olema Creek during the summer months (NPS 2002d). Any potential change in water surface elevation may not be measurable and is unlikely to result in harm to salmonids due to its small size.

5. Sediment From Roads

Roads can affect salmonids and their habitat by increasing sediment loads, altering channel morphology and destabilizing stream banks, modifying the hydrological drainage network, creating barriers to fish movement, and increasing the potential for chemical contamination (Furniss *et al.* 1991, Swanston 1991, Trombulak and Frissel 2000, Jones *et al.* 2000).

Construction of a road network, especially unsurfaced road networks, can greatly accelerate erosion rates within a watershed (Beschta 1978, Best *et al.* 1995, Gardener 1979, Hagans and Weaver 1987, Haupt 1959, Kelsey *et al.* 1981, Reid and Dunne 1984, Swanson and Dryrness 1975, Swanston and Swanson 1976). Cederholm *et al.* (1980) reported that the percentage of fine sediments in spawning gravels increased above natural levels when more than 2.5% of a basin area was covered by roads. Roads and other areas of intentional surface disturbance are a chronic source of sediment to streams (Swanston 1991). Roads and related ditch networks are often connected to streams via surface flowpaths, providing a direct conduit for the sediment.

Where these roads and ditches are maintained by periodic "blading," chronic sediment delivery may be temporarily increased as bare soil is exposed and ditch roughness features which store and route sediments are removed. In steeper terrain, road construction may trigger landslide processes that deliver large amounts of sediment directly into streams (Furniss *et al.* 1991). Improperly maintained roads may still fail, years after construction (Furniss *et al.* 1991).

Road networks can affect hillside drainage; intercepting, diverting, and concentrating surface and subsurface flow; and increasing the drainage network of watersheds (Huage *et al.* 1979, Wemple *et al.* 1996). This can lead to changes in peak and base flows in streams. Stream crossings can restrict channel geometry and prevent or interfere with migration of adult and juvenile salmonids (Furniss *et al.* 1991). Crossings can also be a source of sedimentation, especially if they fail or become plugged with debris, causing significant cumulative impacts downstream (Furniss *et al.* 1991, Murphy 1995).

NPS has concluded that grazing lease road impacts are minimal because roads run up ridgelines and connect with each other only in flat areas at ridge tops and valley floors. NPS is also a participant in a MOU for maintenance and management of unpaved roads in the Lagunitas Creek watershed (MMWD *et al.* 2001b). NOAA Fisheries has reviewed this MOU and expects its implementation will significantly reduce the amount of sediment entering fish bearing streams. However, in NOAA Fisheries' experience it is very difficult to completely eliminate sediment and turbidity from road systems, especially unpaved roads. There are at least four road sites in the action area identified by NPS that may continue to contribute sediment to salmonid streams. The identified problems are being addressed by NPS as follows:

1) A road across John West Fork Creek is no longer passable to vehicles because the culvert has been washed away by high flows. Until recently, cattle used the road to cross the creek, raising the potential for additional sediment and turbidity downstream. Cattle have been excluded from this crossing by fencing (NPS 2002b).

2) A road that was constructed on the bed of an intermittent tributary of Olema Creek will be rerouted by NPS to an adjacent rise. NPS will re-contour the road bed and plant willows to improve the creeks' stability (NPS 2002b).

3) A road across Cheda Creek currently has drainage problems. In addition to the erosion control projects proposed by MMWD, NPS will work to ensure that future road maintenance complies with the standards described in the road MOU described above (NPS 2002b).

4) A road which crosses Devils Gulch in several locations has a failing crossing. The crossing is contributing sediment to the creek during rains. Due to the need to maintain fire fighting access, NPS is currently discussing removal or fixing of the culvert with Marin County (NPS 2002b).

Reducing the potential for sediment entry to streams at these sites depends on funding availability and in some cases the cooperation of other agencies. NOAA Fisheries cannot predict when these sites will be addressed from the information available. Sediment from these sites prior to their repair may impact salmonid habitat downstream, but based on the water quality monitoring information available, NOAA Fisheries reasons that impacts will be limited to small localized areas. Some listed salmonids in the immediate vicinity of these road sites may be harmed.

Because specific project details are unavailable for the road projects described above, this analysis does not address potential impacts to listed salmonids from these road projects. NPS will need to consult with NOAA Fisheries separately on each of these projects if listed salmonids are likely to be affected.

G. LWD Placement

As part of the grazing lease program, NPS proposes to place LWD in areas of Lagunitas Creek, Olema Creek, and tributaries to these streams where habitat complexity is lacking. If funding is available, NPS may place as many as 100 pieces of LWD in salmonid streams in the next ten years. Numerous studies document the benefits to salmonids of wood placement in streams. Literature reviews by Bilby and Bisson (1998), Hicks *et al.* (1991), and Stillwater Sciences (1997), all indicate that salmonid density and biomass increases with the addition of LWD. In NOAA Fisheries' judgement, LWD placement in appropriate areas will further enhance the survival of salmonids in the Lagunitas Creek watershed during the freshwater portion of their life history cycle.

NOAA Fisheries cannot accurately estimate the amount of LWD that may be placed each year, nor the specific locations of wood placement, based on the information available. NOAA Fisheries familiarity with wood placement projects and knowledge of the Lagunitas Creek watershed and its juvenile salmonid distribution leads to several assumptions regarding potential adverse effects during LWD placement. NOAA Fisheries expects only a small portion of the total juvenile salmonid population will need to be relocated per piece of LWD placed, if placement involves heavy equipment work in the bed or banks of the stream channel. This assumes placement occurs when adults are unlikely to be present (June 15 - October 31), the work area is isolated from flowing water preventing sediment and turbidity from entering flowing waters, salmonids in the work area are relocated to appropriate areas via netting and electrofishing prior to LWD placement, and removal of riparian trees to facilitate equipment access will be minimized and such vegetation will be replaced. Assuming 10 pieces of LWD are placed in streams in the action area each year, relocation of juvenile salmonids may occur in as many as ten small areas of the watershed. Based on similar work in other streams, NOAA Fisheries assumes that relocation of salmonids will result in no more than 3% of salmonids being harmed or killed during relocation. Isolating the work area from flowing water will likely prevent sediment entry to streams in amounts that could injure or kill salmonids. Replacing trees removed to provide access to the channel will make the impacts of vegetation loss minor and temporary.

H. Floodplain Restoration

Restoration of the Olema Flat Pasture to floodplain habitat, as described above in the *Description of the Proposed Action*, has already begun and is included in the *Environmental Baseline* of this opinion. This work will continue as part of the proposed action, and include fencing of the floodplain area of Front Field Pasture to exclude cattle. Excluding livestock and planting willows is expected to enhance salmonid juvenile overwinter survival. Salmonids seeking to escape high velocity flood flows will have the opportunity to seek cover among willows and other vegetation in the slower moving water outside of the channel's banks. Previously, any salmonids that fled the low-flow channel to escape fast moving floodwaters found themselves in cattle pasture with no hiding places from predators and little relief from high temperatures, which as noted above, can occur as early as May.

VI. CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purpose of this analysis, the action area that is the subject of this opinion is the area of the Lagunitas Creek watershed and Drakes Estero watershed directly and indirectly affected by the proposed action, as described above in the *Description of the Proposed Action*. Actions occurring outside of the action area may affect the action area. For example, a new water diversion upstream may affect flows in the action area. Therefore, future actions occurring in the watershed may be considered cumulative effects, depending upon their specific location and impact. Future Federal actions, including the ongoing operation of dams, hatcheries, fisheries, water withdrawals, and land management activities will be reviewed through separate section 7 consultation processes and are not considered here.

A. Cumulative Effects to Salmonid Populations in the Action Area

1. Urbanization

Additional development and accompanying infrastructure construction is expected to occur in the Lagunitas Creek watershed (Marin Economic Commission 2001) based on the general and specific plans of local communities and Marin County. In the Lagunitas Creek watershed, additional development is likely to lead to increasing water demands, which may impact stream flows if current allocations are not being fully utilized. NOAA Fisheries is not aware of the total number of pending water diversion applications in the Lagunitas Creek basin but the water within the Lagunitas Creek basin is fully appropriated (NOAA Fisheries 2002).

2. Stream Restoration Projects

NOAA Fisheries is aware of several stream restoration projects likely to occur within the Lagunitas Creek basin. The MMWD plans on implementing two streambank stabilization projects, along San Geronimo Creek (Greg Andrews, MMWD, personal communication February 5, 2003); these projects are expected to be completed by 2005. The Marin County Resource Conservation District (RCD), through a Proposition 13 grant from the State Water Resources Control Board, is likely to implement a number of sediment reduction and other habitat enhancement projects in the watershed. The planning process for these projects is underway; work will likely commence between 2004 and 2005 (Greg Andrews, MMWD, personal communication, February 5, 2003). SPAWN has received grant awards for the following several restoration projects (Reuven Walders, SPAWN, personal communication, February 5, 2003): Willis Evans Canyon Creek (formerly Bates Canyon Creek) - remove existing cement box culvert and replace with jump pools/ladder; Sediment Reduction/ Catchement Basin Project - sediment reduction, groundwater infiltration, and promote infiltration of road runoff into ground water; Larsen Creek - repair fish passage baffles to improve fish passage; Roy's Pools - re-vegetate site and eliminate juvenile salmonid migration barriers; and Barnabe Creek - replace a culvert that is currently blocking salmonid migration.

Restoration activities may cause temporary increases in turbidity, alter channel dynamics and stability, and temporarily stress salmonids (Habersack and Nachtnebel 1995, Hilderbrand *et al.* 1997, Powell 1997, Hilderbrand *et al.* 1998). Properly constructed stream restoration projects are likely to increase available habitat, habitat complexity, stabilize channels and streambanks, increase spawning gravels, decrease sedimentation, and increase shade and cover for salmonids.

All other potential actions, including State, private, and local, that may directly affect the action area remain unknown and speculative. Some aspects of critical habitat in the action area and elsewhere in the Lagunitas Creek watershed are expected to improve as a result of the restoration actions described above. The best estimate that can be made of the impact of cumulative effects on the action area is that fish habitat quantity and quality is likely to improve in some parts of the action area during the next five years with other areas maintaining their current conditions.

VII. INTEGRATION AND SYNTHESIS OF EFFECTS

A. Coho Salmon, Chinook Salmon, and Steelhead

Overall, the proposed grazing lease program provides protection for areas that are important to salmonid habitat. Upland headwater streams, which often provide the bulk of sediment and other inputs to salmonid use areas downstream (Spence *et al.* 1996), will receive little impact from livestock. Livestock stocking and ground cover requirements prevent large areas lacking vegetation from developing vegetation. Several floodplain areas adjacent to grazing leases are also, or will be (in the near future), protected and restored. Riparian areas are wide enough in most cases to minimize impacts from adjacent livestock grazing. Impacts from proposed livestock grazing at PRNS and GGNRA likely to harm or kill salmonids are confined to a few small portions of the streams in the action area. In most cases, (except for roads and LWD placement) salmonids in the small number of areas where the project will result in degradation of aquatic habitat are likely to experience high suspended sediment loads in the winter, high water temperatures in the summer, and a lack of habitat complexity throughout the year. These effects, especially when combined, are likely to harm or kill juvenile salmonids in these areas. As noted above, NOAA Fisheries cannot accurately estimate the number of fish affected based on available data. These impacts are temporary, as NPS will remove or reduce the impacts of livestock access to streams by 2006, and continue to monitor and make improvements to grazing practices as needed.

Some of the fish in the affected areas may choose not to remain in these areas and may compete with fish for survival in areas where conditions are somewhat improved. The additional competition may reduce salmonid survival in other areas. NOAA Fisheries cannot accurately estimate the number of fish affected by competition, but does not expect this impact will cascade through the Lagunitas Creek watershed populations of these species based on the small number of fish likely affected. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse.

The largest impacts from roads in the action area are likely limited to a few identified areas. NOAA Fisheries is confident that full implementation of the road MOU will minimize adverse effects to listed salmonids from roads in general. However, NOAA Fisheries remains concerned that the four road areas identified by NPS have no clear schedule for remediation and repair. Remediation and repair activities for these roads will need to be consulted on separately.

Fish relocation for LWD placement will result in some loss of juvenile fish in the Lagunitas Creek watershed over the next ten years, approximately 3% of fish in the areas where relocation occurs. Improved habitat conditions for listed salmonids are the likely result of LWD placement. Long term improvements in living space, including better cover from predators, will likely increase fish production in the watershed in the long term.

Floodplain restoration efforts being conducted by the NPS are likely to provide long term benefits to listed fish populations in the Lagunitas Creek watershed. Specifically, the return of approximately 1 mile of floodplain habitat in Olema Creek will eventually re-create a large amount of overwintering habitat for salmonids in this important tributary. Increased production of salmonids is the likely result, because more juveniles will survive high winter flow events.

The populations of listed steelhead and coho salmon in these watersheds are significantly reduced in number from the best available estimates of historical numbers. Current population estimates appear to show small, relatively stable numbers for both species, although coho juveniles may be continuing to decline. Both species appear well distributed throughout the mainstem of Lagunitas Creek and Olema Creek in the action area, with use of several tributaries that are large enough to support fish. Chinook salmon may be establishing a population in the action area.

Habitat conditions in the action area are mixed, with areas of good, fair, and poor habitat conditions for listed salmonids. In the action area, several key components of habitat (riparian shade and stream temperature, sediment and turbidity, and habitat complexity including LWD cover and floodplain function) are expected to improve as a result of the proposed action. Long-term impacts from roads remain a concern in some small areas. On-going and cumulative effects are expected to result in further improvement to some habitat areas in the watershed, with little to no improvement, and the possibility for continued degradation, in other areas.

NOAA Fisheries does not expect the proposed action will appreciably reduce the survival or recovery of coho salmon or steelhead in the action area. Effects are mostly temporary, and occur in a limited number of small areas. The coho salmon and steelhead populations in the Lagunitas Creek watershed are low (and may be in continued decline), but remain well distributed. In NOAA Fisheries' judgement, their current numbers and distribution are likely high enough to weather the adverse impacts of the proposed grazing program, because impacts are minor, temporary, and will continue to lessen as the program progresses. The overall improvements in habitat expected as a result of this project and cumulative effects in the watershed are expected to allow the populations' numbers to expand in the years to come.

The Chinook salmon observed in the action area appear to be increasing. The number of adults observed in the action area has increased dramatically in recent years, and this trend is concurrent with increases in returns to other coastal streams in the CC ESU. While these increases may not be borne out by future population numbers, this suggests that factors other than habitat conditions in the action area are likely responsible for the increase in Chinook salmon numbers. It is unclear if Chinook salmon will be able to establish a population in the Lagunitas Creek watershed. NOAA Fisheries does not expect the minor and temporary impacts of the proposed grazing program will appreciably affect the ability of Chinook salmon to establish a population in the Lagunitas Creek watershed, and may over time improve the chances of population establishment.

B. Coho Salmon Critical Habitat

Based on the expected long-term improvements in habitat described above, it is unlikely that the value of critical habitat to CCC coho salmon will be appreciably diminished in the Lagunitas Creek watershed. Tributaries to Bolinas Lagoon or the Pacific Ocean from Bolinas Mesa do not currently contain coho salmon (or steelhead). These are short, mostly intermittent tributaries that in NOAA Fisheries judgement provide little, if any, conservation value to coho salmon.

VIII. CONCLUSION

After reviewing the best scientific and commercial data available, the current status of CCC coho salmon, CCC coho salmon critical habitat, CCC steelhead, CC Chinook salmon, the environmental baseline, the effects of the proposed project, and the cumulative effects, it is NOAA Fisheries' biological opinion that the proposed project action is not likely to jeopardize the continued existence of CCC coho salmon, CCC steelhead, and CC Chinook salmon, nor is it likely to destroy or adversely modify CCC coho salmon critical habitat.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. NOAA Fisheries further defines "harm" as an act that actually kills or injures a protected species (64 FR 60727). Harm can arise from significant habitat modification or degradation where it actually kills or injures protected species by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by NPS for the exemption in section 7(o)(2) to apply. The NPS has a continuing duty to regulate the activity covered by this incidental take statement. If the NPS (1) fails to assume and implement the terms and conditions, or (2) fails to require livestock grazing leaseholders to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to their leases, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, NPS must report the progress of the action and its impact on the species to NOAA Fisheries as specified in the incidental take statement [50 CFR 402.14(i)(3)].

A. Amount or Extent of Take

NOAA Fisheries anticipates that incidental take of CCC coho salmon, CC Chinook salmon, and CCC steelhead is likely to occur as a result of implementation of the proposed project. NOAA Fisheries anticipates that take is likely to be limited to small localized areas within the action area as described above. The best available information cannot be used to accurately determine the number of listed coho salmon and steelhead likely to be taken because these listed species are small and dwell in an aquatic environment that makes tracking the condition of specific individuals impracticable. Dead or injured fish will likely be eaten by scavengers and predators, washed downstream, or hidden in the substrate before they can be observed.

Take is anticipated based on the grazing lease program that NPS intends to continue to implement, the specific actions NPS will take in the next five years, and the current condition of salmonids and their habitat in the action area. Implementation of the grazing lease program in a manner different than described, or resulting in effects to instream habitat that exceed NOAA Fisheries' expectations as outlined in this opinion, may increase the amount of listed salmonids taken. Such changes in the proposed action, or results for salmonids and their habitat, may require reinitiation of consultation. NOAA Fisheries has developed habitat criteria to monitor the adverse effects to listed fish affected by the proposed project based on information provided by NPS, developed during consultation, and from the scientific literature. Exceedence of these criteria, described below in the Term and Conditions for Reasonable and Prudent Measure 1, indicates the potential for adverse effects to listed salmonids unanticipated in this opinion, and reinitiation of consultation may be required.

In addition, NOAA Fisheries anticipates that no more that 3% of salmonids relocated during LWD placement will be harmed or killed, as described in the *Effects Analysis* above.

B. Reasonable and Prudent Measures

NOAA Fisheries has determined that the following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of listed salmonids that may occur in the action area as a result of livestock grazing leases.

1. Monitor in-stream suspended sediment, fecal coliform, channel bed conditions, water temperatures, and riparian vegetation conditions to ensure that aquatic and riparian habitat conditions in the action area continue to improve and remain in good condition.

2. Provide monitoring summary reports to NOAA Fisheries.

3. Relocate salmonids and minimize sediment entry into water during LWD stream enhancement projects.

C. Terms and Conditions

The NPS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring conditions. These terms and conditions are non-discretionary.

1. The following terms and conditions implement reasonable and prudent measure No. 1.

NPS is proposing to continue their resource monitoring program as described in the *Description of the Proposed Action*. These measures will not be repeated here. Thresholds are established below to provide guidance for monitoring incidental take of listed salmonids through habitat conditions. Exceedance of the thresholds below requires discussion between NPS and NOAA Fisheries to determine if reinitiation of consultation is needed. The general procedure is as follows. If a threshold is exceeded, NPS shall inform NOAA Fisheries and investigate the cause of exceedance. If the sediment and turbidity levels are directly related to livestock operations (for example, a muddy field draining directly to a stream), NPS shall inform NOAA Fisheries of the measures that will be undertaken to avoid and/or minimize sediment entry to the stream. NOAA Fisheries intends to work with PRNS to resolve any issues that may arise through monitoring. Reinitiation may still need to occur if adverse effects to salmonids from the grazing lease program exceed those analyzed in the opinion.

a. Suspended Sediment and Fecal Coliform.

If suspended sediment levels are found in excess of 315 mg/L at the sites indicated in the *Description of the Proposed Action* (the mouth of Randall Gulch and the mouth of Schooner Creek) after the first major winter storm (2 or more inches in 24 hours) and the next subsequent storm of 1/4" or greater, NPS will contact NOAA Fisheries. The purpose of the contact will be to review the suspended sediment levels, the likely cause of the levels, and the steps, if any, NPS will take to address the suspended sediment levels. Reinitiation of consultation will be needed if the high sediment levels are the result of livestock grazing.

If suspended sediment levels during the winter and spring are found to be at 315 mg/L, or higher, at any one (or more) of the long term monitoring sites throughout the affected streams known to contain salmonids, NPS will contact NOAA Fisheries. The purpose of the contact will be to determine if the cause of the elevated sediment levels is related to the grazing lease program. If so, NPS will propose measures to ameliorate the suspended sediment levels. Reinitiation of consultation will be needed if the problem is related to the grazing lease program (*e.g.*, a muddy pasture is discharging into the creek) and either cannot be solved in one winter season, or if suspended sediment levels are expected to continue at these levels for over 24 hours[8].

In both cases above, if NPS can establish a correlation between NTUs and suspended sediment concentrations, NTU levels may be used in place of the suspended sediment concentrations described above. The use of the 90th percentile as proposed by NPS (in

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[8]A duration of these levels longer than 24 hours is roughly equivalent to the threshold of lethal effects determined by Newcombe and Jensen (1996) for this amount of suspended sediment.

the *Description of the Proposed Action* section) will add a focus on overall turbidity/suspended sediment levels that will help monitor the overall impacts of the grazing lease program as a whole. NPS shall notify NOAA Fisheries of the NTU levels that will be used once correlations to TSS or SSC have been developed and provide the data upon which the correlation to suspended sediment is based. Once this is accomplished, NOAA Fisheries will modify this incidental take statement to reflect the new monitoring criteria.

If the mean fecal coliform levels are found to be higher than 10,000 MPN FCU (most probable number fecal coliform units) per 100 milliliters at one or more monitoring sites on streams known to contain salmonids, NPS will determine if these high levels indicate a stream sediment problem from the grazing leases missed by sediment monitoring. NPS will then contact NOAA Fisheries for the purposes described above[9]. If NPS modifies their pathogen testing program to meet State Water Quality Total Maximum Daily Load Standards, NOAA Fisheries is likely to agree with NPS that these standards will meet NOAA Fisheries monitoring needs for pathogens. However, NPS shall discuss such changes with NOAA Fisheries prior to their implementation.

NOAA Fisheries acknowledges that these thresholds are being set without much specific scientific information available to determine precise thresholds of effect from this proposed project, especially on a watershed wide basis. The thresholds are based on NPS monitoring data from Olema Creek, as presented in Table 7 of the NPS's PRNS Water Quality Monitoring Report (NPS 2001). The thresholds have been set to highlight situations similar to the two identified in Table 7 where elevated sediment and fecal coliform levels were directly related to livestock management. They are also set based on Newcombe and Jensen's 1996 criteria, which were developed to help make general decisions about the nature and severity of sediment events, and whether further investigation is needed (Newcombe and Jensen 1996). The purpose of the thresholds is not to indicate that take exceedence has occurred, but that it may have occurred and further work is necessary by NPS and NOAA Fisheries to determine the likely causes and impact to listed species of the elevated suspended sediment and fecal coliform levels. NPS may need to develop and apply measures to reduce the elevated levels.

b. Channel Form

NPS shall monitor the condition of habitat complexity for salmonids in stream reaches directly adjacent to grazing leases. Not every reach needs to be monitored, but a reasonable sub-sample of reaches (an index reach system) should be repeated on a yearly

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[9]This threshold has been set by NOAA Fisheries to help indicate when livestock may be present in streams or on stream banks in numbers that could be harmful to salmonids. It may not be the same as State Water Quality standards, which include concerns and resources beyond salmonids.

basis. Monitoring shall include a systematic repeatable assessment of LWD and residual pool depths[10]. If pool depths or LWD show a decreasing trend over three or more years, NPS shall contact NOAA Fisheries to determine if consultation needs to be reinitiated. Reinitiation will likely be needed if the decrease observed is geomorphologically significant to the channel and biologically significant to listed salmonids in the action area, and if the decrease is related to the grazing lease program. For example, reinitiation of consultation will be needed if sedimentation was entering Olema Creek from ranch roads or pastures and filling in pools in the creek.

c. Stream Temperatures

NPS shall monitor the condition of stream temperatures at each index stream reach during the summer using continuous data recording devices to take readings every 2 hours or less. Temperature sensors shall be placed six inches to 1 foot off the bottom of the deepest pool in the reach. Data should be summarized as the seven day moving average of the daily maximum temperature (7DMADMT). Studies by NOAA Fisheries staff indicate that the 7DMADMT should not exceed 17.6°C once, 16.8°C 6 times, and 15.9°C 16 times. These thresholds represent conservative estimates of temperature conditions at which coho salmon will start to experience heat stress that could lead to harm (David Hines, NOAA Fisheries, personal communication, June 26, 2003). Because coho salmon have been found to be more sensitive to high water temperatures than steelhead (Welsch 2000), these thresholds will also suffice to monitor and minimize adverse effects to steelhead.

If these thresholds are exceeded, NPS shall contact NOAA Fisheries. The purpose of the contact will be to review the stream temperature conditions in streams in the action area and to determine the likely cause of elevated stream temperatures (lack of shade or general climate conditions, for example), their biological relevance to the salmonids in the action area, and if reinitiation of consultation is necessary. Assuming the restoration of vegetation in Olema Flat Pasture proceeds on a schedule appropriate for the vegetation planted and the local climate and soil conditions, exceedence of temperatures here shall not be cause for reinitiation as high temperatures in this area have been analyzed by NOAA Fisheries in this opinion.

d. Riparian Vegetation

NPS shall monitor riparian conditions where livestock have direct access to streams and where either temporary or permanent fencing has been used to limit livestock access. If vegetative ground cover is not established in two years from the issuance of this opinion, NPS shall contact NOAA Fisheries. The purpose of this contact shall be to review the

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[10]NPS's June 1, 2002, draft fish monitoring program protocol is acceptable for this purpose.

likely causes of the lack of ground cover, the biological implications for listed salmonids, and the steps NPS shall take to establish vegetation in a particular area if establishment is possible.

NPS shall develop revegetation success criteria for riparian areas currently lacking woody riparian plants where livestock have access to the riparian area, or where livestock have been recently, or will be, permanently excluded as described in the *Environmental Baseline* and *Description of the Proposed Action*. The criteria shall be based on the natural plant communities expected at each site for the region, and the current plant communities in adjacent areas upstream and downstream that have been relatively undisturbed by livestock grazing. Quantitative benchmarks or ranges shall be used for the number and distribution of different plant species. For example, a success criteria could be the establishment of between 7 and 12 of a certain tree species per acre. These criteria shall be forwarded to NOAA Fisheries for approval no later than 3 months from the issuance of this biological opinion.

Upon approval from NOAA Fisheries, these criteria shall be used to monitor the success of NPS's revegetation efforts. Every three years NPS shall determine if these criteria are met in each area. NPS shall contact NOAA Fisheries if any of these criteria are not being met. The purpose of this contact shall be as described above.

2. The following terms and conditions implement reasonable and prudent measure No. 2.

   a. Each year for the next six years, NPS shall submit a yearly monitoring summary report to NOAA Fisheries, not to exceed 5 pages, that describes:

      (1) The general extent and results of fish and fish habitat survey work done in the action area during the preceding year.
      (2) The results of water quality monitoring in the action area during the previous year, including the identification of sites experiencing water quality problems.
      (3) The current status of riparian areas within grazing leased lands, identifying those areas that are revegetating, and those that are experiencing loss of vegetation or other problems attributable to livestock.
      (4) The current status of roads used for livestock management, including identification of roads that are causing sedimentation of streams or blocking salmonid migration.
      (5) Any changes to livestock management strategies that are being implemented and their current status, including the status of affected stream habitat.
      (6) NPS's intended response to any issues of concern identified in (1)-(5) above.

   After 6 years, NPS shall meet with NOAA Fisheries to determine if yearly summaries continue to be needed.

b. Every 3 years during the next 12 years, NPS shall send a detailed report evaluating and analyzing the data gathered for the last 3 or more years.

c. Graphs, tables, and maps shall be used as appropriate. The purpose of these reports is to assist NOAA Fisheries and NPS in assessing the long-term impacts of the grazing lease program on listed salmonids and their habitats, and identify and correct any unanticipated impacts in a timely manner.

d. After 12 years, NPS shall meet with NOAA Fisheries to determine if the status of fish populations, habitat, and ranching operations in the park warrant a change in monitoring or reporting requirements.

3. The following terms and conditions implement reasonable and prudent measure No. 3.

a. If LWD placement involves instream work that disturbs stream beds and banks (*e.g.*, digging to key in LWD), NPS shall insure that work does not occur in flowing water or in standing water if listed salmonids are present. Where flowing water occurs in the project area, a culvert or pipe to transport these waters through or around the project area shall be installed along with sandbag cofferdams to isolate the workspace from flowing water. The pipe or culvert must be appropriate to allow juvenile salmonid movement downstream. All work areas with water shall then be de-watered and salmonids relocated to appropriate habitats.

b. The NPS's fishery biologist shall monitor placement and removal of sandbag cofferdams used to dewater the work area or portions of it. Once the workspace is isolated from flowing water, the biologist shall capture any steelhead and coho salmon 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. Salmonids shall be placed so as to prevent overcrowding of off site release areas.

c. The NPS shall ensure 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 removal such as seining shall be used and exhausted prior to the use of electrofishing methods. The use of electrofishing for herding fish shall not be used. Seining and electrofishing shall be conducted in according to the following guidelines:

(1) Seining Methods:

(a) Seining must be conducted by experienced individuals. After seining, individuals should monitor habitat areas and check for fish that were not captured during initial seining efforts, and repeat efforts if necessary.

(b) Captured fish will be released to adjacent stream areas as soon as possible.

(2) Electrofishing Methods:

(a) Electrofishing efforts should start with voltage, pulse width, and pulse rate set at the minimum values needed to capture fish. Settings should gradually be increased only to the where fish are immobilized for capture.
(b) Individuals that are netting immobilized fish should remove fish immediately from the water, and not allow the fish to remain in the electrical field for an extended period of time.
(c) Stream water temperature in the stream and in containers holding captured fish should not exceed 18°C at any time during the relocation effort. Buckets will be aerated.
(d) Captured fish will be released to adjacent stream areas as soon as possible. Fish will not be held in buckets while construction is completed.
(e) NPS shall provide NOAA Fisheries with a report within 2 months of any fish relocation activity. This report can be incorporated into the biological monitoring report for this project (see below). The report shall include the methods used during the fish relocation efforts, number and species captured, and the number of mortalities by species.

d. The fisheries biologist shall be present on site during the in channel work. 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. Should the project last one week or more, 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.

e. Work shall cease and NOAA Fisheries shall be contacted at once if more than 3% of steelhead or coho salmon are killed during relocation or associated activities. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. To contact NOAA Fisheries, call Eric Shott at 707-575-6089 regarding the above. If Eric Shott is not available, NOAA Fisheries Protected Resources Division in Santa Rosa shall be contacted at 707-575-6050.

XI. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. NOAA Fisheries recommends that NPS work with other agencies in the Lagunitas Creek watershed to conduct a watershed analysis and prepare a comprehensive watershed plan for the conservation of fish and wildlife, including listed salmonids. Such a plan should, among other things, prioritize road remediation and maintenance activities, prioritize fish passage improvements at road crossings, identify and prioritize areas where stream floodplains can be further restored, and identify and prioritize riparian areas for conservation and restoration. Such a plan should involve the local communities in the watershed, identify important cultural resources and capital improvements, and help to facilitate management of natural resources for public and private benefit while protecting and conserving those resources at risk.

XII. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the project proposal. In addition to the reinitiation events noted above, as provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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Enclosure 2

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS

I. INTRODUCTION

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established new requirements for Essential Fish Habitat (EFH) descriptions in Federal fishery management plans and to require Federal agencies to consult with the National Marine Fisheries Service (NOAA Fisheries) on activities that may adversely affect EFH. EFH for Pacific Coast salmon has been described in Appendix A, Amendment 14 to the Pacific Coast Salmon Fishery Management Plan. The National Park Service (NPS) Point Reyes National Seashore's livestock grazing leases Golden Gate National Recreation Areas's affects Lagunitas and Olema Creeks, which have been designated EFH for salmon.

Only species managed under a Federal fishery management plan are covered under the MSFCMA. Coho salmon and Chinook salmon are managed under Federal fishery management plans, whereas steelhead are not managed. Therefore, these EFH Conservation Recommendations address only coho salmon and do not address steelhead. No specific recommendations are presented for Chinook salmon EFH. Chinook salmon have not been present historically, but may be trying to establish a population in Lagunitas Creek. The recommendations below for coho salmon EFH will benefit Chinook salmon as well, due to the similarity of aquatic habitat requirements for each species.

II. LIFE HISTORY AND HABITAT REQUIREMENTS

General life history information for coho salmon is summarized in the preceding Biological Opinion. Further detailed information on coho salmon Evolutionarily Significant Units is available in the NOAA Fisheries status review of coho salmon from Washington, Oregon, and California (Weitkamp *et al.* 1995).

III. PROPOSED ACTION

The proposed action is described in the preceding biological opinion for the renewal of grazing leases at Point Reyes National Seashore.

IV. EFFECTS OF THE PROJECT ACTION

Effects of the proposed project on salmon EFH are those associated with the continuation of grazing leases on NPS lands in the Lagunitas Creek watershed. In the action area in this watershed, EFH is adversely affected due to this project by temporary habitat degradation, including: sedimentation, turbidity, high water temperatures, and loss of instream cover.

V. CONCLUSION

After reviewing the effects of the project, NOAA Fisheries expects that the project action, as proposed, will adversely affect the EFH of coho salmon in the Lagunitas Creek watershed.

VI. EFH CONSERVATION RECOMMENDATIONS

Section 305(b)(4)(A) of the MSFCMA authorizes NOAA Fisheries to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. In order to avoid, minimize and/or mitigate for the potential adverse effects, NOAA Fisheries is providing EFH Conservation Recommendations for this proposed project. These conservation recommendations are the following reasonable and prudent measures of the NOAA Fisheries' incidental take statement for this project and the associated biological opinion's conservation recommendations:

Reasonable and Prudent Measures 1 and 2 and their terms and conditions
Conservation Recommendation 1

VII. FEDERAL AGENCY STATUTORY REQUIREMENTS

The MSFCMA (Section 305(b)(4)(B)) and Federal regulations (50 CFR Section 600.920(j)) to implement the EFH provisions of the MSFCMA require Federal action agencies to provide a written response to EFH Conservation Recommendations within 30 days of its receipt. A preliminary response is acceptable if final action cannot be completed within 30 days. The final response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If your response is inconsistent with our EFH Conservation Recommendations, you must provide an explanation for not implementing those recommendations.

VIII. LITERATURE CITED

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Figure 1. Grazing Leases within the Action Area

Point Reyes National Seashore
Golden Gate National Recreation Area

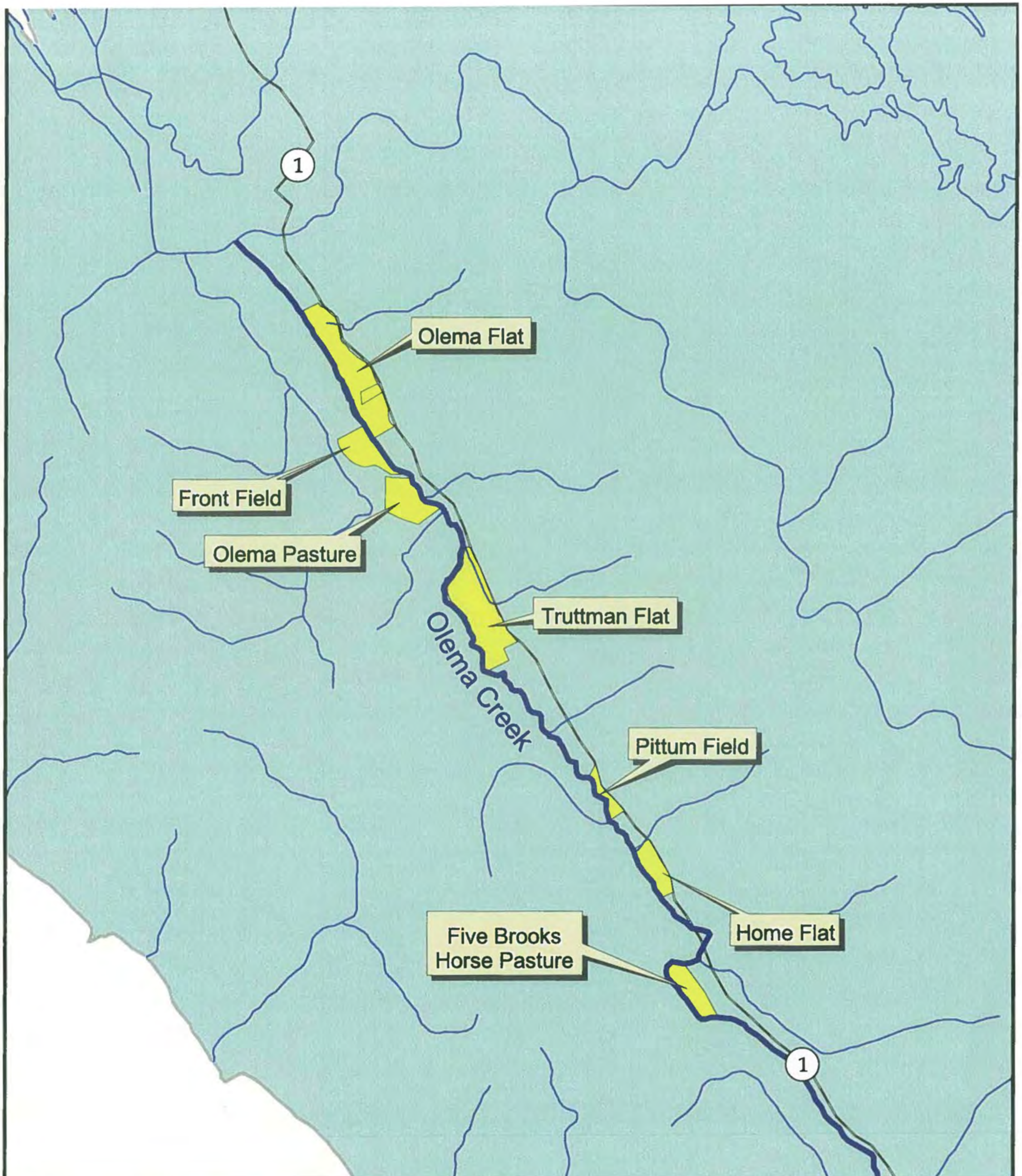

Figure 2. Olema Creek Pastures

Pastures along Olema Creek

1 0 1 2 Miles

N W E S

Sources: USGS, USEPA, CERES, National Park Service
Map Data: May 16, 2003
Created by: KD, Santa Rosa GIS Lab