UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

March 18, 2021 **Refer to NMFS No:** WCRO-2020-02698

Craig Kenkel, Superintendent
National Park Service
Point Reyes National Seashore
1 Bear Valley Road
Point Reyes Station, California 94956

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the National Park Service Point Reyes National Seashore General Management Plan Amendment

Dear Mr. Kenkel:

Thank you for your letter, received via email on September 18, 2020, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) and essential fish habitat provisions in section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)) for the National Park Service (NPS) Point Reyes National Seashore General Management Plan Amendment. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

In this biological opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of the federally endangered Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*), or the threatened CCC steelhead (*O. mykiss*) and California Coastal (CC) Chinook salmon (*O. tshawytscha*). We also conclude the proposed action is not likely to result in the destruction or adverse modification of designated critical habitat for CCC coho salmon or CCC steelhead. However, NMFS anticipates that incidental take of all three species is reasonably certain to occur as a result of the proposed action. Therefore, an incidental take statement with non-discretionary terms and conditions is included with the enclosed biological opinion.

NMFS also reviewed the likely effects of the proposed action on EFH. Based on our review, the proposed action will occur within an area identified as EFH managed under the Pacific Coast Salmon and Pacific Coast Groundfish Fishery Management Plans. The proposed action includes design, staging, monitoring, and adaptive management strategies to avoid or minimize potential adverse effects to EFH, and elements to promote habitat recovery. Thus, no additional EFH conservation recommendations are provided.

Please contact Jodi Charrier of the California Coastal Office in Santa Rosa at 707-575-6069 or jodi.charrier@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: David Press – dave_press@nps.gov
Brannon Ketcham – brannon_ketcham@nps.gov
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Copy to ARN File # 151422SWR2000SR802

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

The National Park Service Point Reyes National Seashore
General Management Plan Amendment

NMFS Consultation Number: WCRO-2020-02698
Action Agency: National Park Service

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Coho Salmon (*Oncorhynchus kisutch*)	Endangered	Yes	No	Yes	No
Central California Coast Steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
California Coastal Chinook Salmon (*O. tshawytscha*)	Threatened	Yes	No	N/A	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No
Pacific Coast Groundfish	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: March 18, 2021

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.) and implementing regulations at 50 CFR 402, as amended. We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at NMFS' North-Central Coast Office in Santa Rosa, California (ARN 151422SWR2000SSR802).

1.2. Consultation History

- August 8, 2019 - NMFS received a letter from The National Park Service (NPS) requesting formal consultation and The Point Reyes National Seashore (PRNS) General Management Plan Amendment Biological Assessment (BA) via email. NPS determined that the proposed action was likely to adversely affect federally endangered Central California Coast (CCC) coho salmon, threatened CCC steelhead, and California Coastal (CC) Chinook salmon as well as designated critical habitat for CCC coho salmon and steelhead. Since the proposed action will occur within an area identified as EFH for coho salmon and Chinook salmon managed under the Pacific Coast Salmon Fishery Management Plan, NPS also requested consultation on EFH.

- August 22, 2019 - NMFS sent an email to NPS, requesting additional information on the project description and details on the implementation of the April 5, 2004 biological opinion which covered livestock grazing within PRNS.

- September 12, 2019 - NMFS conducted a site visit with NPS.

- September 20, 2019 - NMFS received the requested information from NPS.

- October 25, 2019 - NMFS sent a notification letter to NPS clarifying that we would not initiate consultation until a final decision on a preferred alternative in the environmental impact statement (EIS) had been reached through the public National Environmental Policy Act (NEPA) process.

- January 23, 2020 - NMFS attended a site visit and stakeholder meeting at Point Reyes National Seashore.

- August 4, 2020 - NPS held a virtual meeting with NMFS, U.S. Fish and Wildlife Service (USFWS), and representatives for the ranching community to clarify applicant coordination, review process, and timing for the section 7 consultation.

- September 18, 2020 - NPS requested formal section 7 consultation, and provided a complete project description and the final EIS.

- September 30, 2020 - NMFS contacted NPS via email with notification that review of the incoming consultation request was complete and we had all of the information necessary to initiate formal section 7 consultation. The start date was set for September 18, 2020 with a due date for a biological opinion by January 30, 2021.

- November 23, 2020 – NMFS provided draft sections of the opinion to NPS for review. NPS then provided these draft sections to rancher applicants for their review.

- December 8, 2020 – NPS provided feedback to NMFS on draft sections of the opinion.

- December 10, 2020 – NMFS addressed NPS comments and returned a pdf containing revisions on sections of the draft opinion to be provided to rancher applicants.

- December 14, 2020 – NPS provided draft sections of the opinion to rancher applicants for review by December 23, 2020.

- December 29, 2020 – NPS provided a letter to NMFS containing rancher applicant comments on the draft sections of the opinion.

- December 30, 2020 – NMFS provided comments to NPS via email on the rancher applicant letter.

- January 21, 2021 – Phone call held between NMFS, NOAA Office of the General Counsel, NPS, and Department of the Interior solicitor to discuss review comments.

- January 29, 2021 – NMFS requested from NPS via email a 21-day extension of the consultation due to necessary revisions in response to rancher applicants, NPS, and NOAA Office of the General Counsel review. The final biological opinion will be issued on or before February 19, 2021.

- February 1, 2021 – NPS provided an email to NMFS approving the extension.

- February 23, 2021 – NMFS notified NPS that the consultation will be delayed beyond the extension deadline.

- February 16 – March 4, 2021 – Email and phone call exchange between NMFS and NPS to further clarify and refine measures related to herbicide use.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Under the MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910). We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

The proposed action (as identified in the preferred alternative in the final EIS) is to amend the NPS 1980 General Management Plan (plan) (NPS 1980) and update management guidance for more than 28,000 acres, including all lands currently leased for beef and dairy ranching and administered by Point Reyes National Seashore in Marin County, California (Figure 1). The amended plan will adopt a new zoning framework, allow for continued ranching with lease-permit terms of up to 20 years, and set a population threshold for the Drakes Beach Tule elk (*Cervus canadensis nannodes*) herd. NPS estimates authorizations will be similar to existing lease-permits, with approximately 2,400 animal units (AU) of beef cattle and 3,115 dairy animals. The plan includes best management practices (BMPs) for ranching operations within the park. The overall goals include: environmental protection and restoration, public recreation opportunities, and permitting for ranchers to continue agricultural operations.

1.3.1 Agricultural Lease-Permits and Rancher Operator Agreements

Under the proposed action, NPS will issue 20-year term lease-permits to continue beef and dairy operations on approximately 26,100 acres. The lease-permits will authorize the ranch families to operate on park lands and will include general terms and conditions, commitments, and standards for the operations. The lease-permits will also establish the process for ranchers to work with NPS to identify priority projects. Specific details for operations and infrastructure will be identified through Ranch Operating Agreements (ROAs) that will be included in the lease-permit for each ranch property.

The ROAs will identify ranch-specific operational details and requirements associated with: (1) beef or dairy ranching, (2) authorized diversification activities, and (3) maintenance requirements. The ROAs will also identify U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Conservation Practice Standards and mitigation measures that apply to authorized management activities. ROAs will also incorporate the U.S. Environmental Protection Agency (EPA), state, and Regional Water Quality Control Board (RWQCB) requirements, including implementation of water quality improvement practices, monitoring, manure and nutrient management, and grazing management. Regulations include total maximum daily loads and associated grazing waivers in the Tomales Bay watershed, as well as waste discharge requirements or waivers of discharge requirements for confined animal facilities. Maps identifying each resource management subzone (described in the next section) and associated with each ranch will be attached to the ranch's ROA to guide the location of the authorized activities.

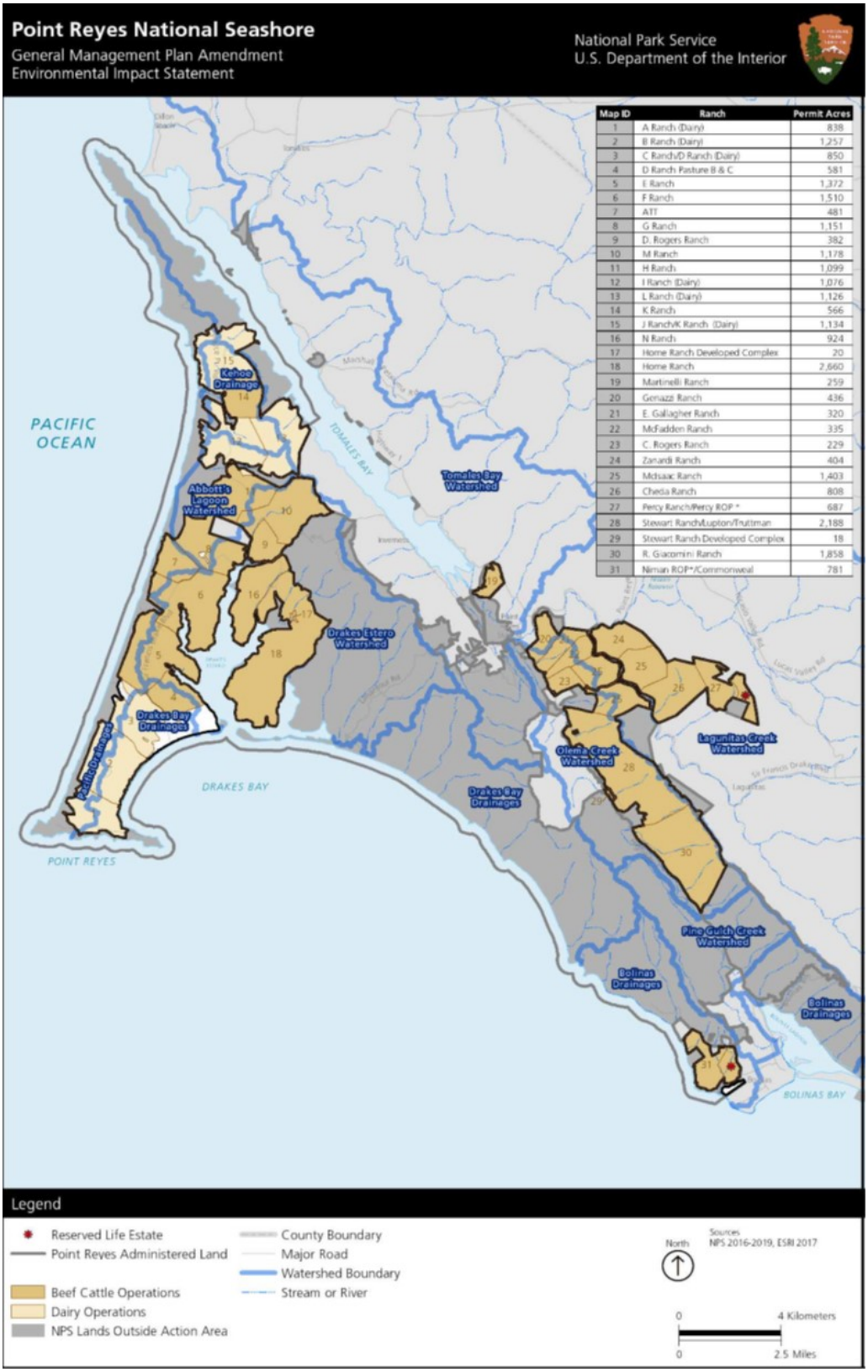

Figure 1. Map of beef and dairy ranches in the plan area (modified from NPS 2020c). See Section 2.3 below for a description of the ESA section 7 action area.

ROAs will be developed with each rancher and reviewed during an annual meeting with NPS staff. If no changes are made, the existing ROA will be recertified for the following year of the lease term. As part of annual ROA discussions, ranchers may submit proposals for other activities that are compatible with the management zoning and other parameters of the plan to NPS. Depending on the proposal, other types of compliance and permitting requirements may also apply (including but not limited to a separate ESA section 7 consultation with NMFS, Clean Water Act section 404 permit from the U.S. Army Corps of Engineers, or a Clean Water Act section 401 water quality certification from the California Water Board). If NPS approves changes to operational practices or requirements, the ROA will be revised accordingly and signed by both parties. If approved by NPS following the conclusion of all compliance and permitting processes, the proposed activity will be included in a revised ROA for the ranch. Any additional monitoring requirements specific to authorized activities will also be included in each ROA. NPS will continue to work closely with local agricultural organizations, state agencies, natural resource conservation experts, and stakeholder groups to share information and discuss issues related to ranching. NPS will have the discretion and authority to revoke ROA lease-permits if not up to the standard of the plan.

1.3.2 Zoning Framework

NPS will apply two new management zones, the Ranchland zone and the Scenic Landscape zone, to the plan area. New opportunities and improvements to facilitate public use and enjoyment in the plan area will be implemented in both the Ranchland and Scenic Landscape zones. The Scenic Landscape zone will apply to 600 acres that are in the plan area but not part of any existing ranch lease-permit, including the primary range of the Drakes Beach Tule elk herd.

Ranching activities will be authorized on approximately 26,100 acres within the Ranchland zone. NPS has developed a subzoning framework for the Ranchland zone to distinguish between the: 1) Resource Protection, 2) Range, 3) Pasture, and 4) Ranch Core subzones (Figure 2).

The subzones were developed based on topography, sensitive resources, and ranch management activities. This subzoning framework allows NPS to direct more intensive activities outside of sensitive cultural and natural resource areas. Figure 2 illustrates the proposed zoning for each ranch operation. The exact location will be defined in each lessee's individual ROA.

Resource Protection Subzone - To protect surface waters, threatened and endangered species habitat, and cultural resource locations, no grazing will be authorized within the Resource Protection subzone. This subzone will encompass approximately 2,000 acres, including 800 acres within current lease-permit boundaries already excluded from ranching and 1,200 additional acres that will be excluded from ranching.

Range Subzone - Grazing will be authorized on lands within the Range subzone, but more intensive activities are not allowed because of the presence of sensitive resources including rare plants, aquatic habitats, forested areas, and critical habitat for threatened and endangered species. This subzone includes nearly all areas with slopes greater than 20 percent. Authorized activities will be limited to cattle grazing. No vegetation management or diversification activities will be allowed unless they follow NPS resource management goals and objectives. Approximately 16,900 acres (nearly 65 percent) of the lands under lease-permit are identified as Range subzone.

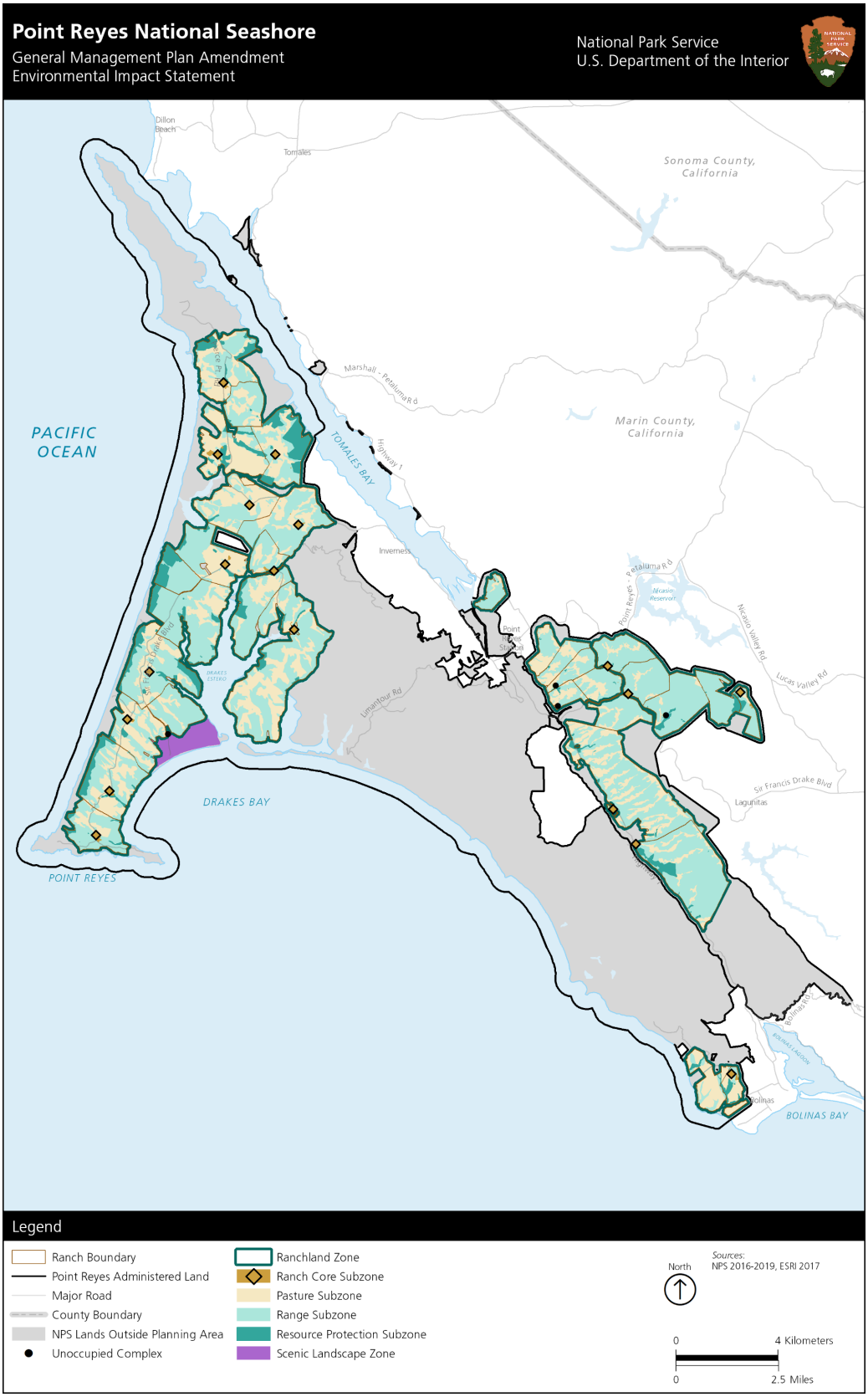

Figure 2. Proposed zoning for each ranch operation (NPS 2020c).

Pasture Subzone - The Pasture subzone will be used primarily for the production of livestock and includes lands where no sensitive resources are known to occur. Approximately 9,000 acres (nearly 34 percent) of the area under lease-permit are identified as Pasture. Existing levels of manure and nutrient management on dairies (approximately 2,500 acres) and forage production (approximately 1,000 acres) will be authorized in the Pasture subzone. In addition to grazing, vegetation management activities such as seeding and mowing and some diversification activities (e.g., new types of livestock, row crops, stabling horses, paid ranch tours and farm stays, small-scale processing of dairy products) will be authorized in this subzone.

Ranch Core Subzone - The Ranch Core subzone includes the developed complex of structures on most ranches. Ranches without a developed complex that are not occupied by individuals associated with ranch operations will not have a Ranch Core subzone. Approximately 220 acres (less than 1 percent) of the area under lease-permit are included in this subzone. It also includes disturbed lands immediately adjacent to developed complexes that do not have the potential to affect sensitive resources. These disturbed lands will not exceed 2.5 acres and will be available for diversification activities or high intensity operations (e.g., building new infrastructure).

1.3.3 Range Operations and Management

Dairy and Beef Operations

Approximately 18,000 acres (20 percent) of PRNS (those located on the peninsula) and 10,000 acres (60 percent) of the north district of Golden Gate National Recreation Area (GGNRA) (those located adjacent to Lagunitas and Olema creeks) are used for beef and dairy ranching under agricultural lease-permits (Figure 1). Both areas are administered by PRNS. Twenty-four families hold lease-permits for beef and dairy cattle operations, and approximately 2,400 AU of livestock on beef ranches and 3,315 dairy animals are authorized on a year-round basis. Eighteen lease-permits include residential uses specific to on-site ranch operations. AU or dairy animals allowed under a lease-permit will continue to be managed to meet the 1,200 pounds per acre residual dry matter (RDM) standard and other NPS management objectives. NPS will determine annual adjustments to AU or dairy animals based on the use of a rangeland forage production model (see Appendix K of the EIS, NPS 2020c), monitoring data, NPS range program manager and rancher expertise, historical information, USDA guidelines, and variation in ground conditions and weather/climate.

The six organic dairies within the Pasture and Ranch Core subzones are located near ranch complexes and require extensive infrastructure to meet production and water quality standards. Dairies produce large quantities of concentrated manure waste and require intensive manure and nutrient management to avoid contaminating aquatic habitats. Dairies manage animal manure by accumulating it in storage ponds and then spreading the liquid or slurry on fields (approximately 2,500 acres) by means of trucks or pumping through pipes that drain waste out onto fields. These activities are conducted outside the rainy season or during dry periods. In addition to compliance with state regulations, the dairies must also comply with the NPS monitoring and reporting program, and development and implementation of site-specific management plans.

The 18 beef operations in the management area vary from the use of residential complexes and other infrastructure such as hay barns, to grazing-only with no associated infrastructure. Beef

cattle are allowed to graze on open grassland year-round. Beef operations typically do not require manure management systems because the cattle are distributed across the landscape.

Elk Management

Management of free-ranging Tule elk under the proposed action will allow elk on the Point Reyes peninsula, but with limited geographic distribution and controls on herd size on areas under lease-permit. There are currently three Tule elk herds within Point Reyes: Limantour, Tomales Point, and Drakes Beach (Figure 3). NPS will actively manage the existing free-range Drakes Beach elk herd with a population target of 120 adults. No new elk herds will be allowed to establish in the Limantour or Tomales Point populations within the plan area.

Forage Production

The purpose of forage production is to optimize yield and quality of forage for livestock and promote vigorous plant regrowth. Forage activities include seedbed preparation, manure spreading, seeding, and harvest mowing to provide feed for consumption by livestock. Non-native grasses, such as ryegrass (*Lolium* spp.), oat grass (*Avena* spp.), and vetch (*Vicia* spp.) are typically planted. Approximately 1,000 acres on four ranches within the Pasture subzone are currently authorized for forage within the plan area and implement current conservation standards set by the NRCS.

Vegetation Management

Under the plan, vegetation will be managed via targeted grazing, mowing and herbicides, and upland and riparian management and planting. Shrub and weed control are conducted to maintain or increase areas of grassland habitat available for grazing activities. Mowing involves cutting or removal of vegetation for forage and control of herbaceous weeds and woody plants, including those that are invasive and noxious. Use of herbicides is strictly limited and must comply with NPS regulations and procedures, including reporting requirements. All lease-permits require herbicides to be handled and disposed of in accordance with applicable laws. Mowing and herbicides will be allowed in the Pasture and Ranch Core subzones and site-specific management may be allowed in the Range subzone. NPS will review each ranch's proposed vegetation management activities on an annual basis and projects within the size and location limitations will be approved and incorporated into their ROA along with all applicable mitigation measures in Appendix F of the EIS (NPS 2020c).

Upland and riparian vegetation management and planting includes the following activities: critical area planting, range planting, riparian herbaceous cover, riparian forest buffer, windbreak and shelterbelt establishment, tree and shrub establishment, mulching, conservation cover, and wildlife habitat planting (see Appendix F of the EIS for full descriptions of these activities). The purpose of upland and riparian vegetation management and planting is to: 1) restore, enhance, or create desired plant communities and fish and wildlife habitats; 2) protect soils, control erosion, reduce sediment, and improve water quality; 3) improve accessibility, quantity, and quality of forage and browse for livestock and wildlife; 4) improve air quality; 5) sequester carbon; and 6) improve soil health.

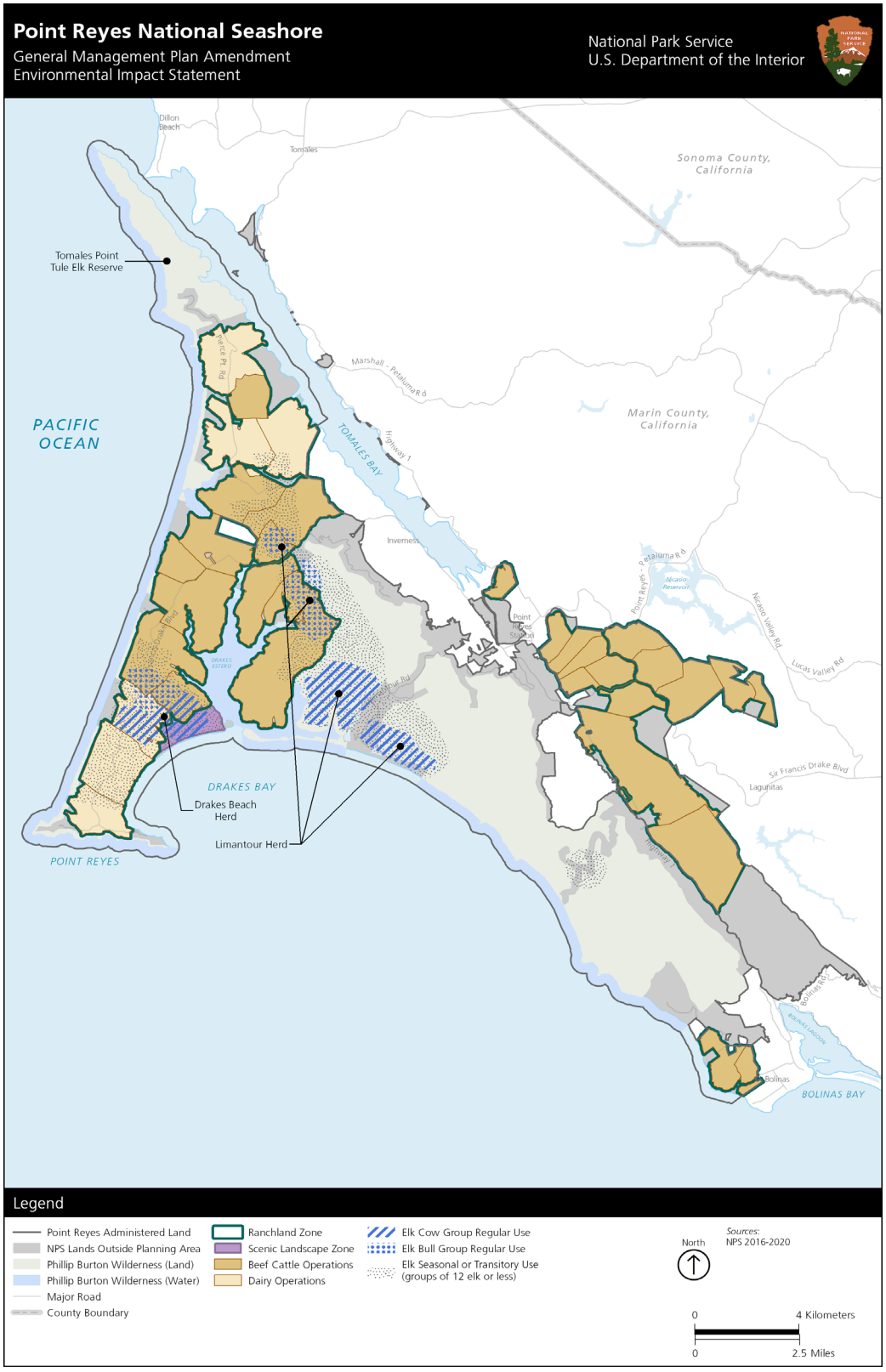

Figure 3. Tule Elk Range and Herds within the plan area (NPS 2020c).

NPS, in coordination with ranchers, has implemented targeted grazing to maintain and enhance rare plant species populations, ensure adequate vegetative cover in riparian areas, and control weeds. Targeted grazing differs from traditional grazing management in that the goal of targeted grazing is to apply defoliation or trampling to achieve specific resource management objectives; whereas the goal of traditional livestock grazing management is the production of livestock crops (Bailey *et al.* 2019). Targeted grazing can be accomplished via rotating cattle seasonally and used to improve or maintain the condition of natural resources such as desired species composition and resilience of plant communities, riparian and watershed function, and soil erosion and health.

1.3.4 Ranch Infrastructure

Over the past two decades, NPS has implemented 170 activities from the following categories to improve resource conditions on ranched lands (Figure 4). NPS relied on how many of these activities were implemented in the past to predict how many may occur during the 20-year lease term. Implementation depends largely on available funding. NPS will coordinate with ranchers through the lease-permit and ROA process to ensure priority projects to protect resources are identified and addressed. The following ranch infrastructure activities will be authorized upon approval by NPS:

- Road Upgrade and Decommissioning,
- Stream Crossings,
- Infrastructure Management,
- Waterway Vegetation and Plantings,
- Fencing,
- Livestock Water Supply,
- Pond Restoration,
- Waterway Stabilization.

The purpose of road upgrade and decommissioning is to prevent erosion and protect water quality by making improvements to an existing road network. Activities may include re-grading surfaces, installing or repairing culverts, or constructing cross-road drains. In areas where roads are no longer necessary for ranch or park operations, they may be decommissioned to restore more natural drainage and habitat conditions. NPS has worked with ranchers to implement several road upgrade and decommissioning activities in the plan area; however, a number of roads still have erosion issues or are no longer actively used or maintained. NPS assumes 20 access road projects, up to 10 trail and walkways, 40 structures for water control, and 5 road closure and treatment projects may be implemented over the 20-year lease-permit term.

Stream crossings stabilize an area across a watercourse to provide access for people, livestock, equipment, and vehicles. They also protect water quality by reducing the delivery of sediment and other pollutants into the water. Bridges authorized under this activity will fully span the watercourse at the top-of-bank. Ford crossings are best suited for use in wide, shallow watercourses with firm streambeds and when use of the crossing is infrequent. However, if the stream crossing will be used often, as in a dairy operation, a bridge or culvert may be required.

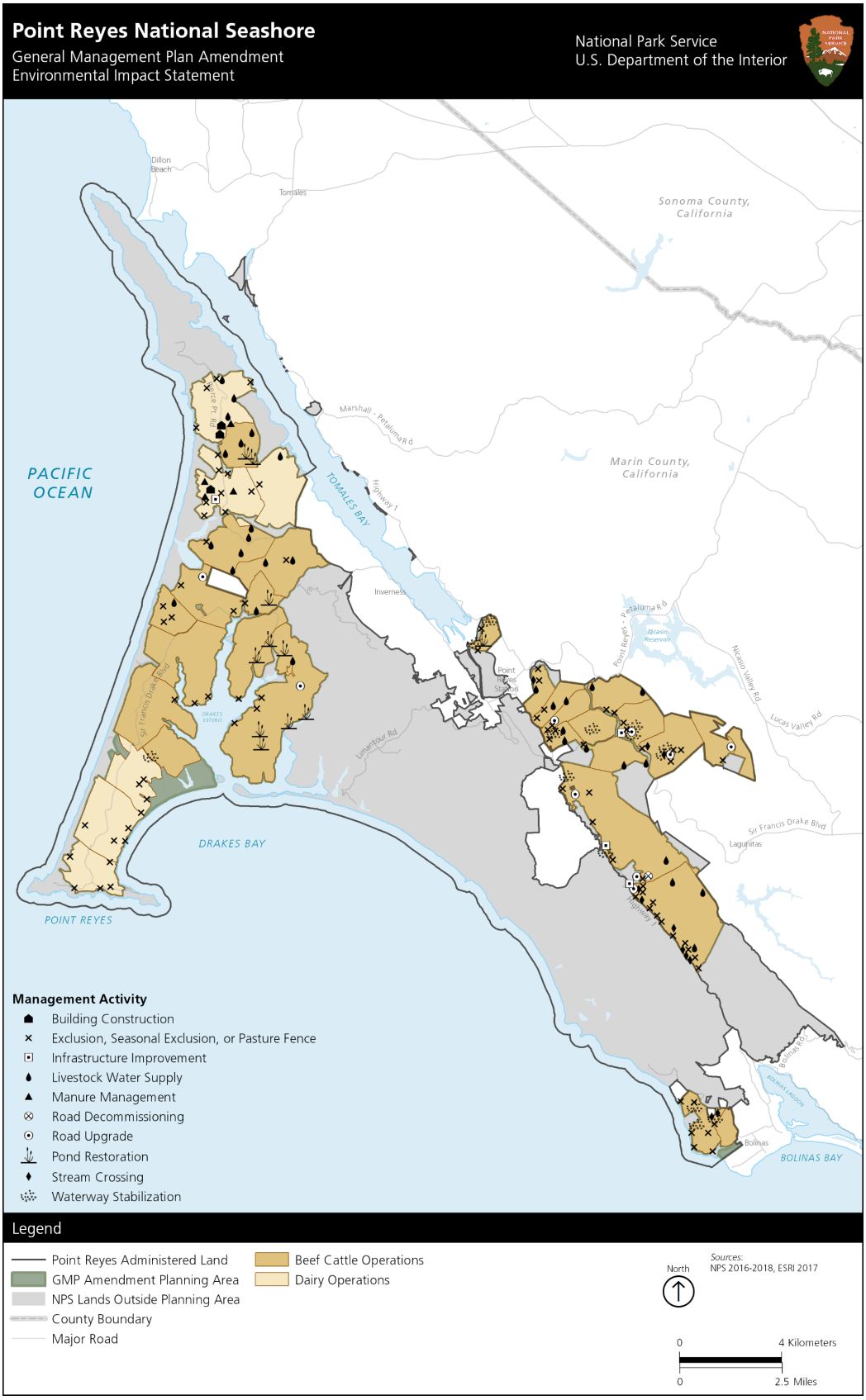

Figure 4. NPS has implemented 170 activities to improve resource conditions in the plan area over the past twenty years (NPS 2020c).

Stream crossings may involve grading and use of mechanized equipment and will be designed to accommodate for site specific conditions and accommodate sediment transport and passage of large woody materials. NPS assumes up to 16 stream crossing projects may occur over the 20-year lease-permit term.

Infrastructure management activities protect heavily used areas by preventing erosion and degradation of critical infrastructure, separating clean runoff from pollutant sources, and preventing flooding in Ranch Core areas. Suitable vegetation may be planted to convey surface water and filter pollutants. NPS assumes 10 roof and covers projects may be implemented over the 20-year lease-permit term, with additional roof runoff structures developed as needed, associated with all buildings. Heavy use area protections are a regular practice associated with troughs and feeding areas, as well as corrals and heavily travelled lanes in the ranch complex.

Waterway Vegetation and Plantings are used in areas where vegetative protection is needed to prevent erosion and improve runoff water quality through infiltration that removes sediment and other suspended solids. NPS assumes up to 25 Grassed Waterways and 12 Filter Strip projects may be implemented over the 20-year lease-permit term.

Fencing provides a means to control the movement of animals, people, and vehicles. Proper fencing allows for livestock management in a rotational grazing program, restricting access to an area being revegetated and other sensitive resources. New fencing will continue to require NPS authorization, and NPS will work with ranchers to ensure that new fence installations and replacements consider wildlife-friendly designs. Approximately 20 percent of the 340 miles of existing fencing will be replaced, 24 miles of new fence will be installed for the Resource Protection subzone, and an additional 35 miles of new fence will be constructed to improve livestock management over the 20-year lease-permit term.

Alternative livestock water sources help to restrict livestock access to streams and wetlands and to provide cleaner, more reliable, and well-distributed drinking water. Most ranches have water developments for cattle consumption, including developed springs, wells, and associated storage tanks and troughs. Many ranches also have aging or abandoned infrastructure. NPS has worked with ranchers to redevelop sources and provide off-stream water to cattle distributed throughout pastures. Redevelopment of existing water sources and associated distribution infrastructure may be authorized following NPS review and approval. No new water sources (e.g., new wells) will be approved as part of the proposed action. NPS assumes up to 25 spring developments, 40 livestock pipelines, 30 watering facilities, and 24 pumping plants may be authorized over the 20-year lease-permit term.

Pond restoration will be limited to restoration and maintenance of existing water impoundment structures. Restoration actions include repairs of emergency spillways, alternative pipe outlets for water flow, and removal of accumulated silt to restore a pond's original storage capacity. No new in-stream ponds or restoration activities involving an increase in the original area or storage capacity of a pond will be authorized. NPS has worked with ranchers in the plan area to maintain functioning stock ponds and the habitat they provide for wildlife such as the California red-legged frog (*Rana aurora draytonii*). NPS assumes up to 25 pond restoration projects may occur over the 20-year lease-permit term.

Waterway stabilization structures and lined waterways are used to stabilize grade, prevent channel down-cutting, reduce erosion of creek banks, avoid advancement of gullies, and reduce

sediment delivery. Such stabilization can also be used to stop sediment aggradation in channels that may be limiting aquatic passage and to maintain the water table. Implementation of waterway stabilization measures may require grading and use of heavy equipment. NPS assumes up to 40 grade stabilization structure (headcut repair) and 20 lined waterway projects (drainage ditch stabilization) may occur over the 20-year lease-permit term.

1.3.5 Best Management Practices and Minimization Measures

The terms and conditions of grazing permits have been made more rigorous since adoption of the 1990 *Range Management Guidelines*. Under the proposed action, NPS will implement extensive practice standards and avoidance, minimization, and mitigation measures to protect and restore natural resources on ranches. Programmatic approaches will be established for streamlined implementation of these measures under ROAs for each ranch. Table 3-3 of the BA (NPS 2020a) and Appendix F of the EIS (NPS 2020c) summarize project size limits and the nondiscretionary measures that will be implemented to ensure the protection of federally listed species under the jurisdiction of NMFS and are incorporated here by reference. Key measures include:

- Activities within the Range subzone, which includes approximately 77 percent of the stream miles in the plan area and all areas with slopes greater than 20 percent, will be restricted to cattle grazing.

- Rancher lease-permits will continue to be managed to meet the 1,200 pounds per acre RDM standard.

- Ranchers will be required to monitor and maintain riparian fencing.

- Erosion and sediment control measures will be available at all times where likelihood of sediment input into waterways exists.

- Work that will disturb waterways or sensitive riparian habitats outside the June 1 through October 31 time frame must be approved in advance by the NPS.

- In-stream crossings shall not be placed within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 4,921 feet (1,500 meters) apart. Crossing construction will not exceed 150 feet per structure and will be designed to require the minimum amount of dewatering, not to exceed 500 feet of channel.

- Culverts will be sized for a 100-year, 24-hour storm event. Smaller culverts may be used (minimum 10-year storm capacity but not less than 12 inches in diameter) if topography and overflow facilities are adequate to prevent damage from larger storms or site conditions preclude use of a larger culvert. Outlets will be placed in a well-vegetated area that will not be subject to erosion, or the outlet will be rocked with an energy dissipater or stabilized by other means to provide a suitable location to discharge stormwater from the roadway that prevents erosion. Culverts that require Clean Water Act section 404 permits from the U.S. Army Corps of Engineers will be designed and stamped by a licensed engineer, geologist, landscape architect or a qualified NRCS engineer.

- During the implementation of upland and riparian vegetation management and planting, or Ranch Infrastructure activities (described above), no more than 0.10 acre of native riparian trees, shrubs, or woody perennials may be removed from riparian areas, for each project implemented and only if the area will be replanted with native vegetation. NPS will review each ranch's proposed vegetation management activities on an annual basis and projects within the size and location limitations will be approved and incorporated into their ROA along with all applicable mitigation measures in Appendix F of the EIS (NPS 2020c). Where the area is exclusively nonnative species, up to 5 acres of riparian vegetation may be removed or treated.

*Additional measures specific to herbicide application (*several of these measures were added to the project description during the consultation process as a result of agreement between NPS and NMFS):

- Vegetation management using herbicides will comply with NPS strict regulations and procedures, applicable handling and disposal laws, and the use of appropriate herbicide application methods (e.g., restrictions on spraying during windy or wet days) to minimize or prevent adverse impacts on surface water quality that could affect listed salmonids.

- Herbicide will not be applied within 15 feet of aquatic features in salmonid habitat and only spot application (applied directly or with a backpack sprayer) will be allowed between 15-100 feet. No broadcast spraying will be allowed within this 100-foot buffer zone. Aerial application is not included in the proposed action.

- Herbicides and surfactants used within the 100-foot buffer zone of salmonid habitat will be limited to those found in Table 1. If other chemicals are proposed for use in this buffer zone within the 20-year plan term, they will be restricted to those approved by EPA for use in aquatic environments. In addition, NPS will request NMFS review of any new chemicals proposed for use to ensure that reinitiation of ESA section 7 consultation or separate section 7 consultation is not needed.

- Herbicides will not be applied when average wind speeds exceed 10 miles per hour at plant height or when air temperature exceeds 85 degrees.

- Herbicides will not be applied within 24 hours of predicted rainfall (>20 percent chance) or until plants are dry following rainfall and not under wet conditions due to dense fog.

- Spot treatments will be the most common method of application. Broadcast treatment will only be considered for more severe infestations, as approved by NPS.

- Over the last 15 years, all 6 dairies have converted to organic operations. The use of commercial fertilizer will not be authorized on certified organic lands and rangelands in the plan area.

- NPS must approve the chemical use proposal before a product can be purchased or applied. Applications are only to be performed by or under the supervision of a certified or registered applicator licensed under the procedures of a federal or state certification

system. All herbicide and pesticide applications are reported to NPS annually.

Table 1. Herbicides and their active ingredients and target species used within the plan area from 2010-2020.

Herbicide Brand Name	Active Ingredient	Target Species
Milestone	Aminopyralid	*Arctotheca calendula, Cytisus scoparius, Carthamus lanatus, Centaurea calcitrapa, Elymus caput-medusae*
Habitat	Imazapyr	*Ammophila arenaria, Cytisus scoparius, Lepidium latifolium*
Polaris	Imazapyr	*Fallopia japonica*
AquaNeat	Glyphosate	*Ammophila arenaria, Carpobrotus edulis, Cytisus scoparius, Ehrharta erecta*
Garlon4Ultra	Triclopyr BEE	*Cytisus scoparius, Eucalyptus globulus*
Roundup Custom	Glyphosate	*Ammophila arenaria*
Telar XP	Chlorsulfuron	*Romulea rosea*
Competitor (Surfactant)	Ethyl Oleate, Sorbitan Alkylpolyethoxylate Ester, Dialkyl Polyoxyethylene Glycol	*Carthamus lanatus*

1.3.6 Monitoring

NPS will conduct annual meetings with individual ranches to ensure compliance with lease-permit conditions and regulatory requirements, and to assess changes that may affect resource conditions (e.g., early detection of invasive species, identification of new areas of erosion). Periodic monitoring is also conducted in association with the implementation of projects and restoration activities. Types of monitoring that occur within the plan area include maintenance of baseline water quality monitoring water stations, vegetation (including rare plants and invasive species), riparian condition, RDM, and infrastructure condition. Riparian restoration and invasive species management are also performed on a routine basis. NPS will continue to use the information obtained from the monitoring programs described below in conjunction with annual review of individual ROAs to pinpoint any specific water quality or other habitat problems related to the grazing leases (and other activities). If monitoring has identified conditions detrimental to salmonids or their habitat, NPS will develop a list of needed actions with the lease

holder and ensure such corrective actions are implemented. No new or site-specific monitoring is being proposed as part of the proposed action.

Fish and Fish Habitat Monitoring

In 1998, the San Francisco Bay Area Network program and its partners (NPS) began monitoring coho salmon and steelhead in Olema, Redwood, and Pine Gulch creeks and have documented significant information regarding coho salmon behavior, life history, distribution, and population trends. NPS submits salmonid monitoring data from adult escapement surveys, outmigrant smolt trapping, and basin-wide coho surveys to the California Department of Fish and Wildlife (CDFW) under the state's Coastal Monitoring Program. This program informs NMFS's five-year status reviews. The Marin Municipal Water District (MMWD) conducts extensive monitoring on stream reaches affected by the reservoirs it manages, including Lagunitas Creek, Devils Gulch, and the main-stem of San Geronimo Creek. MMWD's annual salmonid monitoring data (2013, 2014, 2016, and 2018) are incorporated into a network of Salmonid Life Cycle Monitoring Stations along the California coast. The Salmon Protection and Watershed Network (SPAWN) monitors salmonids in six tributaries of San Geronimo Creek.

Water Quality Monitoring

NPS has conducted fecal coliform sampling at the Lagunitas and Olema Creek watersheds, monthly and during two five-week intervals (one during summer and one during winter) to inform the San Francisco Bay RWQCB Tomales Bay Pathogen TMDL program (Wallitner 2016). Samples collected in the field are also tested for other pathogenic indicator bacteria (e.g., *Escherichia coli* [E. coli] and total coliform) and nutrient parameters.

NPS has conducted water quality monitoring in the Lagunitas Creek watershed (including Olema Creek) and tributaries to Drakes Estero since 1999. Core parameters measured in the field include temperature (air and water), DO, pH, specific conductance, and turbidity. A long-term data set exists for six primary Olema Creek monitoring sites, where monthly water quality monitoring was formalized under the San Francisco Bay Area Network Freshwater Quality Monitoring Program beginning in fall 2006 (Wallitner 2016; Wallitner and Pincetich 2017). This program also monitors two sampling sites in the Lagunitas Creek watershed on the rotating two-year cycle described below. NPS monitored two additional tributaries of Olema Creek and one of the Lagunitas sites for approximately eight years ending in 2014, collecting only core parameter and pathogenic bacteria data.

Each watershed is monitored monthly for a two-year period and monitoring is performed at certain sites in a watershed every four years. The only exception to the rotating basin approach is the Olema Creek watershed, which is monitored annually. An effort is made to visit each site at approximately the same time of day, once a month, and to attempt to capture at least one storm event per year (Wallitner 2016). Water quality monitoring data are compared against established water quality objectives. Only half of the San Francisco Bay Area Network's freshwater quality parameters have objectives established by the RWQCB or EPA; other parameters (temperature, specific conductance, turbidity, and nitrate) do not have established water quality objectives and are compared to ecological objectives drawn from scientific literature. NPS will continue to follow this water quality monitoring program to assess current aquatic conditions, identify pollution sources and address any point-source or obvious problems associated with livestock operations in the plan area.

Vegetation Monitoring

The Range Monitoring Handbook (NPS 1990b) outlines the methodologies used to assess rangeland vegetation species condition and trend and conduct RDM monitoring. Monitoring is designed to determine range carrying capacities, evaluate the effectiveness of current grazing management, and provide baseline data on plant communities. In addition to RDM, NPS conducted spring species composition monitoring at key locations during multiple years from 1987 to 2011. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review. NPS has also established forage productivity plots on a subset of ranches, which are monitored in spring to aid in determination of stocking rates. Site-specific conditions and management goals may call for adjusting the minimum RDM standard for particular sites.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for species addressed in this opinion use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: 1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species, or 2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

To conduct the assessment presented in this opinion, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. For information that has been taken directly from published, citable documents, those citations have been reference in the text and listed at the end of this document.

Additional information regarding the potential effects of the proposed activities on the listed species, their anticipated response to these actions, and the environmental consequences of the actions was formulated from the aforementioned resources, and the following:

- NPS 2020a (BA) - Point Reyes National Seashore General Management Plan Amendment Environmental Impact Statement Biological Assessment. Prepared for National Marnie Fisheries Service. September 2020. 79pp.
- NPS 2020b (EIS) - U.S. Department of the Interior, National Park Service Point Reyes National Seashore General Management Plan Amendment Environmental Impact Statement. September 2020. 250 pp.
- NPS 2020c (EIS Appendices) - U.S. Department of the Interior, National Park Service Point Reyes National Seashore General Management Plan Amendment Environmental Impact Statement Appendices. September 2020. 646 pp.
- NMFS 2012a - Final Recovery Plan for Central California Coast Coho Salmon Evolutionarily Significant Unit. Southwest Region, Santa Rosa, California. September 2012.
- NMFS 2016a - 5-Year Review: Summary and Evaluation of California Coastal Chinook Salmon and Northern California Steelhead. National Marine Fisheries Service, West

Coast Region. April. 61pp.

- NMFS 2016b - Final Coastal Multispecies Recovery Plan: CC Chinook Salmon, Northern California Steelhead, CCC Steelhead. West Coast Region, Santa Rosa, California. October 2016.

The issues NMFS is obliged to address in this opinion are wide-ranging, complex, and often not directly referenced in scientific literature. We base many of our conclusions on explicit assumptions informed by the available evidence. By this, we mean to make a reasonable effort to compile the best scientific and commercial empirical evidence related to the analysis and to then apply general and specific information on salmonid biology from the published literature to make inferences and establish our conclusions. In some cases, we have used the results of recent project specific studies or analyses conducted in the action area. In other situations, only more general local data are available on species presence or absence, and habitat condition. Where necessary, we have used this information and combined it with more general information from the scientific literature to infer salmonid response to the proposed action. In several instances, we make reasonable inferences that rely mainly on information in the scientific literature, because local data are not available.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

NMFS assesses four population viability[1] parameters to discern the status of the listed Evolutionarily Significant Units (ESUs) and Distinct Population Segments (DPSs) and to assess each species ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000). While there is insufficient data to evaluate these population viability parameters quantitatively, NMFS has used existing information to determine the general condition of the populations in the CCC coho salmon and CC Chinook salmon ESUs and CCC steelhead DPS and the factors responsible for the current status of these listed species.

We use these population viability parameters as surrogates for "reproduction, numbers, [and] distribution" in the regulatory definition of "jeopardize the continued existence of" (50 CFR 402.02). For example, abundance, population growth rate, and distribution are surrogates for numbers, reproduction, and distribution, respectively. The fourth parameter, diversity, is related to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when

[1] NMFS defines a viable salmonid population as "an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100- year time frame" (McElhany *et al.* 2000).

genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-level scales.

This opinion analyzes the effects of the proposed action on the following federally-listed species' ESUs, DPS, and designated critical habitat. The action area does not contain critical habitat for Chinook salmon.

CCC coho salmon ESU
Endangered (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999);

CCC steelhead DPS
Threatened (71 FR 834; January 5, 2006)
Critical habitat designation (70 FR 52488; September 2, 2005);

CC Chinook salmon ESU
Threatened (70 FR 37160; June 28, 2005).

2.2.1 CCC Coho Salmon Life History and Status

2.2.1.1 *Coho Salmon Life History*

In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple three year life cycle. Coho salmon are typically associated with medium to small 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. Adult coho salmon typically begin the freshwater migration from the ocean to their natal streams after heavy late fall or winter rains breach the sandbars 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 into March, generally peaking in December and January, with spawning occurring shortly after arrival to the spawning ground (Shapovalov and Taft 1954).

Preferred spawning grounds for coho salmon have: nearby overhead and submerged cover for holding adults; water depth of 4 to 21 inches; water velocities of 8 to 30 inches per second; clean, loosely compacted gravel (0.5 to 5 inch diameter) with less than 20 percent fine silt or sand content; cool water ranging from 39 to 50 degrees Fahrenheit (°F) with high dissolved oxygen of 8 mg/L; and inter-gravel flow sufficient to aerate the eggs. Lack of suitable gravel often limits successful spawning. Coho salmon are semelparous meaning they die after spawning. The eggs hatch after four to eight weeks, depending on water temperature. Survival and development rates depend on temperature and dissolved oxygen levels within the redd. McMahon (1983) found that egg and fry survival drops sharply when fine sediment makes up 15 percent or more of the substrate.

As the fish continue to grow, they move into deeper water and expand their territories until, by July and August, they reside exclusively in deep pool habitat. Juvenile coho salmon prefer: well shaded pools at least 3.3 feet deep with dense overhead cover, abundant submerged cover (undercut banks, logs, roots, and other woody debris); water temperatures of 54° to 59° F (Brett

1952, Reiser and Bjornn 1979), but not exceeding 73° to 77° F (Brungs and Jones 1977) for extended time periods; dissolved oxygen levels of 4 to 9 mg/L; and water velocities of 3.5 to 9.5 inches per second in pools and 12 to 18 inches per second in riffles. Water temperatures for good survival and growth of juvenile coho salmon range from 50° to 59° F (Bell 1973, McMahon 1983). Growth slows considerably at 64° F and ceases at 68° F (Bell 1973).

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.

2.2.1.2 *CCC Coho Salmon Status*

Historically, the CCC coho salmon ESU was comprised of approximately 76 coho salmon populations. Most of these were dependent populations that needed immigration from other nearby populations to ensure their long-term survival. There are now 11 functionally independent populations (meaning they have a high likelihood of surviving for 100 years absent anthropogenic impacts) and one potentially independent population of CCC coho salmon (Spence *et al.* 2008, Spence *et al.* 2012). Most of the populations in the CCC coho salmon ESU are currently not viable, hampered by low abundance, range constriction, fragmentation, and loss of genetic diversity.

Brown *et al.* (1994) estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940s. Abundance declined further to 100,000 fish by the 1960s, then to an estimated 31,000 fish in 1991. In the next decade, abundance estimates dropped to approximately 600 to 5,500 adults (NMFS 2005). CCC coho salmon have also experienced acute range restriction and fragmentation. Adams *et al.* (1999) found that in the mid-1990s, coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams within the CCC coho salmon ESU with no historical records. Recent genetic research has documented reduced genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt *et al.* 2005), likely resulting from inter-breeding between hatchery fish and wild stocks.

Available data from the few remaining independent populations suggests population abundance continues to decline, and many independent populations essential to the species' abundance and geographic distributions have been extirpated. This suggests that populations that historically provided support to dependent populations via immigration have not been able to provide enough immigrants to support dependent populations for several decades. The viability of many of the extant independent CCC coho salmon populations over the next couple of decades is of serious concern. These populations may not have sufficient abundance levels to survive additional natural or human caused environmental change. The overall risk of CCC coho salmon extinction remains high, and the most recent status review reaffirmed the ESU's endangered status (Rogers 2016).

The substantial decline in the Russian River coho salmon abundance led to the formation of the Russian River Coho Salmon Captive Broodstock Program in 2001. Under this program, offspring of wild captive-reared coho salmon are released as juveniles into tributaries within their historic range with the expectation that some of them will return as adults to naturally

reproduce. Coho salmon have been released into several tributaries within the lower Russian River watershed as well as in Salmon, Walker, and Redwood Creeks.

The five CCC coho diversity strata defined by Bjorkstedt *et al.* (2005) no longer support viable populations. The Russian River and Lagunitas Creek populations are relative strongholds for the species compared to other CCC coho salmon populations. According to Williams *et al.* (2016), CCC coho salmon abundance has improved slightly since 2011 within several independent populations (including Lagunitas Creek), although all populations remain well below their recovery targets. Within the Lost Coast – Navarro Point stratum, current population sizes range from 4 to 12 percent of proposed recovery targets. Recent sampling within Pescadero Creek and San Lorenzo River, the only two independent populations within the Santa Cruz Mountains strata, suggest coho salmon have likely been extirpated within both basins.

In positive developments, excess broodstock adults from the Russian River and Olema Creek were stocked into Salmon Creek and the subsequent capture of juvenile fish indicates successful reproduction occurred. Scott Creek experienced the largest coho salmon run in a decade from 2014 to 2015, and researchers recently detected juvenile coho salmon within four dependent watersheds where they were previously thought to be extirpated (San Vincente, Waddell, Soquel and Laguna Creeks). And in the fall of 2020, over 10,000 juvenile coho were released into Pescadero Creek.

2.2.2 CCC Steelhead Life History and Status

2.2.2.1 *Steelhead Life History*

Steelhead are anadromous fish, spending some time in both fresh- and saltwater. The older juvenile and adult life stages occur in the ocean, until the adults move up freshwater streams to spawn. Eggs, alevins (gravel dwelling hatchlings), fry juveniles (newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults.

Steelhead fry rear in edgewater habitats and move gradually into pools and riffles, as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Rearing steelhead juveniles prefer water temperatures of 45° to 58 °F and have an upper lethal limit of 75 °F (Barnhart 1986, Bjornn and Reiser 1991). They can survive in water up to 80.5 °F with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Juvenile steelhead emigrate from natal streams during fall, winter, and spring high flows, to the ocean to continue rearing to maturity. Suspended sediment concentrations, or turbidity, also can influence the distribution and growth of steelhead (Bell 1973, Sigler *et al.* 1984, Newcombe and Jensen 1996).

Although spawning typically occurs between January and May, the specific timing of spawning may vary a month or more among streams within a region, and within streams inter-annually. Spawning (and smolt emigration) may continue through June (Busby *et a.*. 1996). Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years.

2.2.2.2 *CCC Steelhead Salmon Status*

Historically, approximately 70 populations[2] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). About 37 of these were considered independent, or potentially independent (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River - the largest population within the DPS (Busby *et al.* 1996). Though still below historic levels, the trend of adult returns to the Warm Springs and Coyote Valley fish facilities on the Russian River has improved since the 1980s and '90s. Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937; August 18, 1997). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). In San Francisco Bay streams, reduced population sizes and fragmentation of habitat has likely also led to loss of genetic diversity in these populations.

A 2008 viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and the limited information available did not indicate that any other CCC steelhead populations were demonstrably viable (Spence *et al.* 2008). Although there were average returns (based on the last ten years) of adult CCC steelhead during 2007/08, research monitoring data from the 2008/09 and 2009/10 adult CCC steelhead returns show a decline in returning adults across their range compared to the previous ten years. New information from three years of the Coastal Monitoring Program in the Santa Cruz Mountains suggests that population sizes there are higher than previously thought. However, the long-term downward trend in the Scott Creek population, which has the most robust estimates of abundance, is a source of concern. Population-level estimates of adult abundance are not available for any of the seven independent populations inhabiting the watersheds of the coastal strata (Novato Creek, Corte Madera Creek, Guadalupe River, Saratoga Creek, Stevens Creek, San Francisquito Creek, and San Mateo Creek).

The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed appreciably since the previous status review assessment (Williams *et al.* 2016). The most recent status update concludes that steelhead in the CCC DPS remain "likely to become endangered in the foreseeable future", as new and additional information does not appear to suggest a change in extinction risk (Howe 2016). NMFS concluded that the CCC steelhead DPS shall remain listed as threatened (81 FR 33468; May 26, 2016).

[2] Population as defined by Bjorkstedt *et al*. 2005 and McElhaney *et al*. 2000 as, in brief summary, a group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group. Such fish groups may include more than one stream.

2.2.3 CC Chinook Life History and Status

2.2.3.1 *CC Chinook Life History*

Chinook salmon follow the typical cycle of Pacific salmon, hatching in freshwater, migrating to the ocean, and returning to freshwater to spawn and die. The low flows, high water temperatures, and sand bars that develop in smaller coastal rivers of coastal California during the summer months favor an ocean-type life history or fall-run (Kostow 1995). With this life history, adults enter freshwater between August and January (Fukushima and Lesh 1998; Chase *et al.* 2007) and smolts typically outmigrate as sub-yearlings between April and July (Myers *et al.* 1998). Fall-run fish typically enter freshwater, move rapidly to their spawning areas on the mainstem or lower tributaries of mainstem rivers (elevations of 200 to 1,000 feet), and spawn within a few weeks of freshwater entry. Juveniles emigrate to estuarine or marine environments shortly after emergence from the redd (Healy 1991). After emigrating, Chinook salmon remain in the ocean for two to five years and tend to stay in the coastal waters off California and Oregon (Healey 1991).

Optimal spawning temperatures range between 5.6 and 13.9°C. 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 and 13.3°C with an optimal temperature of 11.1°C (Beauchamp *et al.* 1983). Fry emergence begins in December and continues into mid-April (Leidy and Leidy 1984).

2.2.3.2 *CC Chinook Status*

The CC Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River, in Humboldt County, to the Russian River. Seven artificial propagation programs were considered part of the ESU at the time of listing: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs.

The CC Chinook salmon ESU was historically comprised of approximately 32 Chinook salmon populations (Bjorkstedt *et al.* 2005). About 14 of these populations were independent, or potentially independent. The remaining populations were likely more dependent upon immigration from nearby independent populations than dependent populations of other salmonids (Bjorkstedt *et al.* 2005).

Data on CC Chinook salmon abundance, both historical and current, is sparse and of varying quality (Bjorkstedt *et al.* 2005). Estimates of absolute abundance are not available for populations in this ESU (Myers *et al.* 1998). In 1965, CDFG (1965) estimated escapement for this ESU at over 76,000. Most were in the Eel River (55,500), with smaller populations in Redwood Creek (5,000), Mad River (5,000), Mattole River (5,000), Russian River (500) and several smaller streams in Humboldt County (Myers *et al.* 1998). Currently available data indicate abundance is far lower, suggesting an inability to sustain production adequate to maintain the ESUs populations.

CC Chinook salmon populations remain widely distributed throughout much of the

ESU. Notable exceptions include the area between the Navarro River and Russian River and the area between the Mattole and Ten Mile River populations (Lost Coast area). The lack of Chinook salmon populations both north and south of the Russian River (the Russian River is at the southern end of the species' range) makes it one of the most isolated populations in the ESU. Myers *et al.* (1998) reports no viable populations of Chinook salmon south of San Francisco, California.

Because of their prized status in the sport and commercial fishing industries, CC Chinook salmon have been the subject of many artificial production efforts, including out-of-basin and out-of-ESU stock transfers (Bjorkstedt *et al.* 2005). Therefore, it is likely that CC Chinook salmon genetic diversity has been significantly adversely affected despite the relatively wide population distribution within the ESU. An apparent loss of the spring-run Chinook life history in the Eel River Basin and elsewhere in the ESU also indicates risks to the diversity of the ESU.

Data from the 2009 adult CC Chinook salmon return counts and estimates indicated a further decline in returning adults across the range of CC Chinook salmon on the coast of California (Jeffrey Jahn, NMFS, personal communication 2010). Ocean conditions are suspected as the principal short term cause because of the wide geographic range of declines (SWFSC 2008). However, the number of adult CC Chinook salmon returns in the Russian River Watershed increased substantially in 2010/2011 compared to 2008/09 and 2009/10 returns.[3] Since 2010/2011 observed adult returns in the Russian River have averaged 2,886 adults with a record high of 6,713 in 2011/2012 and a record low of 1062 during the California drought in 2015/2016 (SCWA unpublished data).

Williams *et al.* (2016) did not find evidence of a substantial change in conditions since the last status review (Williams *et al.* 2011). Williams *et al.* (2016) summarized conclusions from previous status reviews (Good *et al.* 2005, Williams *et al.* 2011) that the loss of representation from one diversity stratum, the loss of the spring-run history type in two diversity substrata, and the diminished connectivity between populations in the northern and southern half of the ESU pose a concern regarding viability for this ESU. Williams *et al.* (2016) concluded the extinction risk of the CC Chinook salmon ESU has not changed since the last status review. The latest status review of CC Chinook salmon determined that there is no change in the extinction risk for this ESU, and NMFS affirmed that the CC Chinook salmon ESU should remain listed as threatened (NMFS 2016a). NMFS's recovery plan (NMFS 2016b) for the CC Chinook salmon ESU identified the major threats to recovery as: channel modification, roads, logging and timber harvesting; water diversions and impoundments; and severe weather.

2.2.4 Status of Critical Habitat

PBFs for CCC steelhead critical habitat within freshwater include:

- freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
- freshwater rearing sites with:
    - water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility,

[3] http://www.SCWA.ca.gov/chinook/

    - water quality and forage supporting juvenile development,
    - natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
- freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029, 24059; May 5, 1999).

The condition of CCC coho salmon and CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[4]: logging, agriculture, mining, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include: altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp *et al.* 1995; Busby *et al.* 1996; 64 FR 24049; 70 FR 52488). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within coho and Chinook salmon ESUs and steelhead DPSs. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

2.2.4.1 *Additional Threats to Listed Species and Critical Habitat*

Another factor affecting the rangewide status of coho and Chinook salmon and steelhead, and their critical habitat at large, is climate change. Impacts from global climate change are already occurring in California and listed salmonids here may have already experienced some detrimental impacts. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir *et al.* 2013). California has a history of episodic droughts. However, the five-year period from 2012 to 2016 was the driest since record keeping began and 2014-2015 were the hottest years in the state's recorded history (Williams *et al.* 2016).

[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 productivity.

The threat to salmonids from global climate change will continue to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007; Moser *et al.* 2012). Heat waves are expected to occur more often and be comprised of higher temperatures (Hayhoe *et al.* 2004, Moser *et al.* 2012; Kadir *et al.* 2013). Total precipitation in California will likely decline and critically dry years may increase (Lindley *et al.* 2007; Schneider 2007; Moser *et al.* 2012).

For Northern California, most models project heavier and warmer precipitation. Extreme wet and dry periods are projected, increasing the risk of both flooding and droughts (DWR 2013). Many of these changes are likely to further degrade salmonid habitat by reducing stream flow during the summer and raising summer water temperatures. For example, in the San Francisco Bay region, warm temperatures generally occur in July and August, but as climate change takes hold, the occurrences of these events will likely begin in June and could continue to occur in September (Cayan *et al.* 2012). Climate simulation models project that the San Francisco region will maintain its Mediterranean climate regime, but will also experience a higher degree of variability of annual precipitation during the next 50 years.

Wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011, Moser *et al.* 2012). In 2020 the Walbridge fire alone burned over 55,000 acres and included approximately half of the CCC coho salmon spawning habitat available in the lower Russian River tributaries. In the same year, the CZU Lightning Complex fire burned 86,500 acres in San Mateo and Santa Cruz Counties. Of the nine historic CCC coho salmon populations in the Santa Cruz Mountains identified in the recovery plan, six experienced burning, of which three experienced severe burning. These three populations (Gazos Creek, Waddell Creek, and Scott Creek) represented some of the highest quality habitat for CCC coho salmon south of San Francisco (J. Casagrande personal communication 2020). The long-term impacts on such valuable salmonid habitat are yet to be determined. However, there is heightened concern related to increased sediment run-off and erosion, decreased riparian vegetation, increased stream temperatures, and decreased water quality.

Estuaries may also experience changes detrimental to salmonids. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002, Ruggiero *et al.* 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely *et al.* 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al.* 2011; Doney *et al.* 2012).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area encompasses 28,000 acres currently leased for ranching in PRNS and in the north district of GGNRA. PRNS is located 30 miles northwest of San Francisco in Marin County, California. It is bounded to the north, west, and southwest by the Pacific Ocean and to the east by the residential communities of Inverness, Inverness Park, Point Reyes Station, Olema, and Dogtown. The town of Bolinas is south of the PRNS at the southern tip of the peninsula.

The action area is limited to the ranch lands in these watersheds and all streams which drain from them downstream to, and including, Tomales Bay, Drakes Bay, Drakes Estero, Limantour Estero, and Abbotts Lagoon. 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). The action area also includes a small amount of NPS grazing lease lands that drain to Bolinas Lagoon. Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas Lagoons are included due to the potential for very small amounts of sediments and nutrients in runoff from ranch lands to reach these larger waters.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Western Marin County experiences a Mediterranean climate and is primarily rural, with scattered, small, unincorporated towns that serve tourism, agriculture, and local residents. Elevations within the action area range from the beaches at sea level to 1,407 feet along Inverness Ridge. Most of the rangeland lies between 100 and 200 feet. Slopes range from nearly level on the ridgetops and sandy flats to 50 percent on the steeper hillsides. Rainfall averages approximately 12 inches per year, with the heaviest rainfall in December, January, February and March when winter storms can bring relatively high flows. Although there is little rain from mid-April through October, night and morning coastal fog condenses on the trees and vegetation which keeps the environment moist.

Vegetation in the action area is characterized by approximately 60 percent grassland, 18 percent coastal scrub, 14 percent forest, with the remaining portion composed mostly of wetlands, coastal dunes, and riparian forests/shrub lands. Most of the upland plateaus and ridgetops were cleared of shrubs and patches of forest in the past to put the land into cultivation for various crops and hay or for improved livestock pasture. Riparian areas of low-gradient streams in the Lagunitas and Olema Creek watersheds are characterized by shrub communities dominated by arroyo willow (*Salix lasiolepis*) and red alder (*Alnus rubra*) (CDFW 2003). The Point Reyes peninsula consists of small first- and second-order intermittent streams that drain directly to Drakes Estero and Abbotts Lagoon. Many are low-gradient streams on sandy soils, which generally do not support tree species, and instead are dominated by shrubs and understory wetland vegetation such as Juncus species. A few perennial streams (e.g., North Schooner Creek and Home Ranch Creek) along the eastern portion of grazed lands support willow and red alder stands.

Rangeland soils are mostly deep, productive, well-drained loams and sandy loams. However, many range soils are identified as having limitations such as susceptibility to compaction and

slippage, seasonal high-water table, low available water capacity, and a high erosion hazard. The loss of the soil surface layer results in a severe decrease in forage productivity. In steeper units, the slope restricts access by livestock and promotes increased grazing pressure on the less sloping areas.

Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas Lagoons, are among the last estuaries remaining in a mostly natural state along the California coast, and are considered to have high ecological importance as waterfowl habitat, as a nursery for numerous marine fish and invertebrate species, and as a protected retreat for harbor seals. Abbotts Lagoon is ecologically important for migratory and resident waterfowl, shorebirds, and other avian species. Due to lack of monitoring, the extent to which salmonids use these waterbodies is unknown, but it is assumed that they act as migratory corridors and feeding grounds for adult and juvenile salmonids. Other than Lagunitas and Olema Creeks, streams bordering Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas Lagoons are generally small, frequently ephemeral, and do not provide valuable habitat for salmonids. Lagunitas and Olema creeks are the primary perennial streams that provide habitat for federally listed salmonids in the action area.

2.4.1 Status of CCC Coho Salmon in the Action Area

Coho salmon occur year-round in the action area. The Lagunitas Creek watershed supports approximately 10 percent of the remaining CCC coho salmon population, including the southernmost wild, independent population along the Pacific Coast. This population is therefore considered critical to the survival and recovery of the species. Historical records show coho salmon from at least 31 small coastal streams in Marin County and have recently been observed in 17 (55 percent) of these streams, most of which are tributaries to Lagunitas Creek (Moyle *et al.* 2008). Coho salmon are found consistently in the mainstem of Lagunitas Creek, as well as in tributaries including: Olema Creek, Devil's Gulch, San Geronimo Creek, John West Fork Creek and Cheda Creek, but less consistently in other smaller tributaries (CDFW 2004).

Although coho salmon are declining throughout the ESU, the Lagunitas Creek population is considered persistent and moderately abundant (NMFS 2012a). There has been a very slight (statistically non-significant) decrease in redd counts over the entire time series since 1996, but in the last 9-10 years, numbers have been gradually increasing from the lows seen in the 2008-2009 and 2009-2010 spawning seasons, which were the two lowest counts on record (Spence personal communication 2021).

Table 2. Coho salmon redd survey results from 1996-2018 in the Lagunitas mainstem and San Geronimo Creek and tributaries, Devil's Gulch, Cheda and Nicasio creeks, and Olema Creek.[a]

Years	Lagunitas Creek	San Geronimo Creek	San Geronimo Tributaries	Devil's Gulch	Cheda and Nicasio creeks	Olema Creek	Total
1995-96	70	6	No Data	10	No Data	No Data	86
1996-97	98	115	No Data	41	No Data	No Data	254
1997-98	80	107	14	52	No Data	134	387

Years	Lagunitas Creek	San Geronimo Creek	San Geronimo Tributaries	Devil's Gulch	Cheda and Nicasio creeks	Olema Creek	Total
1998-99	92	46	14	32	0	23	207
1999-00	139	58	3	3	0	10	213
2000-01	119	56	18	11	0	80	284
2001-02	79	102	43	59	3	59	345
2002-03	71	39	22	24	2	20	178
2003-04	124	139	66	48	6	109	492
2004-05	120	140	118	112	6	138	634
2005-06	53	48	54	33	2	9	199
2006-07	128	117	26	55	12	95	433
2007-08	87	46	9	6	1	33	182
2008-09	25	1	0	0	0	0	26
2009-10	42	7	0	2	0	14	65
2010-11	32	40	2	6	0	21	101
2011-12	94	19	3	10	4	7	137
2012-13	108	59	4	44	2	29	246
2013-14	172	7	3	5	1	32	220
2014-15	79	30	7	20	4	6	146
2015-16	91	68	28	31	8	66	292
2016-17	49	49	29	31	0	12	170
2017-18	72	13	6	11	1	7	110

[a] Marin Municipal Water District (MMWD 2019). Olema Creek & Cheda Creek data are provided by NPS. San Geronimo tributaries: Arroyo Creek, Larsen Creek, Evans Canyon, Woodacre Creek, and San Geronimo Creek above Woodacre Creek; data provided by SPAWN.

No adult coho salmon or spawning activity has been observed during surveys in Horse Camp Creek, Boundary Gulch, Giacomini Creek, and Quarry Gulch since the 2012-2013 spawning season, and very little coho activity has been documented in these tributaries since 1998 (Carlisle *et al.* 2018; McNeill *et al.* 2020). NPS has not documented coho salmon in Abbotts Lagoon or the Drakes Estero watershed.

2.4.2 Status of CCC Steelhead in the Action Area

According to the recovery plan, CCC steelhead within the Lagunitas Creek watershed in the North Coast diversity stratum are considered an essential independent population with a low risk of extinction. Threats of the greatest concern within this population stratum are roads, urban development, agriculture, and channel modification (NMFS 2016b).

Streams bordering Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas Lagoons are generally small, frequently ephemeral, and do not provide valuable habitat

for salmonids. No adult steelhead or spawning activity was observed during surveys on Horse Camp Creek, Boundary Gulch, and Quarry Gulch during the last three years of monitoring (Carlisle *et al.* 2018; McNeill *et al.* 2020). No salmonids were found during a 1999 survey of seven reaches in Abbots Lagoon (Saki and Martin 2001). Though there may be occasional presence of steelhead in these areas, numbers are so low and sporadic that they are not considered a priority for recovery.

Streams in the action area that are known to support steelhead include the Tomales Bay watershed (Lagunitas and Olema creeks and tributaries) and the Drakes Estero watershed (East and North Schooner, Glenbrook, Muddy Hollow, Home Ranch, and Laguna Creeks). Though survey methodology and timing for steelhead from within the action area vary, abundance estimates appear to be low but stable, with individual run sizes of 500 adult steelhead or fewer (NMFS 2004). During the past three years of monitoring spawning adult steelhead in the Lagunitas Creek watershed, MMWD reported 120 steelhead redds and 43 live steelhead from 2015 to 2016; 35 steelhead redds and 23 live steelhead from 2016 to 2017; and 166 steelhead redds and 204 live steelhead from 2017 to 2018 (MMWD 2016, 2018, 2019). The large steelhead run from 2017 to 2018 translated into one of the largest juvenile steelhead populations on record (MMWD 2019). Fewer steelhead are found in the Olema Creek watershed. Five adult steelhead and 12 redds were observed on the mainstem during 2015 - 2016 monitoring and in 2017–2018, 27 live adult steelhead and 27 redds were observed (McNeill *et al.* 2020). John West Fork (a tributary to Olema Creek) typically supports very few steelhead. Two steelhead adults and 4 redds were observed on John West Fork in 2015 -2016 and no adults or redds were observed in 2017-2018 (Carlisle *et al.* 2018).

2.4.3 Status of CC Chinook in the Action Area

Although the Chinook salmon in the action area are referred to as CC Chinook salmon, NMFS has not formally extended the ESU boundary to include these populations (NMFS 2016b). According to the recovery plan, half of the Chinook salmon in the action area are most closely genetically related to the Central Valley Fall Chinook salmon ESU to the north, while the other half are related to the CC ESU (NMFS 2016b). Even though Chinook salmon were historically planted in the Lagunitas Creek watershed, the present-day fish are believed to be strays from the Russian River population of the CC ESU because of the ecological similarities between Lagunitas Creek and other coastal basins (NPS 2007). As described in the most recent 5-year status review (NMFS 2016a), the biological review team in 2011 tentatively concluded that Lagunitas Creek Chinook salmon should be considered part of the CC Chinook salmon ESU pending additional data (Williams *et al.* 2016). NMFS subsequently indicated that a boundary change for the ESU was under consideration (76 FR 50477; August 15, 2011); however, no action had been taken. There is no new genetic information that would help resolve this issue. Because of the proximity of these fish to the southern boundary of the ESU, NMFS has previously treated the Chinook salmon in the action area as part of the CC Chinook salmon ESU for the purposes of ESA consultation (e.g., NMFS 2004). For the reasons described above, we will continue to treat the Chinook salmon in the action area as part of the CC Chinook salmon ESU for the purposes of ESA consultation.

Chinook salmon are not likely to occur year-round in the action area because they migrate out during their first year as smolts by early summer; however, they are more likely to occur during spawning and migration events. MMWD has documented Chinook salmon in Lagunitas Creek

during 12 of 17 years of monitoring, with 2005 being one of the most successful years to date with 105 estimated Chinook salmon (MMWD 2005). Chinook salmon were not observed in the Lagunitas Creek watershed from 2007 to 2012 (MMWD 2013). During winter 2013-2014, 11 adult Chinook salmon were observed in Lagunitas Creek and 23 Chinook salmon redds were observed during the following survey season (MMWD 2014). Chinook salmon were nearly absent in 2015-2016, with only two redds and four live Chinook observed in upper Lagunitas Creek (MMWD 2016) monitoring. However, in 2016, 32 Chinook salmon redds and 82 live Chinook salmon were observed in Lagunitas Creek (n=27) and San Geronimo Creek (n=5). Above average numbers of Chinook salmon smolts were also observed in 2017, indicating that many Chinook salmon redds and fry survived the record-high stream flows of the previous winter (MMWD 2018). The increasing frequency of Chinook salmon in Lagunitas Creek suggests the development of a self-sustaining population. Chinook salmon do not occur in any other streams in the action area.

2.4.4 Status of Critical Habitat in the Action Area

Table 3 summarizes the length of streams potentially supporting coho salmon, steelhead, and Chinook salmon, totaling approximately 24.5 linear miles of perennial or intermittent streams within ranch boundaries. The proposed action location is within a core priority area for protection and restoration as detailed in the CCC coho recovery plan (NMFS 2012a). The action area does not contain critical habitat for Chinook salmon and Lagunitas is the only watershed where Chinook salmon are found. Critical habitat for the CC Chinook salmon ESU was designated in 2005 (70 FR 52488) and includes many watersheds on the northern California coastline, extending down to the Russian River watershed, but does not extend as far south as the action area (i.e., Tomales Bay) (NMFS 2016b).

Table 3. Length of Stream Reaches Potentially Supporting Coho Salmon and Steelhead (NPS 2020a).

Creek Name	Perennial and Intermittent Stream Reaches Potentially Occupied by Salmon and Steelhead on Ranches in the Action Area	Steelhead Critical Habitat on Cattle Ranches in the Action Area
Lagunitas Creek, including: ▪ Cheda Creek ▪ Devil's Gulch Creek ▪ McIsaac Creek	3.15 miles	0 miles
Olema Creek, including: ▪ Quarry Gulch ▪ Boundary Gulch ▪ Horse Camp Gulch ▪ John West Fork ▪ Randall Gulch ▪ N. Hagmaier Gulch ▪ S. Hagmaier Gulch ▪ Eucalyptus Gulch ▪ Headwaters Gulch	17.7 miles	1.58 miles
Drakes Estero, including: ▪ East Schooner Creek ▪ North Schooner Creek ▪ Home Ranch Creek	3.71 miles	1.08 miles

Designated critical habitat for coho salmon (see Figure 5) in the action area includes all accessible estuarine and stream areas, except areas above longstanding, naturally impassable barriers or above Peter's Dam on the main stem of Lagunitas Creek and Seeger Dam on Nicasio Creek (NPS 2007). This includes Lagunitas Creek and Olema Creek watersheds, which are approximately 53,150 and 9,390 acres, respectively. Ranches in the action area comprise approximately 6 percent (3,540 acres) of the Lagunitas and 56 percent (5,300 acres) of the Olema Creek watersheds (NPS 2019). The main stem of Lagunitas Creek was reduced by more than 50 percent by construction of Alpine Dam in 1918 and Peters Dam in 1953. While the Drakes Estero watershed includes designated critical habitat for coho, NPS has not documented any coho salmon in this system.

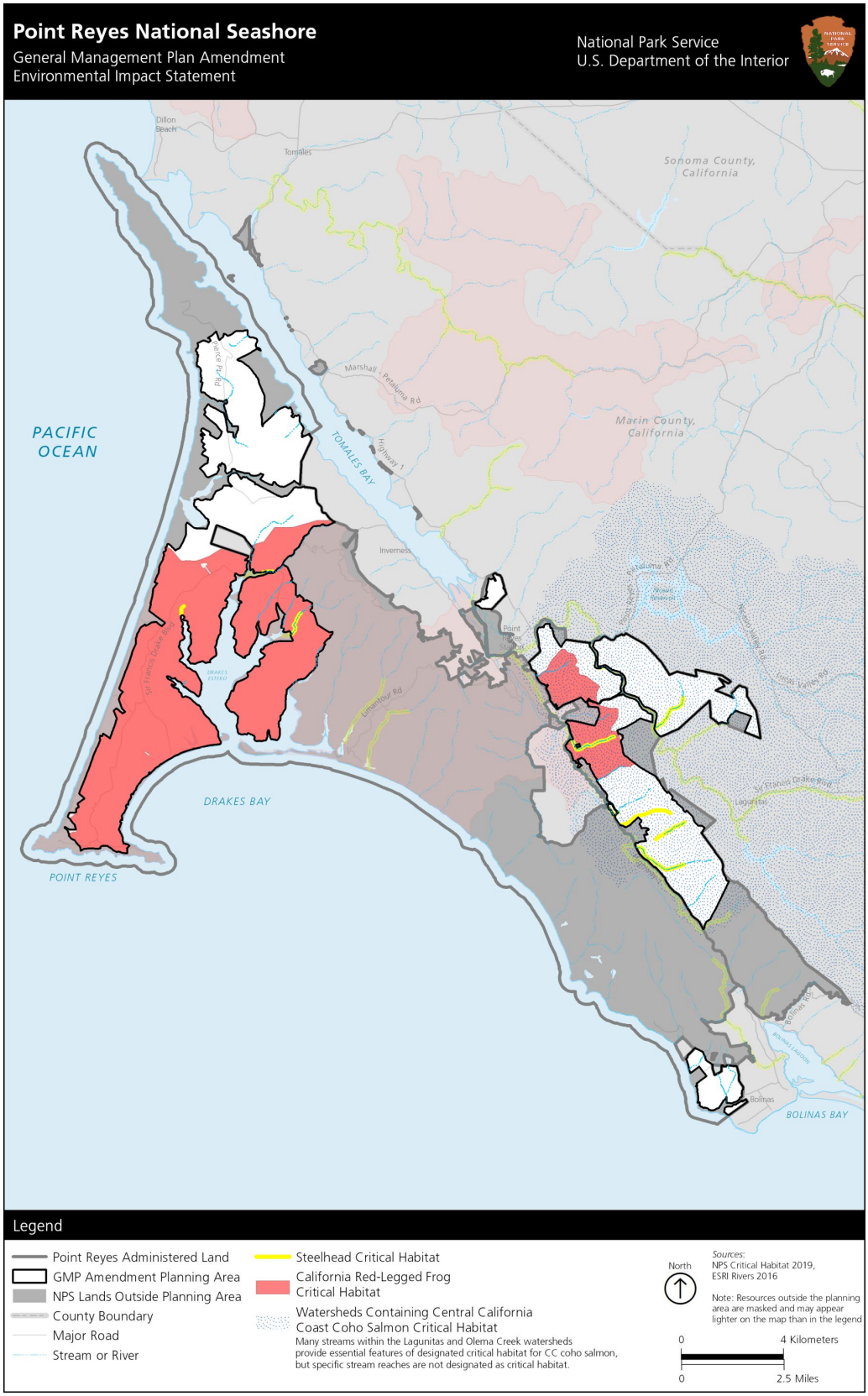

Figure 5. Designated critical habitat (coho salmon streams in blue, steelhead in yellow) within the plan area (NPS 2020c).

Designated critical habitat for steelhead (see Figure 5) includes many of the streams in the park, particularly Olema and Lagunitas creeks. Tributaries of Drakes Estero within the action area that

are designated as critical habitat for steelhead include Home Ranch Creek, East Schooner Creek, and the tributary to Creamery Bay. Ranches in the action area comprise approximately 47 percent (8,200 acres) of the 17,500-acre Drakes Estero watershed. It should be noted that NPS has not documented habitat for or presence of steelhead within the Creamery Bay watershed and the designated tributary is unlikely to contain the PBFs such as freshwater spawning, rearing and migration sites with water quality and quantity, necessary to function as habitat that is essential for the conservation of the species.

A study of the Lagunitas Creek watershed documented winter habitat as a major limiting factor for coho salmon because they experience substantial annual population declines between fall and spring (Stillwater Sciences 2008). This is also true for steelhead and is due largely to poor woody debris recruitment and limited floodplain engagement (NMFS 2016b). Loss of spawning habitat above dams, fish passage barriers at road crossings, high fine sediment loads, low summer streamflow, high summer water temperature, a shortage of cover in the form of large woody debris, and loss of riparian vegetation are also impediments to critical habitat within the action area (CDFW 2004).

The ranches in the action area use both surface water and groundwater from multiple springs, seeps, and wells for cattle watering and private potable water supply (Pawley and Lay 2013). Many of these wells use water stored in shallow alluvial aquifers throughout the area that have limited storage capacities or yields and are adequate only for uses requiring small quantities of water (McClelland 1963, NPS 2007). Water necessary for ranch operations is mostly available year-round. However, during drought years, water supply on a handful of ranches was limited and resulted in emergency measures to tap surface water to meet water demand. Beef operations primarily use water for livestock consumption, whereas dairy operations use water for livestock, barn and equipment cleaning, and other minor uses. Dairy operations that are provided water by NPS have used amounts of water ranging from a low of approximately 1,200 gallons-per-day (gpd) to a high of 11,000 gpd [0.02 cubic feet per second (cfs)], not including water from other sources such as ponds (NPS, Ketcham, personal communication 2018). Beef operations use approximately 12,000 gpd to 34,800 gpd (0.06 cfs), and the dairy operations use approximately 75,914 gpd to 175,695 gpd (0.27 cfs), for a total water usage of approximately 32 million gallons (98 acre feet, 0.14cfs) to 77 million gallons (236 acre feet, 0.33 cfs) per year.

The RWQCB established flow and temperature conditions for the MMWD to comply with to mitigate for impacts to Lagunitas Creek following the enlargement of Kent Lake. Upstream of the action area, MMWD releases water from Kent Lake to ensure year-round minimum stream flows ranging from 8 cfs to 25 cfs in a normal water year and between 6 cfs and 20 cfs in a dry year in Lagunitas Creek. Peak winter flows can reach 2,000 cfs. MMWD also releases periodic flows of at least 35 cfs for 3 consecutive days as measured at the USGS Samuel Taylor gage, which are intended to facilitate passage of anadromous fish through shallow areas in the creek and are required on November 15, December 1, January 1, and February 1 in the absence of a natural storm event preceding those dates (MMWD 2018). Based on extensive sampling within the park the majority of streams fall within the suitable range of water temperatures for salmonids during most of the year (NPS 2013, 2016, 2017).

The RWQCB listed Tomales Bay and major Tomales Bay tributaries, including Lagunitas Creek and Olema Creek, as impaired for nutrients, pathogens, and sedimentation (SWRCB 2010). In 2006, the RWQCB adopted a total maximum daily load (TMDL) for pathogens in the Tomales Bay watershed. Chapter 3 of the EIS identifies general water quality conditions in the action area

and specifically the Lagunitas and Olema Creek watersheds. The main sources of water quality degradation in the action area are bacteria and nutrient loading from nonpoint sources associated with ranches, dairies, septic systems, and stormwater runoff (Wallitner 2013; Pawley and Lay 2013). Long-term trend analysis at park water quality monitoring stations indicate a decreasing trend in fecal indicator bacteria (Lewis *et al.* 2019; Appendix L of the EIS). Sediment loading from erosion and degradation associated with natural processes, ranch and dairy activities, land development and disturbance, stream channel alteration, and stormwater runoff have also affected many of the surface waters. Dissolved oxygen has consistently exceeded the 7.0 milligrams per liter meter standard within the action area (NPS 2013, 2016, 2017). Turbidity monitoring in Lagunitas and Olema creeks during water years 2011-2012, 2013-2014, and 2015-2016 indicates that turbidity levels are below the 25-NTU thresholds 90+ percent of the time (NPS 2013, 2016, 2017). Exceedances were detected during post-storm, high-flow events.

RDM is the herbaceous plant material left standing or on the ground in the fall prior to the onset of germinating rains. RDM monitoring at key area transects from 2015–2019 was conducted by clipping three representative samples of herbaceous material, then converting the average dry weight of the three samples to pounds per acre. In addition to measuring RDM at representative transect locations, visual mapping was conducted during a pilot year (2015) and then from 2016–2019. Visual mapping allows broad estimates of RDM across the landscape, providing information about variation in RDM on each ranch that can be used to inform management. Visual mapping of RDM (also called "zone mapping" in the 1990 protocol) involves ocular estimates of RDM across the landscape with a set minimum mapping unit size. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available in Appendix E of the EIS (NPS 2020c).

Two environmental changes during the 2015–2019 period of mapping are important to note:

1) California experienced a period of moderate to extreme drought spanning water years 2012–2016 (NIDIS 2020; USGS 2020). During the drought, the park discussed range condition with ranchers and their attempts to adjust stocking rates or increase supplemental feeding to accommodate decreased forage production associated with the drought.

2) An increase in common onion grass (*Romulea rosea* var. *australis)* was observed across the park, but this increase was most prominent at three ranches. In 2015 and 2016 RDM sampling, attempts were made to exclude onion grass from samples and the ocular zone mapping based on protocol guidance that noxious weeds should be excluded. However, due to the challenge of removing the onion grass from clipped herbaceous material and visual estimates of cover during 2015 and 2016, onion grass was included in samples (unless >25% cover) and ocular zone mapping estimates starting in 2017. The rationale for inclusion in zone mapping is that the onion grass provides cover that protects the soil from erosion, so excluding it would result in an underestimate of actual vegetative cover and soil protection across the landscape in these areas.

Within the action area, nearly all perennial stream segments either do not have adjacent grazing or have been fenced to exclude cattle, though they occasionally breach exclusion fencing. Since the mid-1990s, NPS has worked with ranchers to exclude cattle from approximately 780 acres of riparian habitat which have been removed from lease-permits. Additionally, within the action area, approximately 800 acres have been fenced to exclude cattle from sensitive resources. Thus

fenced areas along streams now have well-vegetated buffers in place which provide riparian resources for salmonid habitat needs. Other range management activities include planning, implementation, and monitoring to improve resource conditions, protect water quality, and maintain infrastructure integral to ranch operations. To date, more than 170 conservation activities (including fencing, see Figure 4) to improve resource conditions have been implemented in the action area in partnership with USDA-NRCS, San Francisco Bay RWQCB, the MRCD, ranch operators, and others.

Other activities that have been implemented in the Tomales Bay watershed include riparian vegetation management and planting and instream restoration activities to improve threatened and endangered species habitat. In 2007–2008, NPS and the Point Reyes National Seashore Association implemented an approximately 613-acre Giacomini Wetlands Restoration Project in the southern end of Tomales Bay. The project principally focused on conversion of a former dairy ranch into tidal wetlands by restoring natural hydrologic tidal and freshwater processes to promote restoration of hydrologic and ecological functions. The location of the Giacomini wetland at the confluence of Lagunitas Creek, Olema Creek, and Tomales Bay allows these waters to spread out over the restored marsh plain, resulting in improved ecological habitat and water quality for Tomales Bay. Compared to baseline conditions at the beginning of the Giacomini Wetlands Restoration Project, dissolved oxygen levels increased 16 percent, while nitrate, ammonia (NH3), phosphate, phosphorous, and fecal coliform bacteria levels decreased at least 23 percent (Parsons and Ryan 2015).

Since 1996, several partners including NOAA's Restoration Center, MMWD, CDFW, MRCD, SPAWN, the Marin Agricultural Land Trust, and NPS have undertaken restoration projects within the Lagunitas and Olema Creek watersheds. Projects have included: sediment control, woody debris enhancement, rearing habitat enhancement, modification to grazing strategies, fish passage improvement, riparian exclusion fences, and watershed protection agreements with private landowners. In 2011, MMWD began implementing the Lagunitas Creek Winter Habitat and Floodplain Enhancement Project, carrying out actions at 10 sites to enhance winter habitat and floodplain function. In summer 2018, SPAWN initiated floodplain restoration and riparian habitat enhancement on NPS lands in the Jewell and Tocaloma areas of Lagunitas Creek. This reach of Lagunitas Creek has been identified as an opportunity to restore high value off-channel habitat for juvenile salmonids. In 2019, MRCD implemented two large wood installations and in 2020, SPAWN began a fish passage and floodplain restoration project (Roy's Pools) on San Geronimo Creek.

2.4.5 Climate Change Impacts in the Action Area

As noted in the *Marin County Climate Action Plan*, Marin County is located in a transition zone. Projections for areas to the north indicate wetter and warmer conditions, while projections for areas to the south indicate drier and warmer conditions, making it particularly difficult to project impacts. (Marin County 2015). Current projections indicate that temperatures will continue to increase, and Marin County may experience drier summers and wetter winters with heavier rain events (Marin County 2015). An increase in heavier rain events may cause inland flooding, which increases storm surge frequency and stormwater runoff and could increase soil erosion in the action area, specifically in areas with high concentrated use that are devoid of vegetation. Changes in precipitation patterns could also affect potential for soil compaction by altering soil moisture conditions across the landscape.

A projected increase in temperature could result in increases in extreme heat conditions, inland flooding, rising sea levels, and a shift in water demand and supply (Marin County 2015). Drought, flooding, and water supply could be altered in the action area; however, all ranches in the action area are at an elevation where sea level rise would not have a direct impact. Specific changes in water resources in the action area as a result of climate change are difficult to predict. An increase in heavier rain events may cause inland flooding, which increases storm surge frequency and stormwater runoff and could potentially increase pollution in surface waters.

Climate change may alter the temperature and annual rainfall amounts in the action area, although these changes are difficult to project. Impacts could include loss of wetland habitats from drought and encroachment of trees and scrub into coastal prairie (Bagne *et al.* 2012). Drought also has the potential to increase the risk of wildfire, which would affect all vegetation in the location where a fire occurs. In October 2020, the Woodward Fire burned almost 5,000 acres located within PRNS (outside of the action area).

2.4.6 Previous Section 7 Consultations Affecting the Action Area

The following opinions concluded that the projects, as proposed, were not likely to jeopardize the continued existence of CCC coho salmon and steelhead or adversely modify designated critical habitat for CCC coho salmon and steelhead. Small amounts of incidental take were anticipated, mostly due to dewatering and fish relocation activities necessary to complete the projects.

- On April 5, 2004, NMFS provided an opinion to NPS on the Continued Issuance of Grazing leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California.

- On August 18, 2014, NMFS provided an opinion to NPS on the Potential Improvements to 12 miles of Sir Francis Drake Boulevard.

- On June 14, 2016, NMFS provided an opinion to NPS on *Riparian Restoration Projects.*

- On March 8, 2018, NMFS provided an opinion to the Federal Highway Administration for the *Sir Francis Drake Boulevard Improvement Project, Marin County, California.*

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

2.5.1 Impacts to CCC Coho Salmon and CCC Steelhead and CC Chinook Salmon

The purpose of this section is to identify effects to listed species that are likely to result if NPS continues to issue lease-permits for livestock grazing and dairy operations for the next 20 years. Activities covered under Elk Management and Forage Production occur in areas where no coho or Chinook salmon or steelhead are present. Forage Production will only be authorized in the pasture subzone which contains no sensitive natural resources. There are a few tributaries to Drakes Bay that are designated critical habitat for coho salmon and steelhead that overlap with Elk Management of the Limantour herd (see Figures 3 and 5). These tributaries are generally small, frequently ephemeral, and do not contain the PBFs such as freshwater spawning, rearing and migration sites with water quality and quantity necessary to function as habitat that is essential for the conservation of the species. Therefore, NMFS expects actions related to Elk Management and Forage Production will not result in any impacts to listed salmonids or designated critical habitat and effects of those activities will not be discussed further.

Ranch Infrastructure

Activities associated with Ranch Infrastructure (see Section 1.3.4) and Vegetation Maintenance allowed to occur on lands within the Range, Pasture, and Ranch Core Subzones that may disturb waterways or sensitive riparian habitats will occur from June 1 through October 31 when only juvenile coho salmon and steelhead are expected to be in the action area. Juvenile Chinook salmon are not likely to occur year-round in the action area because they migrate out during their first year as smolts by early summer. However, they are more likely to occur (only in Lagunitas) as adults during spawning and migration events which start in August. Therefore, NMFS expects CCC coho salmon and steelhead and CC Chinook salmon may be exposed to the following stressors as a result of activities included under Ranch Infrastructure:

- Dewatering, fish collection, and relocation,
- Impaired water quality,
- Loss of benthic habitat,
- Reduced riparian vegetation,
- Decreased food sources,
- Herbicides in aquatic environments.

Ranch Infrastructure activities are intended by NPS to be ultimately beneficial to aquatic, riparian, and upland habitats. Although the total numbers of Ranch Infrastructure activities described in Section 1.3.4 represent the amount of such activities expected to occur within the action area, there is no specific information on how many of the activities are expected to occur within or nearby streams containing listed salmonids, their critical habitat, or both. Nor is there any aspect of the proposed action that would focus all of the activities into areas where effects to listed salmonids or critical habitat are likely. Thus, for purposes of analyzing the effects of those activities, NMFS assumes that all of the activities could occur within or near streams or waterbodies containing listed salmonids, their critical habitat, or both. While this will likely overestimate beneficial impacts, it will also likely overestimate adverse effects to the same degree, because not all of these activities will occur in or near streams containing listed salmonids, their critical habitats, or both. In addition, as described in the Integration and Synthesis section of this opinion, NMFS is not relying on the beneficial effects of the

implementation of new Ranch Infrastructure activities as part of the proposed action in its conclusions in that section.

Dewatering stream reaches and capturing and relocating fish may be necessary during the implementation of activities described in Section 1.3.4 Ranch Infrastructure (specifically during Road Upgrade and Decommissioning, Stream Crossings, and Waterway Stabilization). Road upgrade and decommissioning treatments may cause temporary habitat disturbance but if strategically addressed, these projects also have the potential to reduce erosion and have beneficial results for fish passage and water quality. Stream crossings and fencing that limits cattle access to waterways allows for reduced soil erosion and minimized delivery of pollutants and nutrients to sensitive habitats. This conservation action also allows for passive riparian restoration as the vegetation self generates.

Fish collection and relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish collecting gear, whether passive (Hubert 1983) or active (Hayes *et al.* 1996), has some associated risk to fish, including stress, disease transmission, injury, or death. Capturing and handling all fish causes them stress, though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived (NMFS 2002). The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18ºC (64ºF) or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. Effects from in-water work are generally avoided and minimized through use of: 1) In-water work isolation strategies that often involve capture and release of trapped fish and other aquatic invertebrates; and 2) performing the work during work windows when the fewest individuals of a species are present. Since fish relocation activities will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000), injury and mortality of juvenile fish during capture and relocation will be minimized. Key conservation measures in the guidance such as avoiding work during times of high stream temperatures significantly reduces mortality that can occur during work area isolation. Use of properly sized screens during water withdrawal can reduce or nearly eliminate injury or death of fish caused by entrainment.

Stream flow diversion and dewatering could harm individual rearing juvenile salmonids by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile fish that avoid capture in the project work area will likely die during dewatering activities due to desiccation or thermal stress. Withdrawal without an adequate fish screen can entrain juvenile fish, which typically injures or kills them. However, dewatering efforts will be monitored by qualified biologists and NMFS-approved protocols will be used during dewatering and fish relocation. Therefore, unintentional mortality of listed juvenile salmonids is not likely to exceed three percent of the total amount of fish handled during dewatering and relocation activities.

Turbidity is the degree to which water loses its transparency due to the presence of suspended sediment. Turbidity may have beneficial or detrimental effects on fish, depending on the intensity, duration and frequency of exposure (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high

suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Deposition of fine sediments reduces incubation success (Bell 1991), interferes with primary and secondary productivity (Spence *et al.* 1996), and degrades cover for juvenile salmonids (Bjornn and Reiser 1991). Chronic, moderate turbidity can harm newly-emerged salmonid fry, juveniles, and even adults by causing physiological stress that reduces feeding and growth and increases basal metabolic requirements (Redding *et al.* 1987, Lloyd 1987, Bjornn and Reiser 1991, Servizi and Martens 1991, Spence *et al.* 1996). Older salmonids typically move laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987, Sigler *et al.* 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991).

A level of turbidity greater than 5 Nephelometric Turbidity units (NTU) is considered visible turbidity and turbidity levels above 25 NTU have been shown to cause reductions in salmonid growth (Sigler et al. 1984). On the other hand, predation on salmonids may be reduced in waters with turbidity equivalent to 23 NTU (Gregory 1993, Gregory and Levings 1998), an effect that may improve overall survival. Any listed fish residing within the project stream reach during and immediately after infrastructure activities will likely experience short-lived, sub-lethal behavioral impacts (e.g., reduced feeding efficiency) due to temporarily increased levels of turbidity. Turbidity from instream work to implement Ranch Infrastructure Activities is expected to be minimal and temporary because NPS will, for example, employ common BMPs to reduce soil disturbance and limit runoff from soils disturbed by construction. These ephemeral turbidity impacts, lasting a couple to several hours, are not expected to reduce fish growth as feeding behaviors will quickly resume after the short pulse of turbidity.

Operating equipment in and near streams has the potential to introduce hazardous materials and contaminants into streams. Potentially hazardous materials include wet and dry concrete debris, fuels, and lubricants. Spills, discharges, and leaks of these materials can enter streams directly or via runoff. Such impairment can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Disturbance of streambeds by heavy equipment or construction activities can also cause the resuspension and mobilization of contaminated stream sediment with absorbed metals. These effects have the potential to harm or injure exposed fish and temporarily degrade habitat. However, proposed BMPs will substantially reduce or eliminate the potential for construction material and debris to enter waterways, degrade water quality, and adversely affect listed fish. For example, NPS will require all equipment to be refueled outside of streams and checked daily for leaks.

Other impacts to listed salmonids may include changes in water temperature due to alteration or obstruction of flow and removal of thermal refugia including shade from riparian vegetation (Poole and Berman 2001). Riparian zones serve important functions in stream ecosystems such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper *et al.* 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan 1991), water quality improvements (Mitsch and Gosselink 2000), channel and stream bank stability (Platts 1991), source of woody debris that creates fish habitat diversity (Lisle 1986, Shirvell 1990), and both cover and shelter for fish (Wesche *et al.* 1987, Murphy and Meehan 1991). As part of the proposed action, no more than 0.10 acre of native riparian trees, shrubs, or woody perennials may be removed from riparian areas for each Ranch Infrastructure or vegetation management activity implemented, and only if the area will be replanted with native vegetation. Where the area is exclusively comprised of non-native vegetation species, up to 5 acres of riparian vegetation may be removed or treated. While the loss of cover may cause individual fish to seek alternative areas where suitable cover exists nearby, such temporary displacement of fish is not

expected to reduce their individual performance because there is cover nearby to accommodate additional individuals without becoming overcrowded. Thus, impacts of reduced shade and cover from removal of riparian vegetation are expected to have negligible impacts on rearing and migratory behavior of individual fish within the action area.

Benthic (bottom-dwelling) aquatic macroinvertebrates within the project site may be killed or their abundance reduced when river habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be temporary because construction activities will be relatively short lived and the dewatered reach will not exceed 500 linear feet. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). In addition, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas since stream flow will be bypassed around the project work site. Therefore, juvenile fish are not anticipated to be exposed to a reduction in food sources from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Relocated salmonids may also have to compete with other fish causing increased competition for available resources such as food and habitat. Responses to crowding by salmonids include self-thinning, resulting in emigration and reduced salmonid abundance with increased individual body size within the group, or increased competition (Keeley 2003). Some of the fish released at the relocation sites may choose to move to areas that have more vacant habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In some instances, relocated fish may endure short-term stress from crowding at the relocation sites. Such stress is not likely to be sufficient to reduce their individual fitness or performance. Sites selected for relocation should have similar water temperatures as the capture sites, and should have adequate habitat to allow for survival of transported fish. NMFS cannot accurately estimate the number of fish that may be affected by competition, but does not expect this short-term stress to reduce the individual performance of juvenile fish, or cascade through watershed populations of these species based on the small area to be affected and the relatively small number of salmonids to be relocated.

Herbicide Use

Seven herbicides (containing five different active ingredients) and one surfactant have been used in the action area since 2010, are proposed for use in this plan, and have the potential to enter the aquatic environment if a chemical makes its way into surface or ground water. These chemicals could enter the aquatic environment via a number of pathways, including unintentional spray drift, accidental spills, or chemical transport by erosion and sediment transport, runoff, or soil percolation. Any herbicides reaching surface waters may result in mortality to fish during incubation, or lead to altered development of embryos. Stehr et al. (2009) found that the low levels of herbicide delivered to surface waters are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead and trout. However, mortality or sub-lethal effects such as reduced growth and development, decreased predator avoidance, or modified behavior may occur. Herbicides are likely to also adversely affect the food base for listed salmonids and other fish, which includes terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

The following active ingredients of herbicides (and one surfactant) proposed for use in this plan are approved by the EPA for aquatic use and are considered only slightly toxic or practically

nontoxic to fish as defined by EPA (i.e., having an EC50 or LC50 of >10-100 parts per million (ppm), and >100 ppm, respectively; a LC50 is the dose that is acutely lethal to 50 percent of the test subject population while an EC50 is the dose that produces an acute effect in 50 percent of the test population). NMFS has previously analyzed the effects of these activities using the similar active ingredients and project design criteria for the Habitat Improvement Program conducted by the Bonneville Power Administration (BPA) (NMFS 2020). In this most recent analysis (NMFS 2020), BPA analyzed the aquatic toxicity of numerous herbicides using EPA's GENEEC modeling software to produce generic estimated environmental concentrations (EECs) assuming direct application of the active ingredient to a one-acre pond that is one foot deep. These EECs were compared to adverse effect thresholds for listed salmonids defined as either $1/20^{th}$ of the LC50 value or the lowest acute or chronic "no observable effect concentration", whichever was lower. Four of the active ingredients (listed below) proposed for use by the NPS underwent this comparison and all of these four active ingredients were found to be of "low concern", for having a risk of adversely affecting listed salmonids (NMFS 2020). Information on the adjuvant Competitor was also examined and this product was deemed acceptable for use. NPS did not conduct their own modeling analysis for this project, but NMFS considers the recent analysis (NMFS 2020) to be sufficiently similar and robust to apply to this project.

- Aminopyralid - shows moderate mobility through the soil, but it does not bioconcentrate in the food web. The primary means of exposure for fish and aquatic invertebrates is through direct contact with contaminated surface waters. Acute toxicity tests show aminopyralid to be practically non-toxic, with aquatic invertebrates showing more sensitivity. Thus, if aminopyralid does end up in surface waters, the most likely pathway of effect for salmon and steelhead is through loss of prey.
- Imazapyr - The persistence and movement of Imazapyr in soil is highly complex and differs substantially depending of site-specific factors. Imazapyr has only been tested in a limited number of species and conditions. The best available data support no adverse effects on animals. Adverse effects on algae and aquatic macrophyte production may cause a reduction in availability of forage for juvenile salmonids. Over time, juvenile salmonids that receive less food have lower body condition and smaller size at smoltification.
- Glyphosate – is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range 1-174 days). Glyphosate is relatively non-toxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. In resident freshwater fish, toxicity appears to increase with increasing temperature and pH. The U.S. Forest Service and Bureau of Land Management looked at the exposure of ESA-listed fish from the treatment of emergent knotweed with glyphosate. They found that potential for exposure varied with application rates, and that there was a potential for adverse effects at the higher application rate with all three application methods. They concluded, however, that adverse effects were not likely to occur with the stem injection methods because only a few milliliters of glyphosate would be injected per stem, and it is unlikely that enough stems would be broken to result is instream concentrations exceeding the salmonid effects threshold.
- Chlorsulfuron - does not bioaccumulate in fish. The EPA Fact Sheet from 2005 states that chlorsulfuron is practically nontoxic to both freshwater and estuarine/marine fish on an acute exposure basis and is slightly toxic to estuarine/marine invertebrates.

- Competitor – is modified vegetable oil found to have a low acute toxicity to rainbow trout and a surrogate prey species.

NPS proposes to use a different type of triclopyr (Garlon4Ultra) than was examined in NMFS 2020. NPS proposes to use triclopyr BEE, which is not labeled for aquatic use, while formulations containing triclopyr TEA, the active ingredient proposed for use by BPA, are often labeled for aquatic use. This is because triclopyr BEE products (e.g., Garlon4Ultra) are significantly more toxic to aquatic life than triclopyr TEA products (e.g., Garlon3 products) with the salmonid survival median LC50 for triclopyr BEE being 0.470 ppm compared to 79.2 ppm for triclopyr TEA (NMFS 2011, EPA 1998). NMFS (2011) examined the potential impacts of registered uses of triclopyr BEE, determined that the rapid runoff of it into small waterbodies could kill fish or their prey and considers triclopyr BEE to pose a medium level risk to fish. NPS proposed several mitigation measures that will help reduce the potential for the herbicides and the adjuvant from entering the stream network. These practices were presented in Section 1.3.5 of this biological opinion. The more extensive examination done recently by BPA and NMFS (2020), informed by modeling of exposure and including additional and more stringent management controls, still determined that some herbicides are likely to enter streams through drift, attached to eroded sediments or dissolved in runoff from treated areas. This is due to the uncertainties associated with the effectiveness of the conservation measures. We expect that over the 20 year period of actions covered by this consultation that it is reasonably likely that herbicides, alone or in combination with other herbicides and the proposed adjuvant, will reach streams with listed salmonids and that this may result in some sublethal adverse effects to listed fish as described above.

Range Operations and Management

NMFS expects all freshwater life stages of CCC coho salmon, CCC steelhead, and CC Chinook salmon may be exposed to the following stressors as a result of and Dairy and Beef Operations in all four subzones (see Section 1.3.3 Range Operations and Management). Although the most intensive Range Operation and Management activities will be restricted to areas with the fewest sensitive natural resources, the effects of these activities may cascade throughout the watershed(s).

- Impaired water quality;
- Destruction or reduction of riparian vegetation;
- Erosion and compaction of soils.

Much is known about the detrimental impacts that grazing can have on stream ecosystems (Belsky *et al.* 1999, Larsen *et al.* 1998, Spence *et al.*1996, Platts 1991, Knapp and Mathews 1996). There is concern that grazing cattle on public lands degrades water quality by increasing levels of contaminants such as fecal indicator bacteria, fecal coliform, E. coli, nitrogen, and phosphorus. 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. Nutrient enrichment from cattle manure is likely to increase primary productivity of the stream for short distances in a few locations, which may cause both qualitative changes in invertebrate composition and quantitative changes in invertebrate growth and productivity. These changes can be detrimental or beneficial to listed fish depending on the amount of nutrients added, downstream distance from the nutrient source, and environmental factors such as stream flow, water temperature, channel gradient, channel

morphology, and water chemistry. Other detrimental water quality effects on salmonids include increased water temperature and turbidity (Belsky *et al*. 1999).

Reports on the effects of grazing on public land in the West on water quality conditions are often conflicting. Several studies found higher detections of waterborne pathogens below cattle grazing sites (Derlet and Carlson 2006, Derlet *et al.* 2012, Myers and Whited 2012). While others found degradation to be well-below levels used as benchmarks by the EPA and RWQCB (Roche *et al.* 2012 and 2013, Gary *et al.*, 1983, Ahearn *et al.* 2005). It should be noted that comparing such studies is often challenging due to the differences in study designs (varying climate, soils, time spans, foraging and spatial distribution of cattle, sampling methods and water quality standards, implementation of conservation measures, etc.). However several studies have documented the success of reducing water quality impairment from livestock by implementing conservation practices such as: fencing, proper nutrient and manure management, targeting grazing, vegetative buffer strips and grassed waterways, off-stream water supplies, and soil surface cover (Koelsch *et al.* 2006; Tate *et al.* 2006; Sullivan *et al.* 2007) which are all part of the proposed action. Concurrent with the implementation of management activities such as Livestock Water Supply, Fencing, and Stream Crossings intended to reduce pathogen, sediment, and nutrient loading to local streams throughout the watershed, there was a 95 percent decrease in fecal coliform bacteria concentrations from 1999 to 2017. This includes approximately 40 actions in the Olema Creek watershed, which provided increased control of livestock access to more than 17 miles of Olema Creek and nearby tributaries (Lewis *et al.* 2019).

With respect to sedimentation, it is not the peak turbidity levels that cause negative ecological consequences, but the persistence of high levels after storm events: longer durations of high turbidity levels are more likely to cause damage to fish (Newcombe and MacDonald 1991). The current water quality monitoring program captures single turbidity samples during site visits, and does not conduct continuous monitoring or turbidity threshold sampling. However, turbidity monitoring in Lagunitas and Olema creeks during water years 2011-2012, 2013-2014, and 2015-2016 indicates that turbidity levels are below the 25-NTU thresholds 90+ percent of the time (NPS 2013, 2016, 2017). Exceedances were detected during post-storm, high-flow events. Due to land-use activities in addition to ranching occurring throughout the watersheds, including outside of the action area, it is not possible to identify specific sources based on the available data (i.e., sampling locations are not numerous enough throughout watersheds to pinpoint sources of the exceedances seen).

The functional values of riparian corridors and the benefits they provide to aquatic systems and stream fish populations 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. With respect to effects of grazing related to destruction or reduction of riparian vegetation, impacts to listed salmonids may 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.

Within the Pasture and Ranch Core subzones, Practice Standards (see Appendix F of the EIS, NPS 2020c), zoning restrictions, mitigation measures, riparian fencing, and size limitations will

be implemented to minimize the effects of contaminated stormwater runoff. Impacts in the Range subzone will be avoided or minimized through continued adherence to the RDM standards of Bartolome *et al.* (2015). RDM monitoring allows land managers to assess whether conservation goals on grazed landscapes are being achieved (Bush 2006). As an important indicator of range condition, RDM levels can be tracked annually and used to adjust grazing levels to better meet conservation goals (Shook 1990; Bartolome et al. 2006). The 1990 guidelines establish a minimum RDM level of 1,200 pounds per acre of herbaceous plant material remaining in the fall to protect the soil resources and optimize vegetative production. Lower levels of cover are permitted in identified high-impact areas, such as water and feeding troughs, corrals, and adjacent to dairies. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review 25 years of RDM monitoring data and update the program. The UC report (Bartolome *et al.* 2015) concluded that the minimum 1,200 pounds per acre standard remains appropriate. Maintaining a minimum RDM level of 1,200 pounds per acre minimizes soil erosion, increases seed germination, minimizes nutrient runoff via bio-infiltration, and improves forage production (Bartolome et al. 1980; Jackson and Bartolome 2002).

Streams on the peninsula, where dairy operations are located, and where the most intensive activities occur, do not support coho or Chinook salmon, but some do support steelhead. Approximately 162 acres of Pasture subzone on dairies authorized for nutrient and manure management will be located within the Tomales Bay watershed. Runoff laden with nitrogen and phosphorus from fields following manure application is a potential source of water pollution to Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts Lagoon. Though salmonid use of these waterbodies is not clearly understood, it is assumed that at least some are used as migrating corridors and feeding grounds during adult and smolt life stages. However, multiple measures will be in place to protect water resources including: 1) absence of waterways and slopes greater than 20 percent within the Pasture subzone; 2) required nutrient management plans under regulation by the RWQCB; 3) required monitoring and maintenance of riparian fences along salmonid streams; and 4) adherence to Practice Standards and mitigation measures for manure and nutrient management (see Appendix F of the EIS, NPS 2020c). These measures will serve to avoid or minimize any potential adverse effects on salmonids due to impaired ground or surface water leading into these waterbodies.

Items addressed by lease-permits and ROAs include tree and vegetation removal, ground disturbance, use of hazardous materials, pesticides and herbicides, management of livestock, and protection of wildlife, plants, and water quality. The subzoning framework will ensure resource protection by identifying the most appropriate locations on each ranch for grazing and management activities. Each lease-permit will require ranchers to enter into an ROA, identifying ranch-specific operational details and requirements associated with beef or dairy ranching, authorized diversification activities, and maintenance requirements. The ROA will also identify management activities, required NRCS Conservation Practice Standards, and mitigation measures that apply to the authorized activities.

Available information indicates that impaired water quality, destruction or reduction of riparian vegetation, and erosion and compaction of soils that would likely occur as a result of Range Operations and Management is likely to be limited to a few small localized areas. Impacts are likely to be further reduced for the following reasons: 1) NPS restricts the amount of livestock allowed on grazing lease land to maintain vegetative cover; 2) 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; 3) most of the

salmonid streams in areas of grazing have been fenced to exclude livestock access to riparian areas and ranchers will be required to monitor and maintain fences along salmonid streams; 4) NPS requires that all ranches comply with well-established NRCS Conservation Practice Standards, including the 1,200 pound per acre RDM standard; 5) the delineation of subzones will restrict the most land-intensive activities to those areas with the fewest sensitive natural resources; and 6) annual reviews of ROAs will allow NPS to closely monitor and adaptively manage Range Operations and Management activities.

Therefore, NMFS expects adverse effects to all freshwater life stages of listed coho salmon, steelhead, and Chinook salmon will only occur in localized, dispersed areas. Although it is not possible to estimate precisely how many, we expect that therefore only a small number of listed salmonids will experience harm (injury or mortality due to poor habitat conditions) in these dispersed locations.

2.5.2 Impacts to Critical Habitat

PBFs of critical habitat for both species found within the action area include sites for migration, rearing and spawning. For the same reasons described above, effects to critical habitat from project site dewatering associated with Ranch Infrastructure activities on critical habitat PBFs are expected to be temporary and minor, and project sites will recover relatively quickly (one to two months) after the project site is re-watered. Similarly, for reasons described above, short-term turbidity from elevated levels of suspended sediment may slightly degrade the value of critical habitat in the action area, but only temporarily. Based on the size of the areas to be dewatered and stream and bank substrate conditions, NMFS expects turbidity after rewatering the project sites to last for only a few hours. Thus, turbidity and sediment deposited downstream resulting from this activity type are expected to be miniscule, or short-term and temporary, and are therefore unlikely to have more than negligible impacts on migration, spawning, or rearing PBFs in the action area.

In addition to the effects on aquatic habitat described in the section above, effects of the proposed action on designated critical habitat include altered watershed hydrology and channel morphology. Natural fluvial and geomorphic processes are important for maintaining PBFs of critical habitat. Streams transport water and sediment from upland sources to the ocean and, generally speaking, the faster the streamflow, the greater the erosive force. Natural processes constrain and moderate these erosive forces, such as when complex structure both within (*e.g.*, boulders or woody debris) and adjacent (*e.g.*, riparian vegetation) to the stream channel slows the water velocity and, by extension, its erosive force (Knighton 1998). Where existing geology and geomorphology allow, such as within the action area, a stream channel will also naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. For instance, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies LWD, and allows floodplain engagement during appropriate winter flows (Spence *et al.* 1996).

Habitat destruction in streams resulting from livestock access is well-understood (Platts 1991, Knapp and Mathews 1996, Myers and Swanson 1995, Clary and Kinney 2002, McIver and McInnis 2007, Ranganath *et al.* 2009). Livestock grazing effectively forces streams into a simplified linear configuration that, without the ability to move laterally, instead erode and deepen vertically (Leopold 1968; Dunn and Leopold 1978). The resulting "incised" channel fails to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. The resulting simplified stream reach typically produces limited macroinvertebrate prey and poor functional habitat for rearing juvenile salmonids (Kauffman *et al.* 1983, Florsheim *et al.* 2008).

Since the mid-1990s, NPS has worked with ranchers to exclude cattle from approximately 780 acres of riparian habitat which have been removed from lease-permits. Additionally, within the action area, approximately 800 acres have been fenced to exclude cattle from sensitive resources. Activities within the Range subzone, which includes approximately 77 percent of the stream miles in the action area, will be restricted to cattle-grazing. Most other surface water resources are contained in the Resource Protection subzone, which includes fencing that excludes livestock from streams occupied by coho salmon. Protection of riparian areas has focused on watersheds known to contain salmonids and exclusion efforts have prioritized those with the most evident impacts, such as lack of streamside vegetation, erosion, and frequent cattle use. Overall, riparian systems in and adjacent to the action area are in good condition and support the habitat needs of endangered coho salmon and threatened steelhead (NPS 2020a). Cattle are excluded from direct access to Lagunitas and Olema creeks, the two most significant streams occupied by coho salmon in the action area. Cattle will thus only directly affect this habitat for salmon and steelhead on occasion if they were to breach pasture fences into excluded riparian areas. Ranchers will be required to monitor and maintain riparian fences along salmonid streams to minimize any breaching occurrences. Lands added to the Resource Protection subzone will exclude cattle from approximately 2.4 miles of perennial streams in the Lagunitas and Olema Creek watersheds. In the Olema Creek watershed, these livestock exclusion areas will restrict grazing from approximately 1.9 miles of riparian habitat covering approximately 33 acres, including critical habitat on John West Fork and Horse Camp Gulch. In the Lagunitas Creek watershed, cattle would be excluded from approximately 60 acres added to the Resource Protection subzone in the upper reaches of Devil's Gulch, and an additional 5 acres would be added to the Resource Protection subzone along other reaches of important aquatic habitat.

NMFS expects the continued alteration of watershed hydrology and channel morphology within the action area from cattle ranching and dairy operations to adversely affect designated critical habitat for CCC coho salmon and steelhead. However, available information indicates that these adverse effects are likely to be limited to a few small localized areas for the following reasons: 1) NPS restricts the amount of livestock allowed on grazing lease land to maintain vegetative cover; 2) 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; 3) most of the salmonid streams in areas of grazing have been fenced to exclude livestock access to riparian areas and ranchers will be required to monitor and maintain these fences; 4) NPS requires that all ranches comply with well-established NRCS Conservation Practice Standards, including the 1,200 pound per acre RDM standard; 5) the delineation of subzones will restrict the most land-intensive activities to those areas with the fewest sensitive natural resources; and 6) annual reviews of ROAs will allow NPS to closely monitor and adaptively manage Range Operations. In addition to these reasons, conservation actions

implemented by NPS over the last 30 years (and those planned via reauthorizing ranching permit-leases for 20 years), in combination with enforcement of mitigation measures and NRCS Conservation Practice Standards are likely to help maintain or improve habitat conditions for listed salmonids.

With respect to effects of the proposed action on instream flows, most ranches have water developments for cattle consumption, including developed springs, wells, and associated storage tanks and troughs. Redevelopment of the following existing water sources and associated distribution infrastructure may be authorized over the 20-year lease permit term following NPS review: up to 25 spring developments, 40 livestock pipelines, 30 watering facilities, and 24 pumping plants. Minimum stream flows in the mainstem of Lagunitas Creek range from 8 to 25 cfs in a normal water year and between 6 to 20 cfs during drought conditions. Beef and dairy operations use an estimated 0.14 to 0.33 cfs per year across the action area (NPS, Ketcham, personal communication 2018). Even though summer flows in some of the tributaries or other creeks could be quite low, it is expected that the water use necessary to implement the plan will be but a fraction of what's available across the action area and will not result in adverse effects.

While herbicides are reasonably expected to reach streams within the action area over the 20 year period of the proposed action and may affect individual salmonids, the limitations proposed by NPS on the herbicides and adjuvants, and the procedures to minimize drift or other routes of entry, are expected to make this exposure relatively rare. Therefore, any impact to the PBFs in the action areas are also expected to be temporary and minor, and project sites will recover relatively quickly.

2.6. Cumulative Effects

"Cumulative effects" are 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 (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

For the purpose of this analysis, the action area that is the subject of this opinion is limited to the ranch lands in these watersheds and all streams which drain from them downstream to, and including, Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas lagoons directly and indirectly affected by the proposed action, as described above in the Action Area section of this opinion. 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 ESA section 7 consultation processes and are not considered here.

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. NMFS is not aware of the total number of

pending water diversion applications in the Lagunitas Creek basin but water rights within the Lagunitas Creek basin have been fully allocated.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: 1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or 2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.7.1 CCC Coho Salmon, CCC Steelhead, and CC Chinook Salmon

As independent populations, federally endangered CCC coho salmon and threatened CCC steelhead within the Lagunitas Creek watershed, including Olema Creek, are important to the recovery of the ESU and DPS, respectively. Many independent populations of CCC coho salmon that supported the species' overall numbers and geographic distributions in the past have been extirpated and steelhead numbers are substantially reduced from historic levels. The Lagunitas Creek watershed supports approximately 10 percent of the remaining CCC coho salmon population. This population is also considered the southernmost wild, independent population along the Pacific Coast and is critical to the survival and recovery of the species. The proposed action location is within a core priority area for protection and restoration as detailed in the CCC coho salmon recovery plan (NMFS 2012a).

Geographically, the Lagunitas Creek watershed and tributaries of Drakes Estero represent a relatively small portion of the overall CCC coho salmon, CCC steelhead, and CC Chinook salmon geographic range. Small populations are more vulnerable to demographic and environmental fluctuations than are larger populations (Gilpin and Soule 1986, Pimm *et at.* 1988), while each small population also acts as a buffer against extinction of the species. The species' relatively broad distribution throughout the species' ranges is a positive indicator 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. However, the value of these watersheds to salmonids remains significant given the current degraded condition of habitat throughout the ESUs and DPS. 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.

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, CDFW 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 (NMFS 2001). 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.

The steelhead and Chinook salmon populations that use the action area, while substantially reduced from historical numbers, appear to be relatively stable. CCC coho salmon abundance has improved slightly since 2011 within several independent populations (including Lagunitas Creek), although all populations remain well below their recovery targets. 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 therefore depend upon programs that protect and restore aquatic habitats in watersheds and the continued reduction of impacts from land use and water withdrawal. The implementation of the proposed avoidance and minimization measures combined with the long-term beneficial effects of past Ranch Infrastructure activities are expected to maintain or improve the status of aquatic habitat in the watersheds within the action area.

Global climate change presents another real threat to the long-term persistence of listed salmonids, especially when combined with the current depressed population status and human caused impacts. Regional (*i.e.,* North America) climate projections for the mid to late 21st Century expect more variable and extreme inter-annual weather patterns, with a gradual warming pattern in general across California and the Pacific Northwest. However, extrapolating these general forecasts to the smaller action area is difficult, given local nuances in geography and other weather-influencing factors. Water temperatures may rise somewhat in the action area due to climate change over the next several decades, reinforcing the likelihood of reduced carrying capacity in the action area due to loss of riparian habitat as described above.

The number of individual salmonids that may be adversely affected or killed during proposed action activities is expected to make up a very small portion of the individuals within the action area, a smaller portion of the Lagunitas watershed populations, and subsequently an even smaller portion of the overall ESUs and DPS. Of the ESA-listed species considered in this opinion, only juvenile coho salmon and steelhead are likely to be captured during work area isolation. Chinook salmon are not likely to occur year-round because they migrate out during their first year as smolts by early summer. Adult salmon and steelhead that may be present when the in-water work area is isolated are likely to leave by their own volition, or can otherwise be easily excluded without capture or direct contact before the isolation is complete. It is rare for adult fish to be captured during work area isolation. Because the quality of habitat in and around the action area is adequate to support rearing salmonids, NMFS expects fish will be able to find food and cover in the action area downstream of project sites as needed during dewatering activities.

The peak number of Ranch Infrastructure projects anticipated to occur under the plan (See Section 1.3.4) is very small compared to the total number of miles of critical habitat available in

each recovery domain. The likelihood of additive adverse effects on species in the action area due to Ranch Infrastructure projects occurring in close proximity within the same watershed, or even within sequential watersheds, is low. Ranch Infrastructure activities that are considered conservation actions should result in long-term benefits for listed salmonids. This conclusion regarding beneficial effects is not reliant on the implementation of new Ranch Infrastructure activities as part of the proposed action. Those activities that have already been implemented across the plan area will continue to be maintained and therefore result in long-term benefits regardless of whether any new conservation activities are implemented.

The ultimate effect of changes in the distribution and productivity of salmon and steelhead will vary with life stage, the duration and severity of the stressor, the frequency of stressful situations, the number and temporal separation between exposures, and the number of contemporaneous stressors experienced (Newcombe and Jensen 1996; Shreck 2000). Projects that dewater streams are likely to impair local movements of juvenile fish for hours or days, and downstream migration maybe similarly impaired.

It is unlikely that the small loss of salmon and steelhead from freshwater life history stages resulting from this proposed action, via the effects of Ranch Infrastructure activities and Range Operations and Management (i.e., dewatering and fish relocation activities, altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions), would impact future adult returns such that impacts would occur to the populations' resilience and persistence over time. As noted in the effects section, effects from the proposed action are likely to be limited to small areas within the action area. In addition, given the small reduction in the growth and survival of fish that will be directly affected, primarily at the fry, parr, and smolt life stages, the relatively low intensity and severity of that reduction at the population level, any adverse effects to fish growth and survival are likely to be inconsequential to the populations inhabiting the action area. Moreover, the proposed action is also reasonably certain to lead to some degree of population enhancement within the action area, including more normal growth and development, improved survival, and improved spawning success. Thus, the improvement of watershed function through conservation dairy and beef ranching methods and Ranch Infrastructure activities will likely have long-term beneficial effects on population structure.

The adverse effects of each proposed individual action will be too infrequent, short-term, and limited to harm or kill more than a small number of (largely) juvenile fish at a particular site or even across the range of a single population. Thus, it is unlikely that the small losses of fish resulting from this proposed actin would impact future adult returns. The resilience and persistence of these populations, their numbers, reproduction, and distribution, are unlikely to be meaningfully reduced by the proposed action. Consequently, we do not expect that implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the CCC coho salmon ESU, CCC steelhead DPS or CC Chinook salmon ESU in the wild by reducing their numbers, reproduction, or distribution.

2.7.2 CCC Coho Salmon and CCC Steelhead Critical Habitat

While conditions vary across the ESU and DPS, designated critical habitat for CCC coho salmon and CCC steelhead is generally impaired by: logging, agriculture, mining, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals. These factors also affect the critical habitat designated in the Lagunitas Creek watershed which may be

affected via fish passage barriers, high fine sediment loads, low summer streamflow, high summer water temperature, a shortage of cover in the form of large woody debris, and loss of riparian vegetation.

NMFS concludes that many of the adverse effects to critical habitat 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 habitat function, sedimentation and turbidity in fish habitats, loss of shade and higher water temperatures, and high instream nutrient loads. However, nearly all the riparian areas of salmon-bearing streams within the action are fenced and ranchers will be required to monitor and maintain this fencing as part of their lease-permits. Cattle are excluded from direct access to Lagunitas and Olema Creeks, the two most significant streams occupied by coho salmon in the action area. Cattle will thus only directly affect this habitat for salmon and steelhead on occasion if they were to breach pasture fences into excluded riparian areas. In these areas, the proposed action will degrade PBFs of designated critical habitat, namely those related to juvenile rearing. Regarding Ranch Infrastructure activities, the majority of the proposed action's impacts to critical habitat will be temporary, and temporarily disturbed habitat will be restored upon completion. Ranch Infrastructure activities that are considered conservation actions should result in long-term benefits for critical habitat. This conclusion regarding beneficial effects is not reliant on the implementation of new Ranch Infrastructure activities as part of the proposed action. Those activities that have already been implemented across the plan area will continue to be maintained and therefore result in long-term benefits regardless of whether any new activities are implemented.

The effects of the proposed action, when added to the environmental baseline, cumulative effects, and species status, are not expected to appreciably reduce the quality and function of critical habitat at the larger ESU or DPS levels, given: 1) the temporary duration of many of the effects, 2) the small areas within the action area experiencing longer term adverse effects, and 3) the size of the action area compared to the quality and quantity of habitat within the entire Lagunitas Creek watershed (including Olema Creek). While the environmental baseline remains in degraded condition due to historical ranching practices (channelization, etc.) and other impacts, NPS has taken steps described above in the environmental baseline to restore channel functions and reduce impacts on aquatic habitat that is already providing improved habitat conditions. These restorative actions are expected to continue during the period of the proposed action (as noted above they will be maintained as part of leasing agreements), and habitat quality is expected to continue to improve in many portions of the action area. Thus, the proposed action will not impair the ability of critical habitat to play its intended conservation role of supporting populations of CCC coho salmon and CCC steelhead at the ESU and DPS levels.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC coho salmon, CCC steelhead, or CC Chinook salmon or destroy or adversely modify designated critical habitat for CCC coho salmon or CCC steelhead.

2.9. 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 a 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. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

In this opinion, NMFS determined that incidental take of juvenile CCC coho salmon and CCC steelhead and adult CC Chinook salmon in the form of injury, harm, or mortality is reasonably certain to occur as follows during dewatering and fish relocation events that occur during the implementation of Ranch Infrastructure activities:

> As described in the preceding opinion, based on prior experience with current relocation techniques and protocols likely to be used to conduct the dewatering and fish relocation, unintentional mortality of listed salmonids expected from capturing and handling fish is not likely to exceed three percent of the total fish handled. The amount of incidental take during dewatering and fish relocation will be considered exceeded if more than three percent of the total fish handled are injured or killed during any Ranch Infrastructure activity.

In this opinion, NMFS also determined that a low-level of incidental take in the form of harm of any freshwater life stage of CCC coho salmon, CCC steelhead, and CC Chinook salmon is reasonably certain to occur from habitat-related impacts (altered stream hydrology/morphology, impaired water quality, including exposure to the proposed herbicides and adjuvant, and degraded riparian habitat conditions) due to the implementation of Ranch Infrastructure and Range Operations and Management activities. NMFS expects this incidental take to occur in localized and dispersed areas. The precise number of these listed salmonids that are expected to be incidentally taken resulting from these habitat-related impacts cannot be accurately quantified because: 1) these species are relatively small (especially as eggs, alevins, and juveniles); 2) these species live in aquatic environments where visibility is often low, hiding cover is often available, and predators feed; and 3) we cannot precisely predict where and when habitat impacts will occur across the ranching area and over the course of the 20-year permit term. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i).

Incidental Take related to Ranch Infrastructure Activities

As described above, NMFS determined that a low-level of incidental take in the form of harm of any life stage of CCC coho salmon, CCC steelhead, and CC Chinook salmon is reasonably

certain to occur from habitat-related impacts (altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions) due to the implementation of Ranch Infrastructure activities. The following programmatic surrogate for the amount or extent of such incidental take is the best currently available indicator that is proportional to those effects. This is because all habitat pathways of incidental take will vary in proportion to altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions.

The extent of incidental take will therefore be considered exceeded if the total number of Ranch Infrastructure activities implemented under the proposed action within the action area over the 20-year term of the plan exceed the numbers listed below for any category. As described in the Effects of the Action section of this opinion, although the following totals represent the amount of such activities expected to occur within the action area, there is no specific information on how many of the activities are expected to occur within areas occupied by salmonids in the action area, nor is there any aspect of the proposed action that would limit all of the activities from occurring. Thus, for purposes of analyzing the adverse effects of such activities that may occur in the action area as a result of the proposed action, NMFS is assuming that all of the activities are likely to occur within the 3.15 miles of Lagunitas Creek, 17.7 miles of Olema Creek, and 3.71 miles in Drakes Estero plus respective tributaries that support CCC coho salmon, CCC steelhead, and CC Chinook salmon (see Table 3); and are reasonably certain to result in incidental take of listed species.

- 20 access road projects, up to 10 trail and walkways, 40 structures for water control, and 5 road closure and treatment projects.
- 16 stream crossing projects.
- 25 Grassed Waterways and 12 Filter Strip projects.
- 20 percent of the 340 miles of existing fencing will be replaced, 24 miles of fence will be installed for the Resource Protection subzone, and an additional 35 miles of new fence will be constructed to improve livestock management.
- 25 spring developments, 40 livestock pipelines, 30 watering facilities.
- 25 pond restoration projects.
- 40 grade stabilization structure (headcut repair) and 20 lined waterway projects (drainage ditch stabilization).

Incidental Take related to Range Operations and Management Activities

As described above, NMFS determined that a low-level of incidental take in the form of harm of any life stage of CCC coho salmon, CCC steelhead, and CC Chinook salmon is reasonably certain to occur from habitat-related impacts (altered stream hydrology/morphology, impaired water quality including from the proposed herbicides and adjuvant, and degraded riparian habitat conditions) due to the implementation of Range Operations and Management activities. NMFS is using riparian fence maintenance and herbicide application buffers in salmonid habitat, and RDM standards as surrogates for this incidental take. These measures are the best take indicator

for this incidental take as a result of these activities because: 1) the habitat effects of cattle grazing increase with the amount of time cattle spend in close proximity to streams and riparian fences are imperative to minimizing these effects; 2) all habitat pathways of take will vary in proportion to altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions; 3) the herbicide application buffers have been assigned to reduce potential exposure following modeling procedures that produced EECs meant to be protective of adverse effect thresholds for listed salmonids defined as either $1/20^{th}$ of the LC50 value or the lowest acute or chronic "no observable effect concentration", whichever was lower; and 4) the 1,200 pounds per acre RDM standard is well established as an effective conservation measure to protect soil resources, increase biofiltration, and minimize nutrient runoff into aquatic habitats.

Therefore, the extent of incidental take as a result of these activities will be considered exceeded if: 1) riparian fences that must be maintained, as identified in ROAs, are found to be in disrepair and are not completely repaired or replaced (to prevent cattle breaching); 2) no spray buffers and other measures in the proposed action meant to reduce the potential for the herbicides and the adjuvant from entering the stream network (described in Section 1.3.5 of this opinion under additional measures specific to herbicide application) are not followed; and 3) RDM levels of 1,200 pounds per acre are not maintained, except in the following limited circumstances. RDM levels of 1,200 pounds per acre may be adaptively managed: a) in identified high-impact areas, such as water and feeding troughs, corrals, and adjacent to dairies; or b) if NPS determines it is necessary to adjust RDM levels to manage toward desired resource conditions (for example, during drought or when vegetative species composition changes). If NPS determines it is necessary to adjust these RDM levels to manage toward desired resource conditions, NPS shall provide NMFS a full explanation as part of the annual reporting process.

2.9.2 Effect of the Take

In this opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.10 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of CCC coho salmon, CCC steelhead, and CC Chinook salmon:

1. Measures shall be taken to minimize the amount or extent of incidental take due to the implementation of Range Operation and Management and Ranch Infrastructure activities.

2. Measures shall be taken to monitor the amount and extent of incidental take by reporting the results of fish relocation activities, herbicide applications, and the ROA annual reporting and review process.

2.11 Terms and Conditions

The terms and conditions described below are non-discretionary, and NPS or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). NPS or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

The following Terms and Conditions implement Reasonable and Prudent Measure 1:

1. NPS shall ensure that all fisheries biologists working on projects that require dewatering and fish relocation are qualified to conduct fish collections in a manner that minimizes all potential risks to ESA-listed salmonids. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to the NOAA Fisheries Guidelines (NMFS 2000).

2. NPS shall ensure that a fisheries biologist is on site during all dewatering events in anadromous fish streams to ensure that all ESA-listed salmonids are captured, handled, and relocated safely. During fish relocation activities the fisheries biologist shall contact the NMFS Santa Rosa office if mortality of federally listed salmonids exceeds three percent of the total for any species collected, at which time NMFS will stipulate further measures to avoid or minimize the take of listed salmonids.

3. If ESA-listed fish are handled, NPS shall ensure that the fish are handled with extreme care and they shall be kept in water to the maximum extent possible during rescue activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish shall not be removed from this water except when released. To avoid predation the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured salmonids shall be relocated as soon as possible to a suitable instream location where suitable habitat conditions are present to allow for survival of transported fish and fish already present.

4. NPS shall ensure that pumps used to dewater the work area are equipped with screens that meet the following NMFS fish screening criteria:

    a. Perforated plate: screen openings shall not exceed 3/32 inches (2.38mm), measured in diameter.
    b. Woven Wire: screen openings shall not exceed 3/32 inches (2.38 mm measured diagonally).
    c. Screen material shall provide a minimum of 27 percent open area. Approach velocity shall not exceed 0.33 feet per second.

5. NPS shall ensure the 1,200 pounds per acre RDM standards are met by continuing to use visual RDM mapping across the plan area ranches to better inform management. This mapping will occur using the same approach as was used from 2016-2019.

6. NPS shall ensure that riparian fences that must be maintained, as identified in ROAs, and that are found to be in disrepair are completely repaired or replaced (to prevent cattle breaching) within one year of discovery.

7. NPS shall ensure that broadcast applications of herbicide are not conducted within 100 feet of salmonid streams in the action area in order to achieve the same level of protection against adverse effect to listed salmonids (defined as either $1/20^{th}$ of the LC50 value or the lowest acute or chronic "no observable effect concentration", whichever was lower) as achieved in NMFS 2020.

8. NPS shall ensure that spot applications of herbicides containing triclopyr BEE do not occur within 50 feet of salmonid streams in the action area.

9. NPS shall ensure that a nontoxic colorant is added to broadcast (liquid) herbicide applications in order to ensure that drift is not occurring into non-targeted areas. The recent programmatic biological opinion (NMFS 2020) cleared four colorants proposed for use by the applicant (Dynamark™ U.V. red and blue, Aquamark™ Blue and Hi-Light® blue).

10. NPS shall ensure that herbicide applications do not take place when ground temperatures exceed 80 degrees Fahrenheit in order to prevent volatilization and transport of herbicides from the target area.

11. NPS shall ensure that all sprayers are set to apply at the maximum recommended droplet size and lowest pressure setting recommended to the herbicide.

12. NPS shall ensure that no more than three herbicides are mixed in a tank mixture in order to prevent potential additive toxicity in the event that non-targeted areas are exposed.

The following Terms and Conditions implement Reasonable and Prudent Measure 2:

<u>Annual Program Reporting</u>

1. NPS shall report annually the number and species of any listed fish handled during fish relocation activities. The annual reports will contain the following information:

    a. The number of each species of fish relocated and injured or killed for each relocation event and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities, and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

    b. The date, time, air and water temperature during each fish relocation event

    c. The length of stream dewatered during each fish relocation event.

    d. The location of each fish relocation event including where fish were relocated from and to.

e. A description of the equipment and methods used to collect, hold, and transport salmonids.

2. NPS will use the information obtained from ROA monitoring and annual discussions to provide an annual program summary report to the NMFS Santa Rosa Office by December 31st each year. NPS will coordinate with NMFS within six months of the issuance of this opinion to finalize a template for this report which allows for succinct, informative relay. The report will contain a summary of the following activities (a-g below) that occur within the specific stream reaches within the action area containing listed salmonids, their critical habitat, or both (i.e., 3.15 miles of Lagunitas Creek, 17.7 miles of Olema Creek, and 3.71 miles in Drakes Estero plus respective tributaries (see Table 3 for lengths of stream within the action area containing listed salmonids, their critical habitat, or both)):

    a. A brief description of any covered ranch infrastructure activities implemented during the report period (see Section 1.3.4 and the ITS).

    b. A summary of each year's vegetation management, required NRCS Conservation Practice Standards, and mitigation measures that apply to the authorized activities as reported in ROAs, including how the 1,200 pounds per acre RDM standard was met (see Sections 1.3.6, 2.4.4, and 2.5.1).

    c. A list of all herbicides and surfactants used and applicable mitigation measures (including location, buffers, and application method).

    d. A summary of the following monitoring and maintenance metrics conducted on riparian fencing: 1) linear feet monitored; 2) linear feet of any occurrences of breaching or disrepair; 3) date(s) that breaching or disrepair was discovered; and 4) specific dates and actions taken to repair.

    e. The identification of persistent water quality concerns from any sediment and nutrient monitoring efforts.

    f. Identification of roads used for livestock management that are causing persistent levels of sedimentation of streams.

    g. Before and after photo documentation of: 1) the condition of the surrounding habitat for any ranch infrastructure activities that require dewatering of salmonid streams; and 2) lengths of riparian fencing that require repair.

2.12 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

NMFS has the following conservation recommendation for NPS:

1. NPS should engage with NMFS on other potential Program-level efforts to achieve improved conservation and regulatory efficiency during section 7 consultations.

2. NPS should replace use of triclopyr BEE products with triclopyr TEA products that are safer for use within riparian zones and are often approved for in water use.

3. NPS should review the BPA Habitat Improvement Program biological opinion (NMFS 2020) and associated documents and then discuss with NMFS the means to amend their current program to increase their options and flexibility for herbicide and adjuvant use while protecting listed salmonids and their habitat.

2.13 Reinitiation of Consultation

This concludes formal consultation for the National Park Service Point Reyes National Seashore General Management Plan Amendment. As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by NPS and descriptions of EFH for Pacific coast salmon (PFMC 2014) and the Pacific coast groundfish (PFMC 2019) contained

in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Pacific coast salmon and Pacific coast groundfish EFH may be adversely affected by the proposed action. Specific habitats identified in PFMC 2014 for Pacific coast salmon include Habitat Areas of Particular Concern (HAPCs), identified as: 1) complex channels and floodplain habitats; 2) thermal refugia; and 3) spawning habitat. HAPCs for coho salmon include all waters, substrates and associated biological communities falling within the critical habitat areas described above in the accompanying opinion. Essentially, all CCC coho salmon and CC Chinook salmon habitat located within the proposed action area is considered HAPC as defined in PFMC 2014.

As defined in the Groundfish FMP (PFMC 2019) and the Salmon FMP (PFMC 2014), Drake's Estero, including the project footprint, is defined as Estuary HAPC. In addition, project activities in streams that drain to Tomales and Drakes Bays, Drakes and Limantour Esteros, and Abbotts and Bolinas Lagoons may affect eelgrass (*Zostera marina*) beds, defined as seagrass HAPC and marine and estuarine submerged aquatic vegetation HAPC (SAV) in the Groundfish FMP and Salmon FMP, respectively. Many species managed under the Groundfish FMP are dependent on stable and productive eelgrass beds throughout some or all of their lifestages (PFMC 2006). Studies have shown seagrass beds to be among the areas of highest primary productivity in the world (Herke and Rogers 1993; Hoss and Thayer 1993). As described in the Salmon FMP, these habitats provide important nurseries, feeding grounds, and shelter to a variety of fish species, including salmon (Shafer 2002; Mumford 2007), as well as spawning substrate to Pacific herring (*Clupea pallasii*), an important prey species for all marine life stages of Pacific salmon. Juvenile salmon use eelgrass beds as migratory corridors as they transition to the open ocean, and the beds provide both refuge from predators and an abundant food supply (see reviews by Fresh, 2006 and Mumford, 2007).

3.2 Adverse Effects on Essential Fish Habitat

The potential adverse effects of the project on EFH have been described in the preceding opinion and include degraded water quality, benthic disturbance, and temporary loss of riparian vegetation. Therefore, the effects of the project on ESA-listed species and critical habitat are anticipated to be the same as the effects to EFH in the action area.

3.3 Essential Fish Habitat Conservation Recommendations

Section 305(b)(4)(A) of the MSA authorizes NMFS to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. Although temporary potential adverse effects are anticipated as a result of the project activities, the proposed minimization and avoidance measures, and BMPs in the accompanying biological opinion are sufficient to avoid, minimize, and/or mitigate for the anticipated effects. Therefore, no additional EFH Conservation Recommendations are necessary at this time that would otherwise offset the adverse effects to EFH.

3.4 Supplemental Consultation

NPS must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these components, documents compliance with the Data Quality Act, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is NPS and an electronic copy of this opinion will be provided to NPS. Other interested users include rancher/lease applicants, and NPS will distribute either hard or electronic copies to these users at their request. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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