Point Reyes National Seashore
North District of Golden Gate National Recreation Area

U.S. Department of the Interior
National Park Service

GENERAL MANAGEMENT PLAN AMENDMENT DRAFT ENVIRONMENTAL IMPACT STATEMENT

Appendices

AUGUST 2019

APPENDIX A—MAPS

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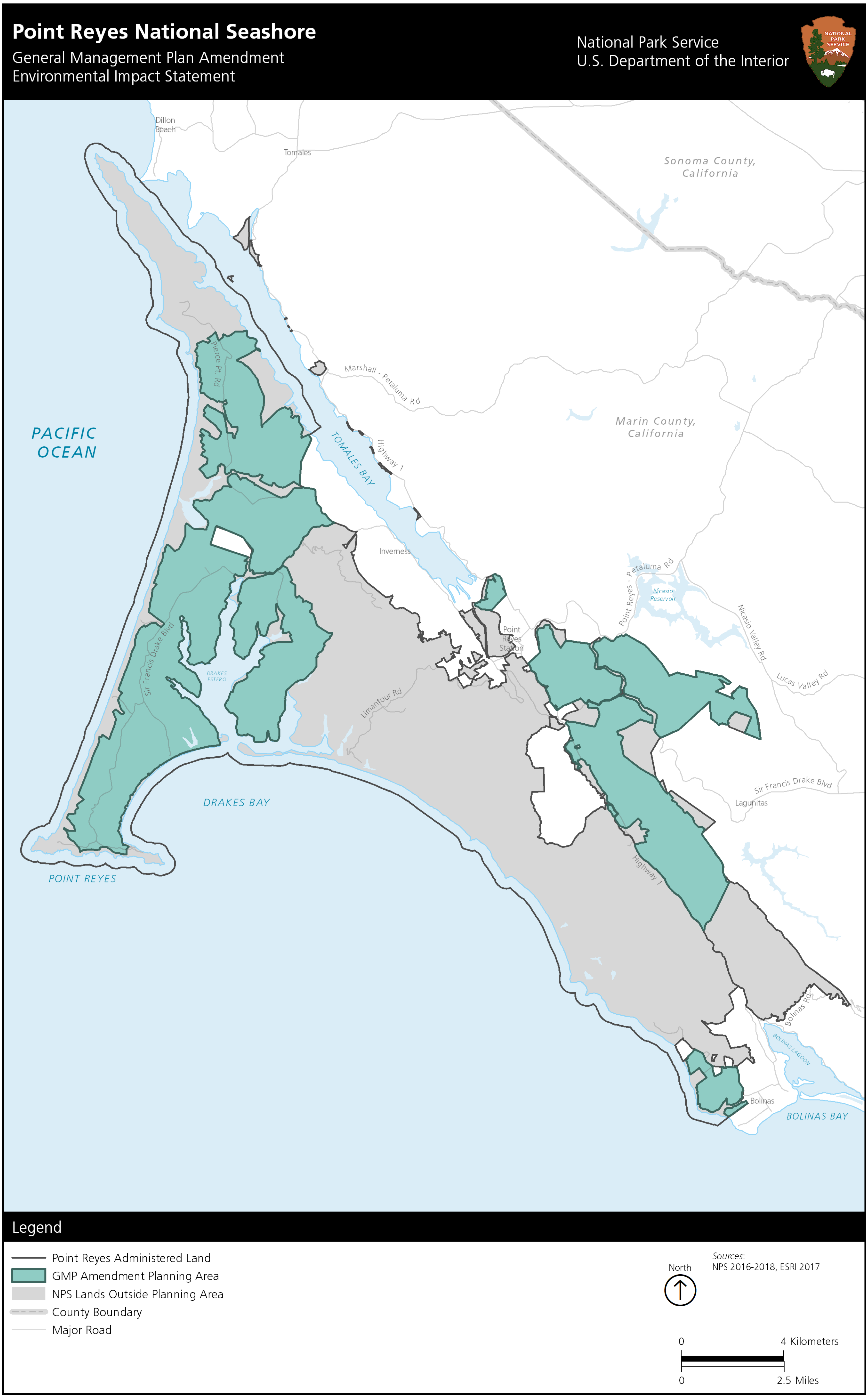


FIGURE 1: PLANNING AREA

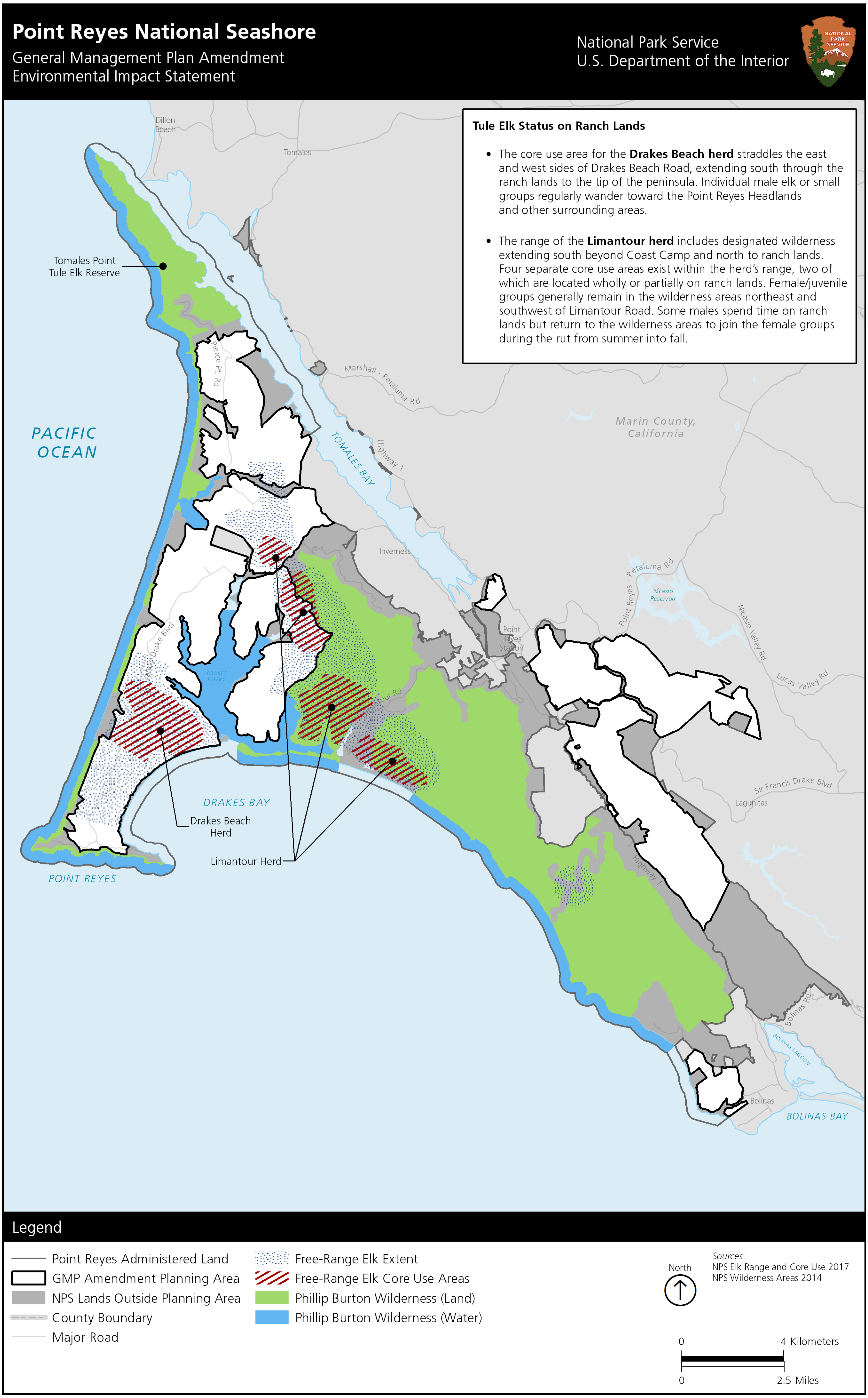
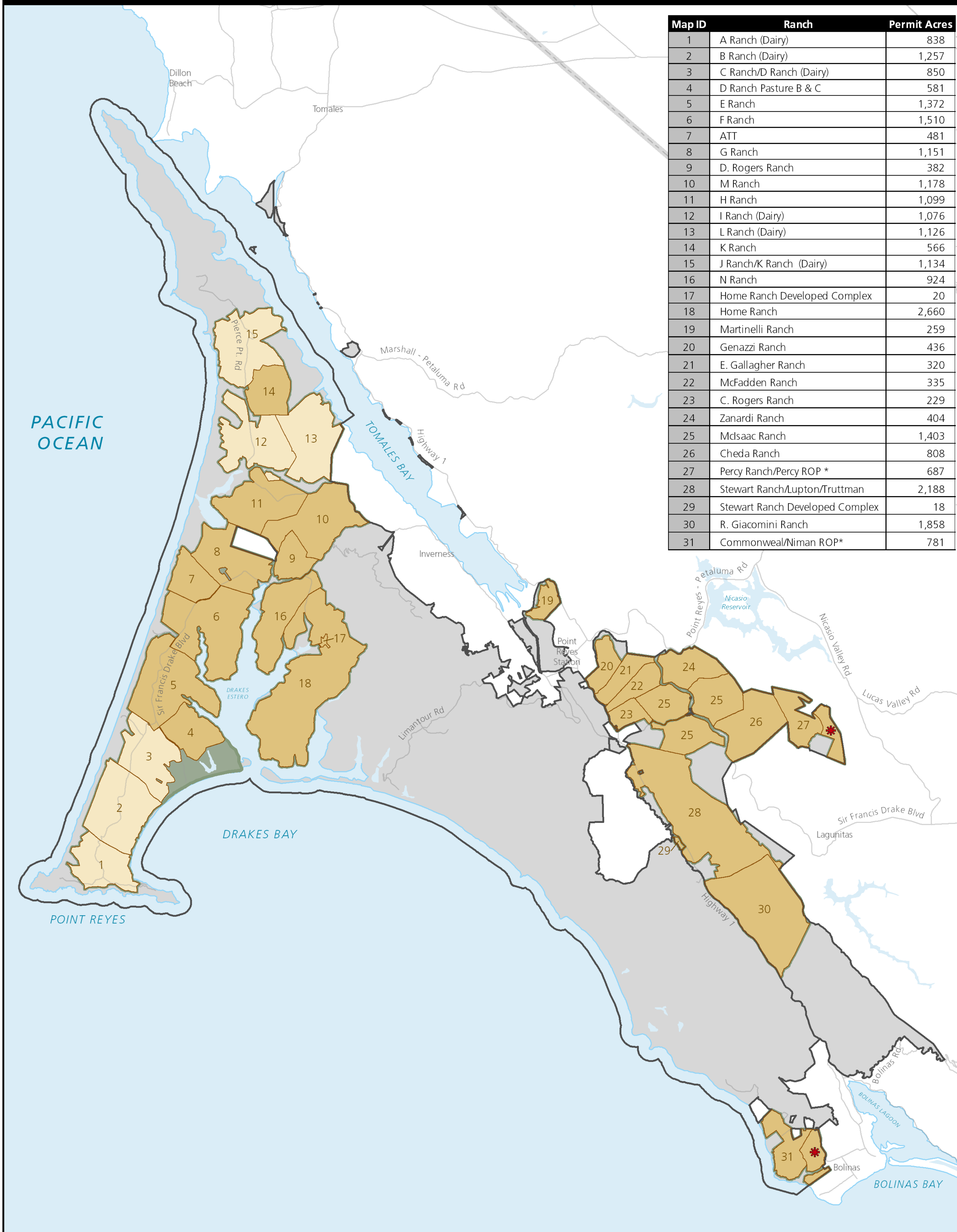


FIGURE 2: TULE ELK RANGE IN THE PLANNING AREA

Point Reyes National Seashore

General Management Plan Amendment
Environmental Impact Statement

National Park Service
U.S. Department of the Interior



Map ID	Ranch	Permit Acres
1	A Ranch (Dairy)	838
2	B Ranch (Dairy)	1,257
3	C Ranch/D Ranch (Dairy)	850
4	D Ranch Pasture B & C	581
5	E Ranch	1,372
6	F Ranch	1,510
7	ATT	481
8	G Ranch	1,151
9	D. Rogers Ranch	382
10	M Ranch	1,178
11	H Ranch	1,099
12	I Ranch (Dairy)	1,076
13	L Ranch (Dairy)	1,126
14	K Ranch	566
15	J Ranch/K Ranch (Dairy)	1,134
16	N Ranch	924
17	Home Ranch Developed Complex	20
18	Home Ranch	2,660
19	Martinelli Ranch	259
20	Genazzi Ranch	436
21	E. Gallagher Ranch	320
22	McFadden Ranch	335
23	C. Rogers Ranch	229
24	Zanardi Ranch	404
25	McIsaac Ranch	1,403
26	Cheda Ranch	808
27	Percy Ranch/Percy ROP *	687
28	Stewart Ranch/Lupton/Truttman	2,188
29	Stewart Ranch Developed Complex	18
30	R. Giacomini Ranch	1,858
31	Commonweal/Niman ROP*	781

Legend

- Point Reyes Administered Land
- GMP Amendment Planning Area
- NPS Lands Outside Planning Area
- County Boundary
- Major Road
- Reserved Life Estate
- Beef Cattle Operations
- Dairy Operations

North

0 — 4 Kilometers
0 — 2.5 Miles

Sources:
NPS 2016-2019, ESRI 2017

Figure 3: Ranch Key Map

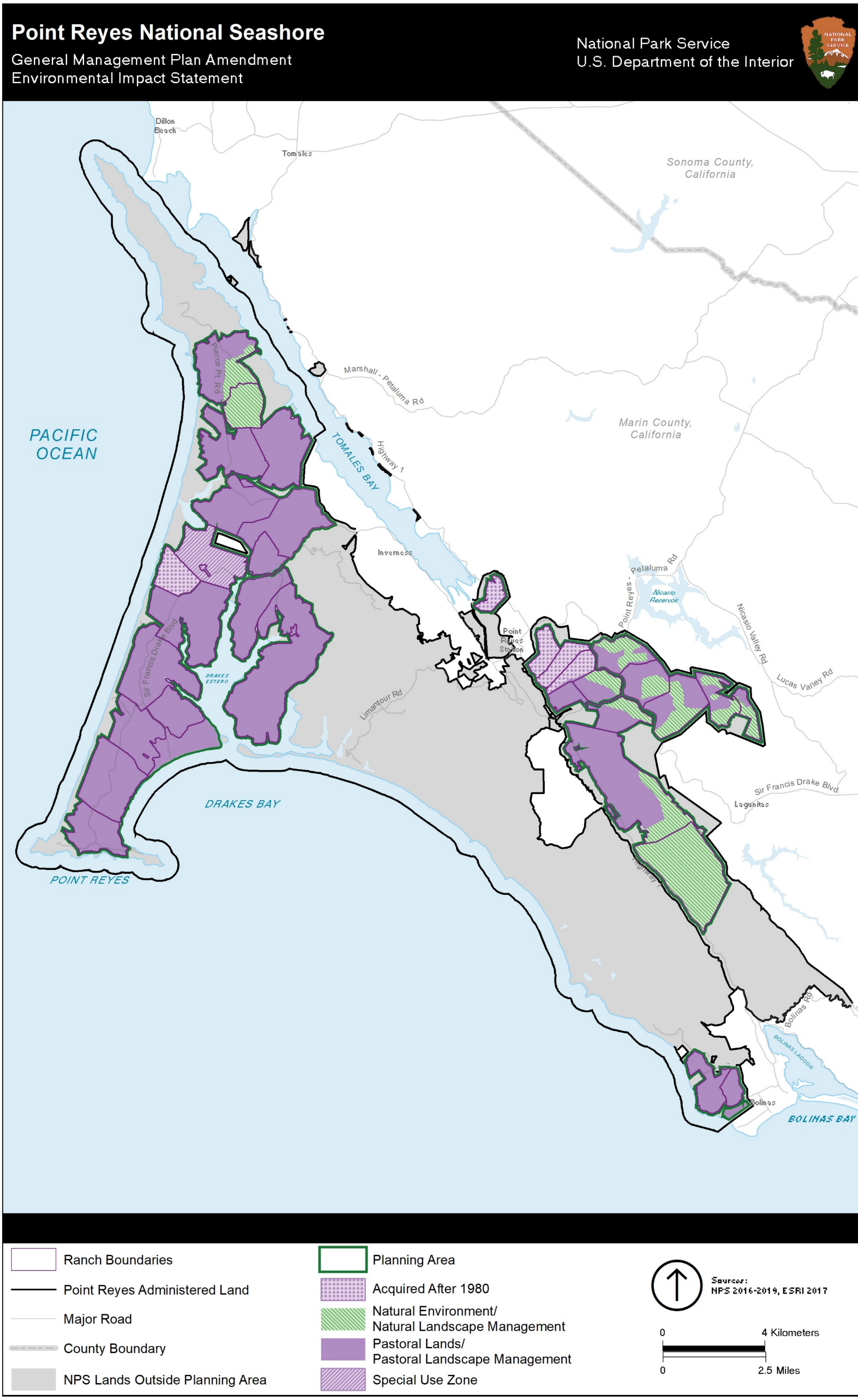


Figure 4: Alternative A Zoning Map—1980 Pastoral Zone Designation

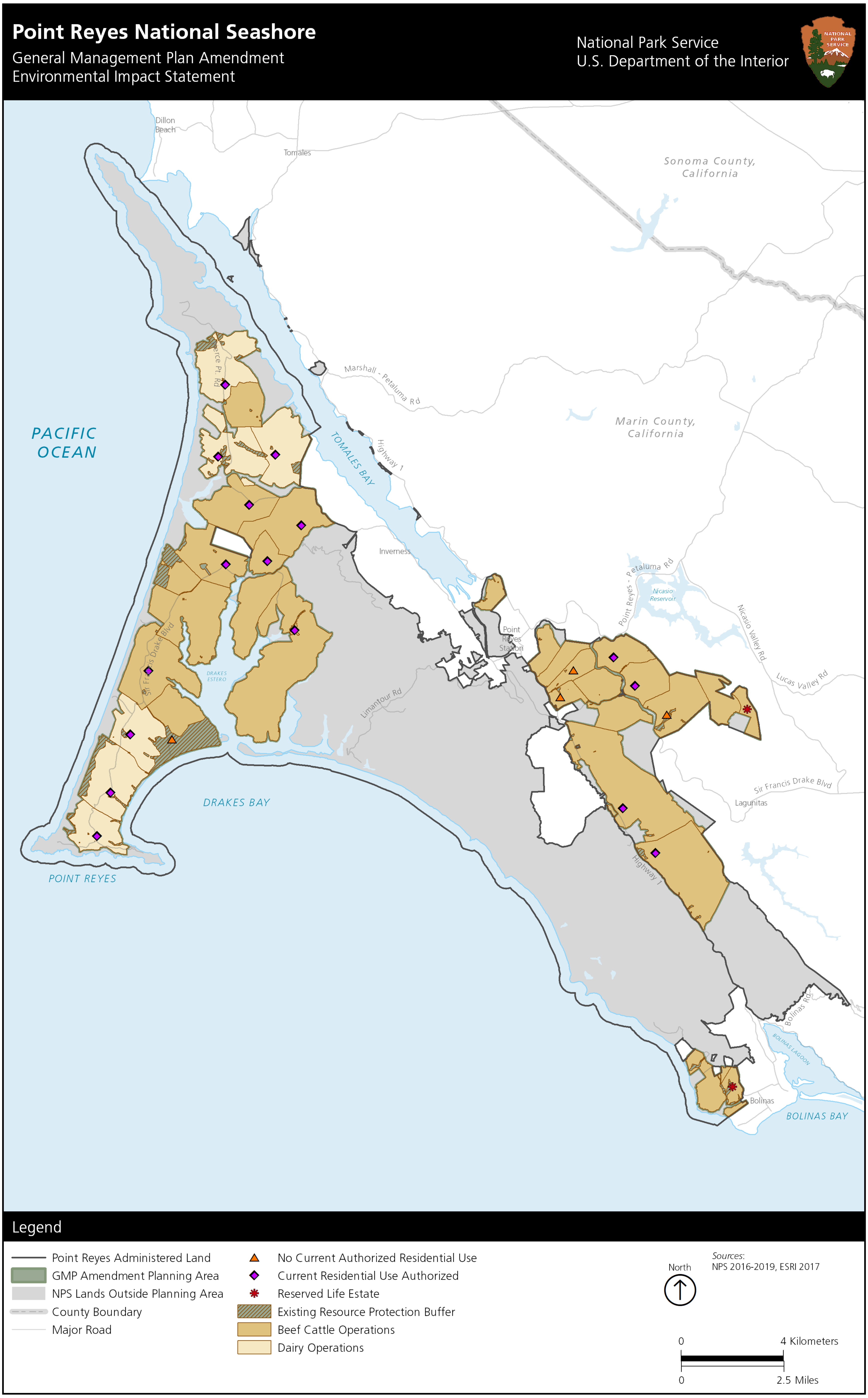


FIGURE 5: ALTERNATIVE A

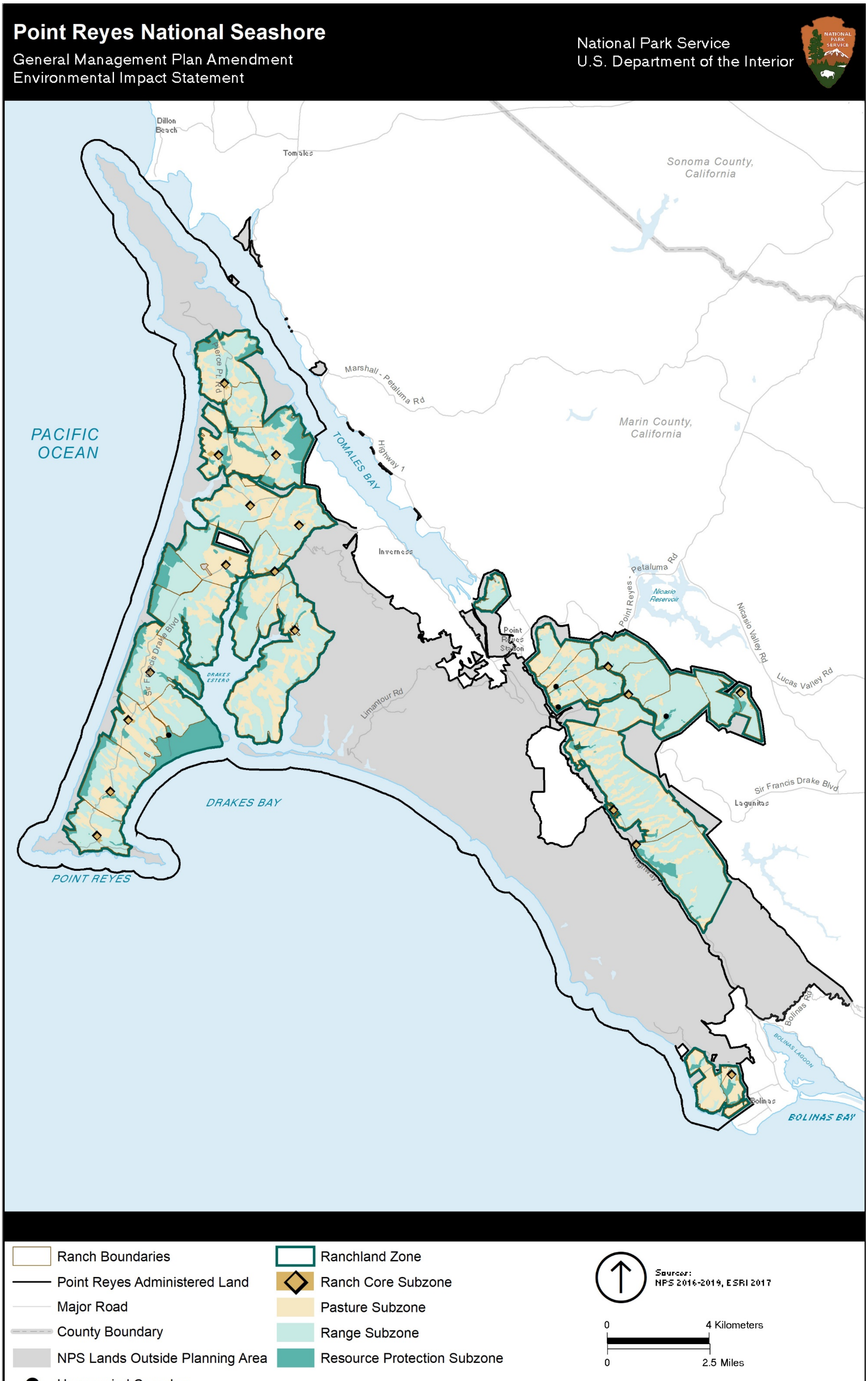


FIGURE 6: ALTERNATIVE B ZONING MAP

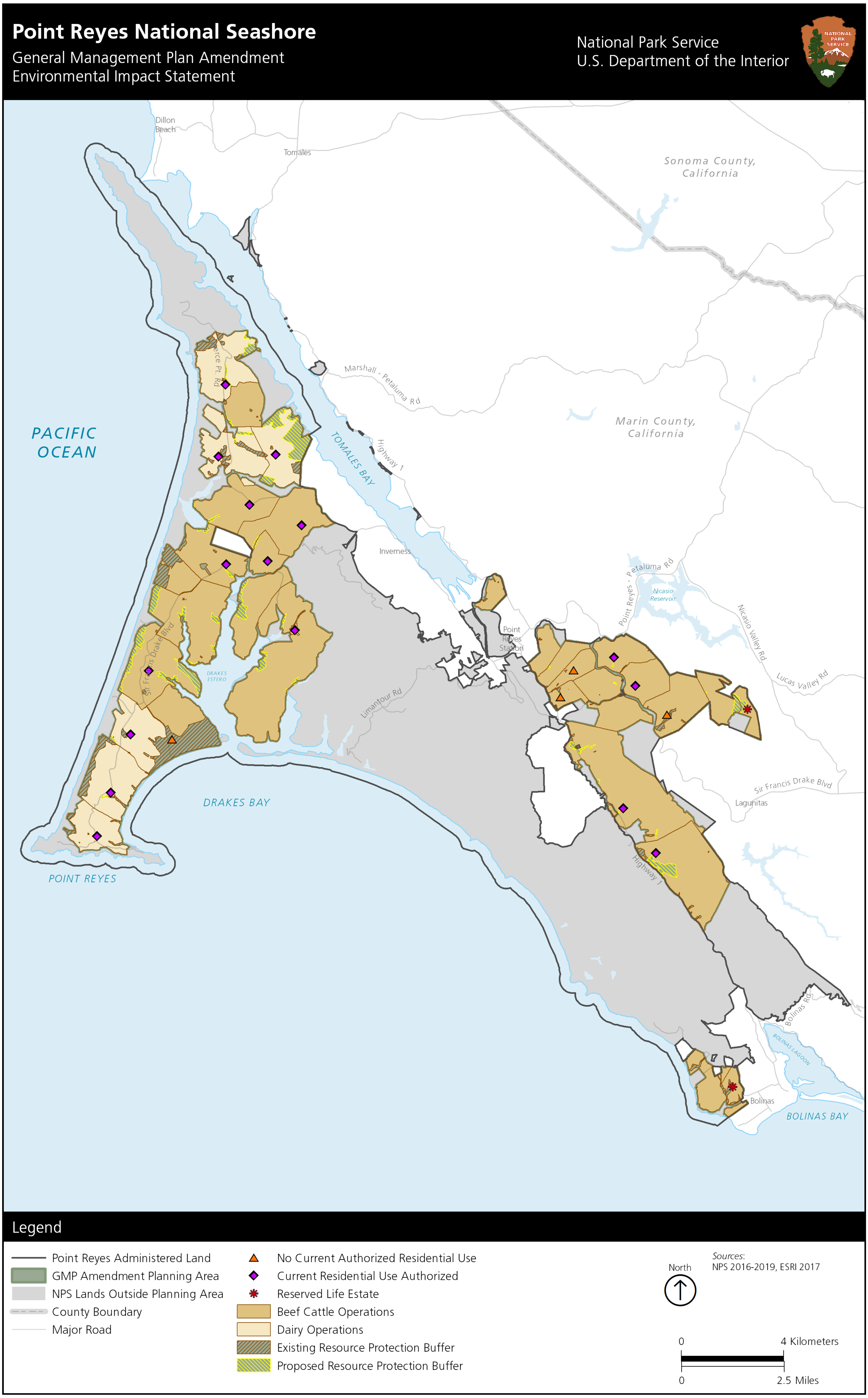


FIGURE 7: ALTERNATIVE B

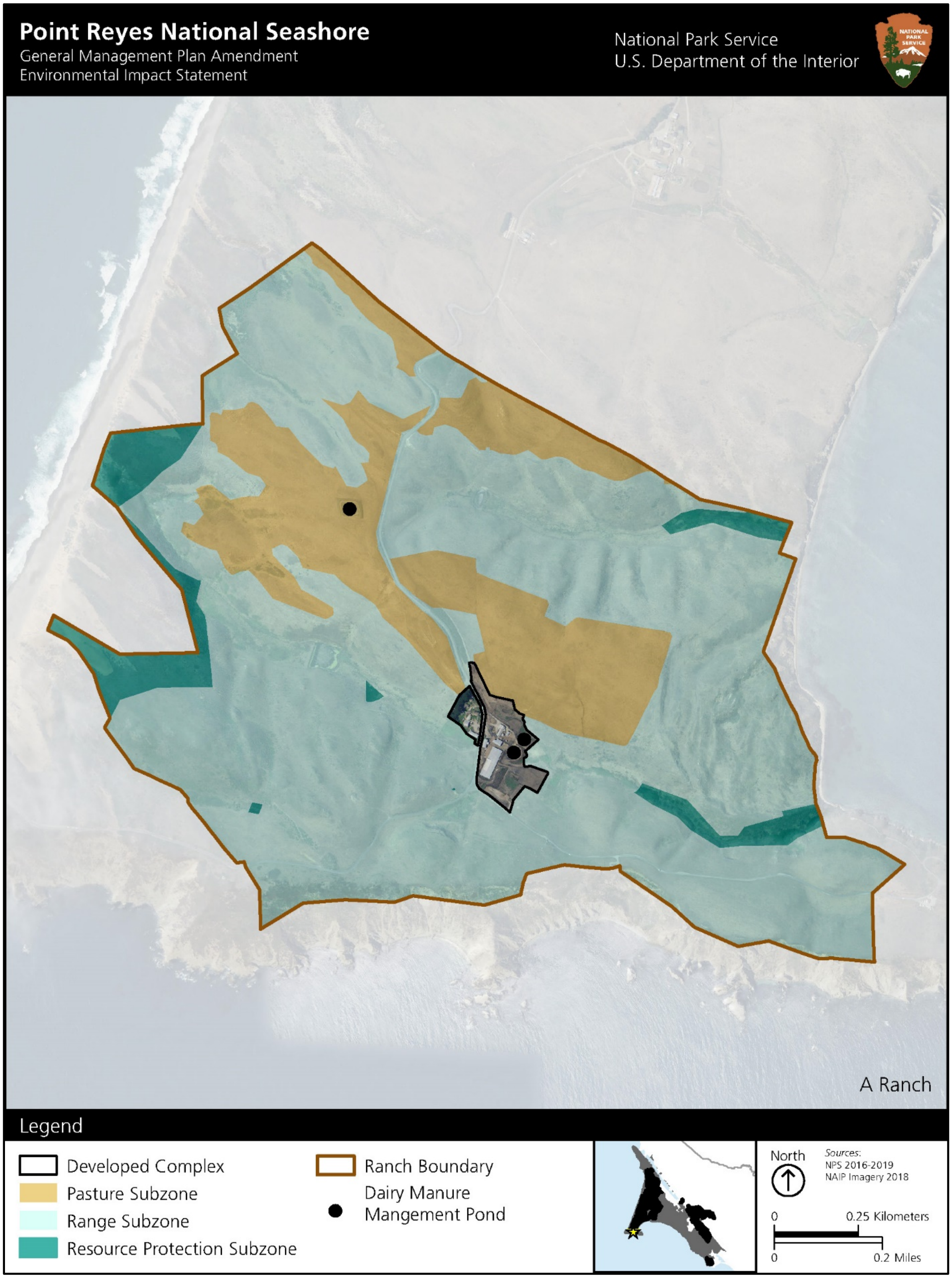


FIGURE 8: A RANCH ZONING MAP

FIGURE 9: B RANCH ZONING MAP

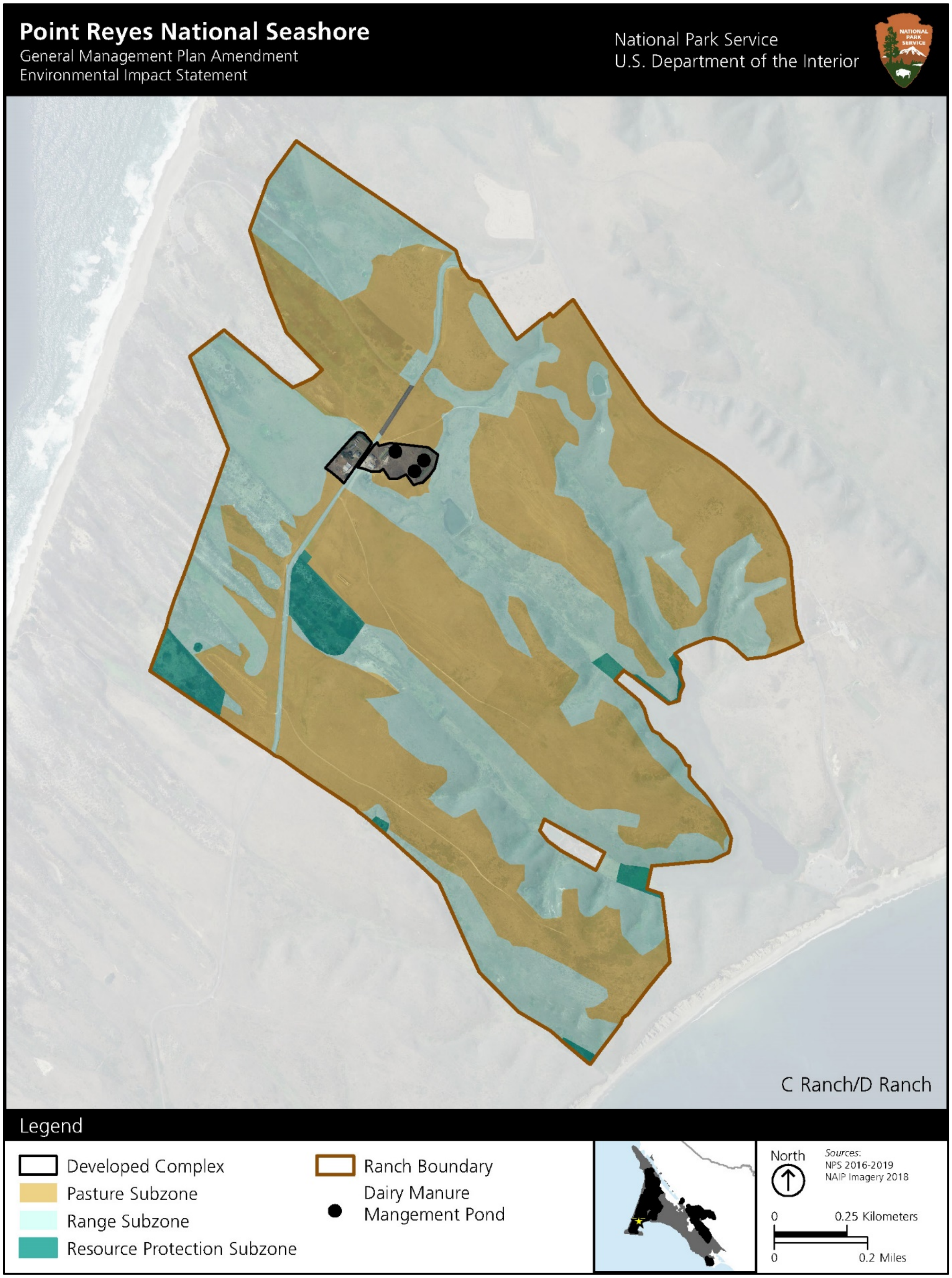


FIGURE 10: C RANCH/D RANCH ZONING MAP

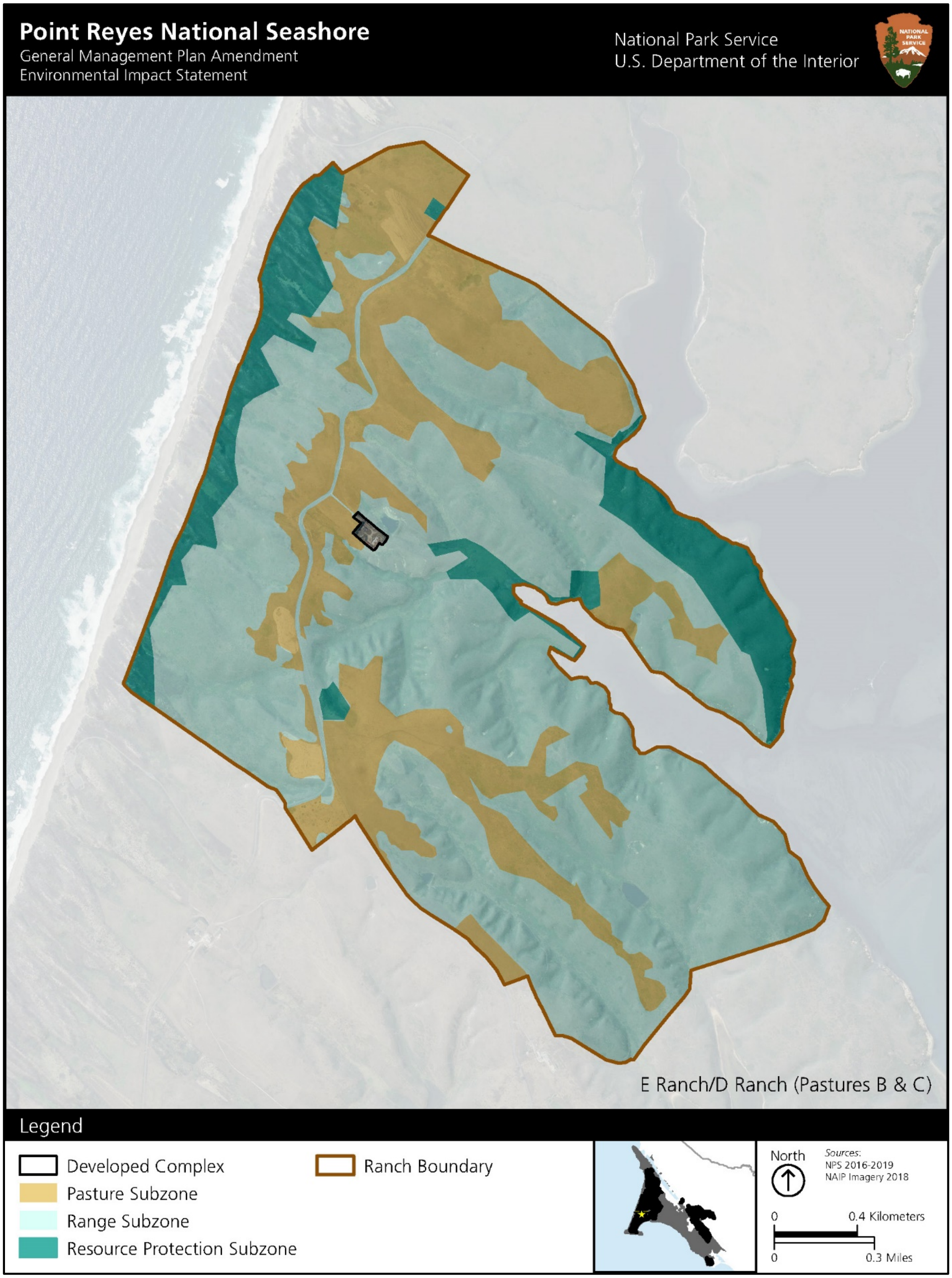


FIGURE 11: E RANCH AND PASTURE B & C OF D RANCH ZONING MAP

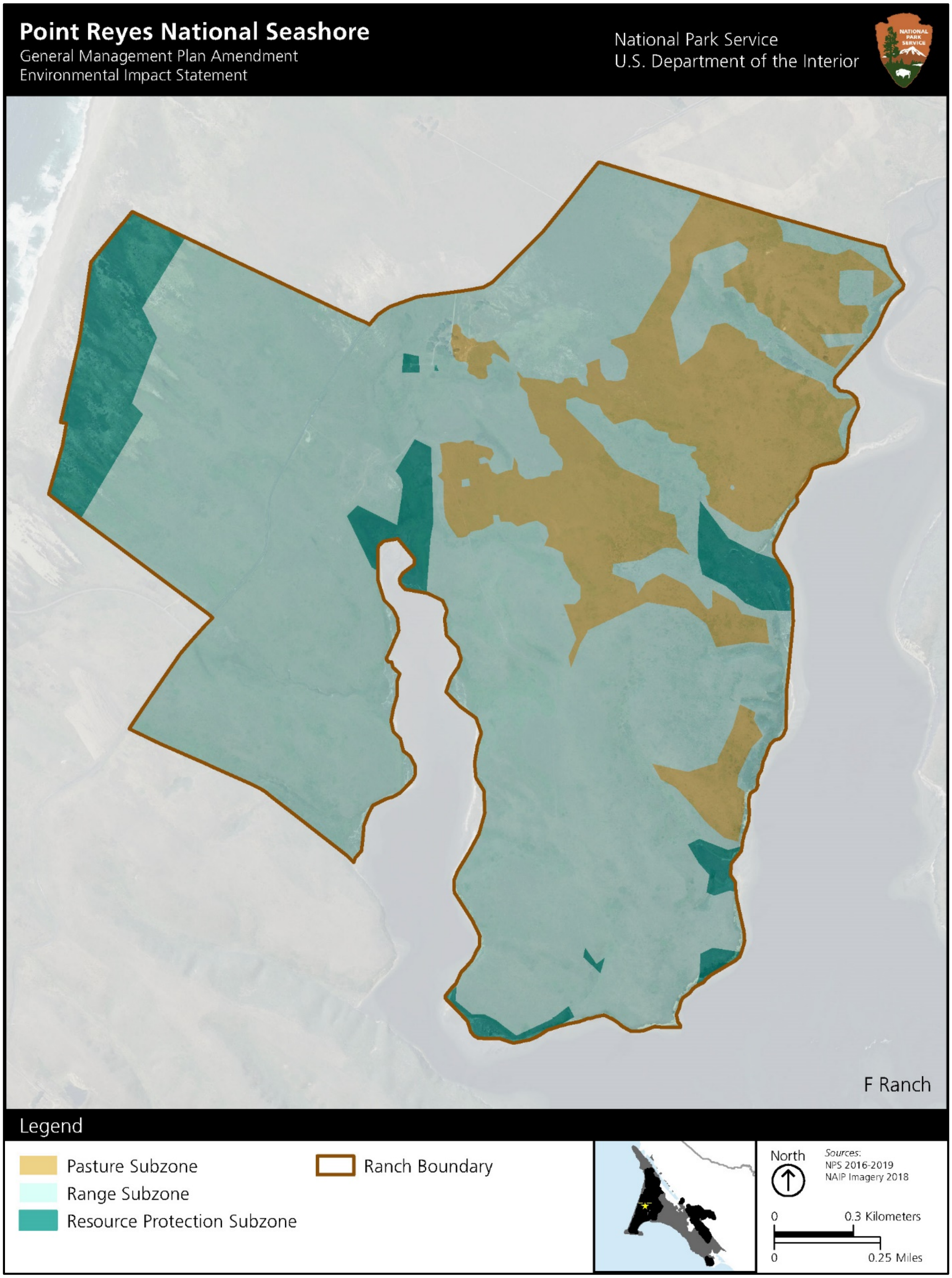


FIGURE 12: F RANCH ZONING MAP

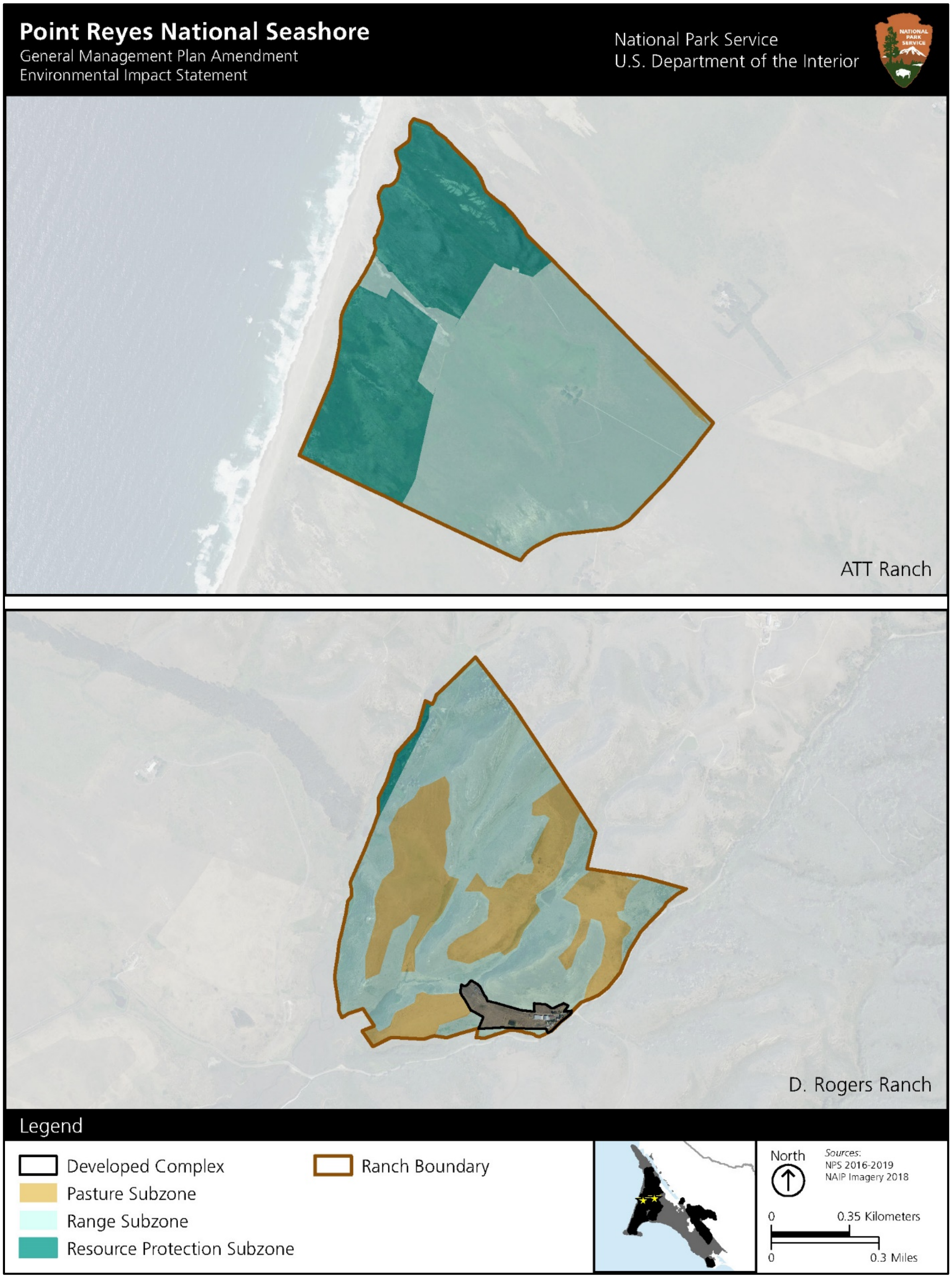


FIGURE 13: ATT RANCH/D. ROGERS RANCH ZONING MAP

FIGURE 14: G RANCH ZONING MAP

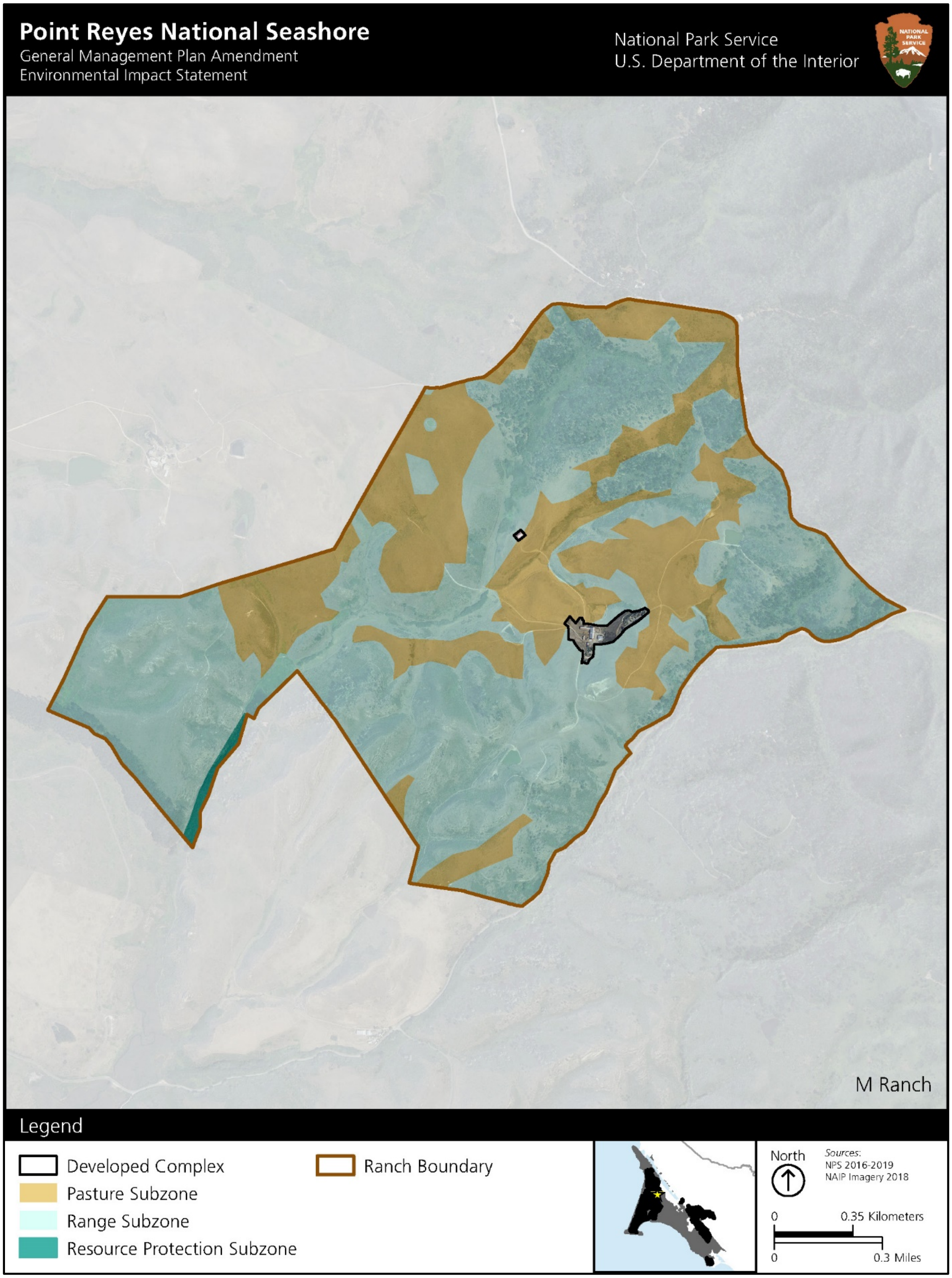


FIGURE 15: M RANCH ZONING MAP

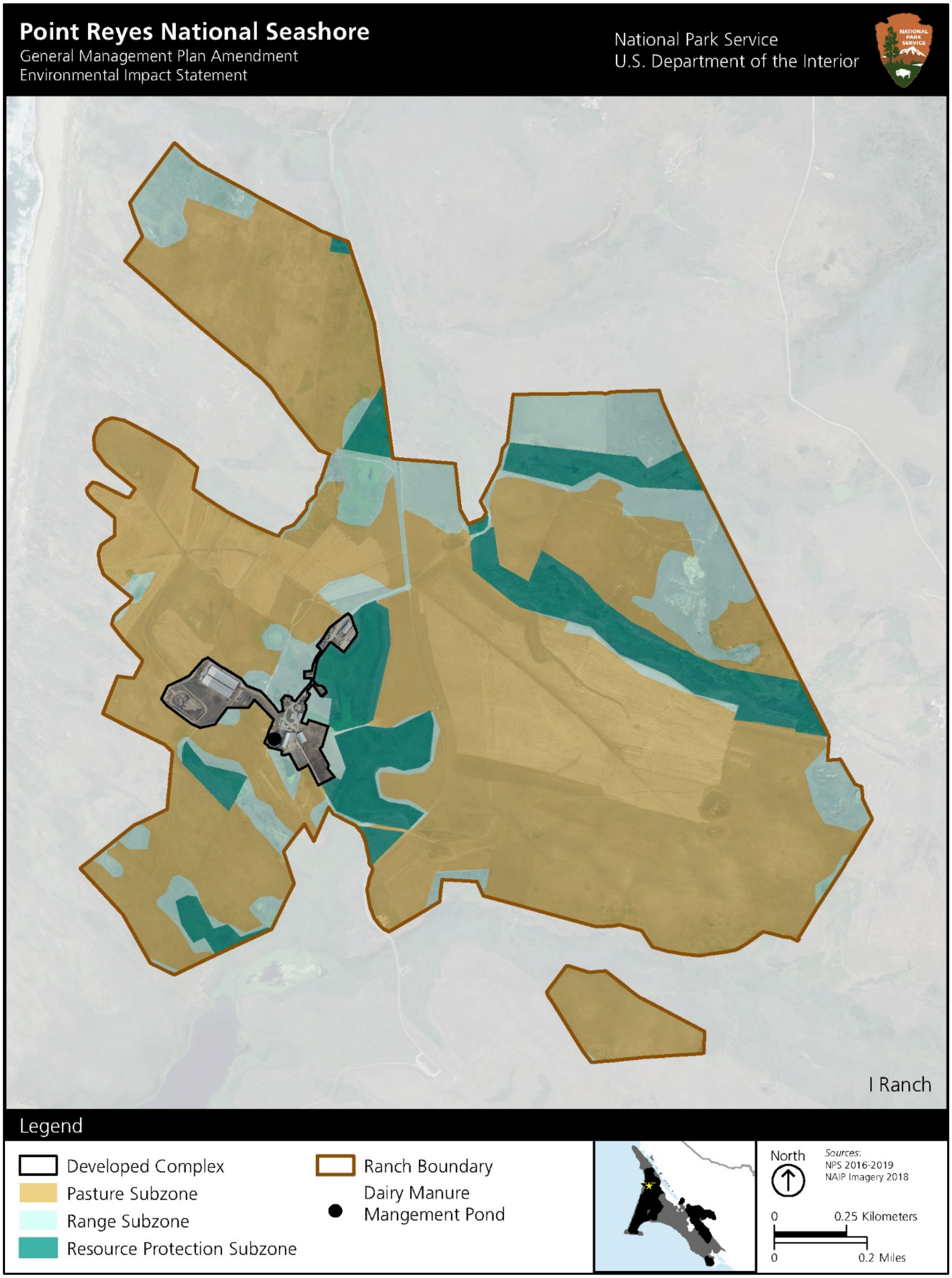


FIGURE 16: I RANCH ZONING MAP

FIGURE 17: H RANCH/K RANCH ZONING MAP

FIGURE 18: L RANCH ZONING MAP

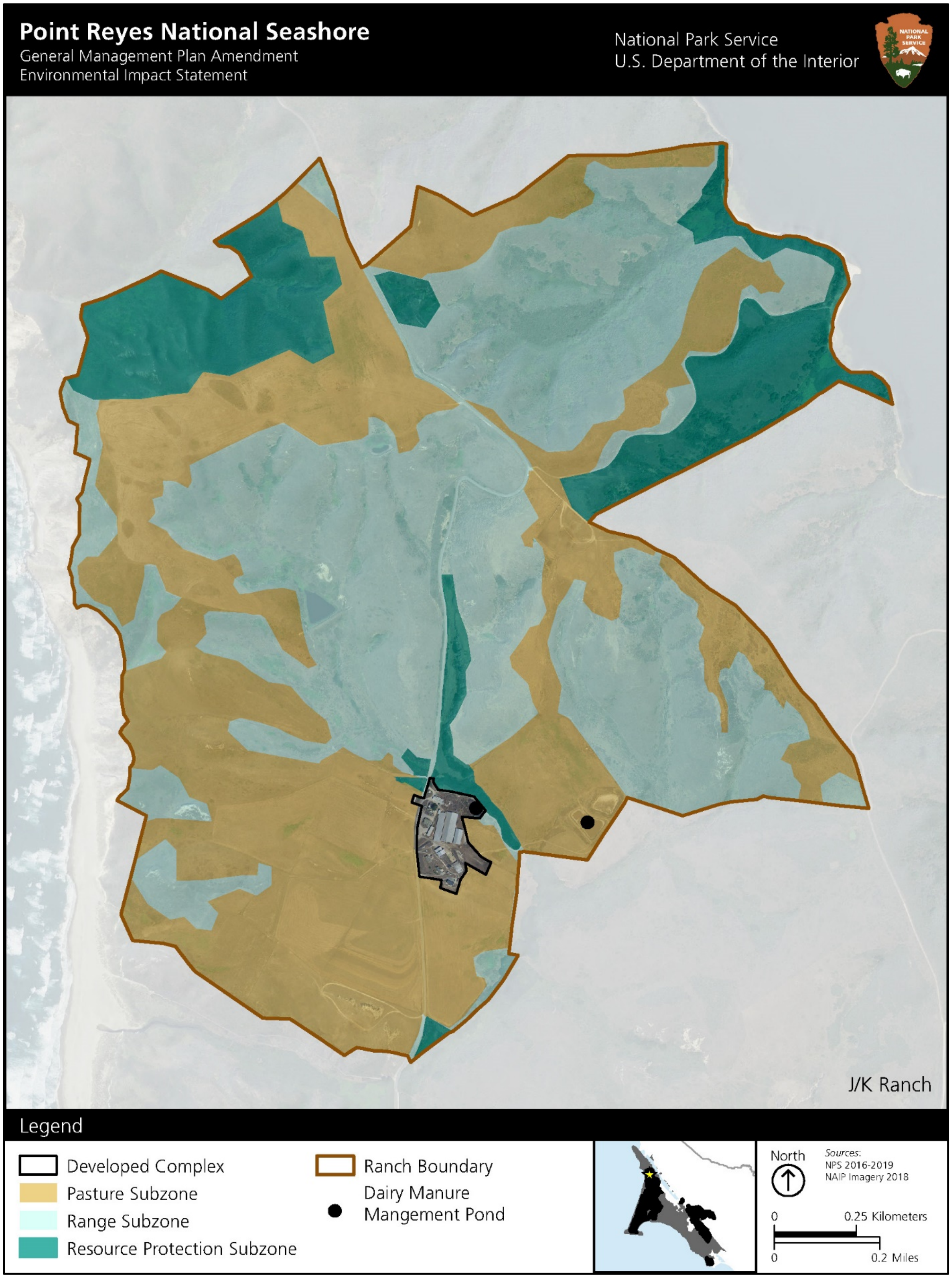


Figure 19: J/K Ranch Zoning Map

FIGURE 20: N RANCH/Home RANCH ZONING MAP

FIGURE 21: MARTINELLI RANCH ZONING MAP

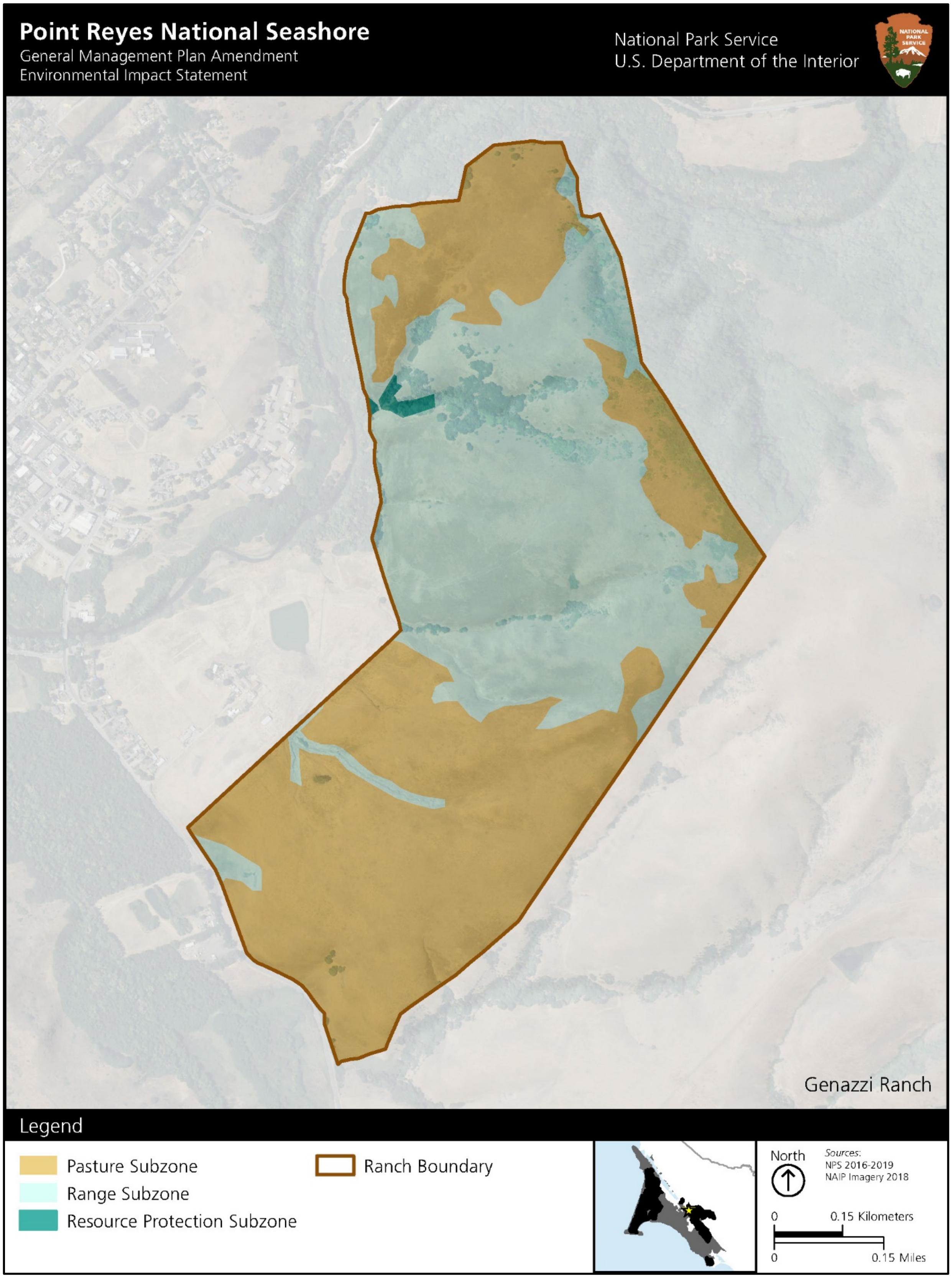


FIGURE 22: GENAZZI RANCH ZONING MAP

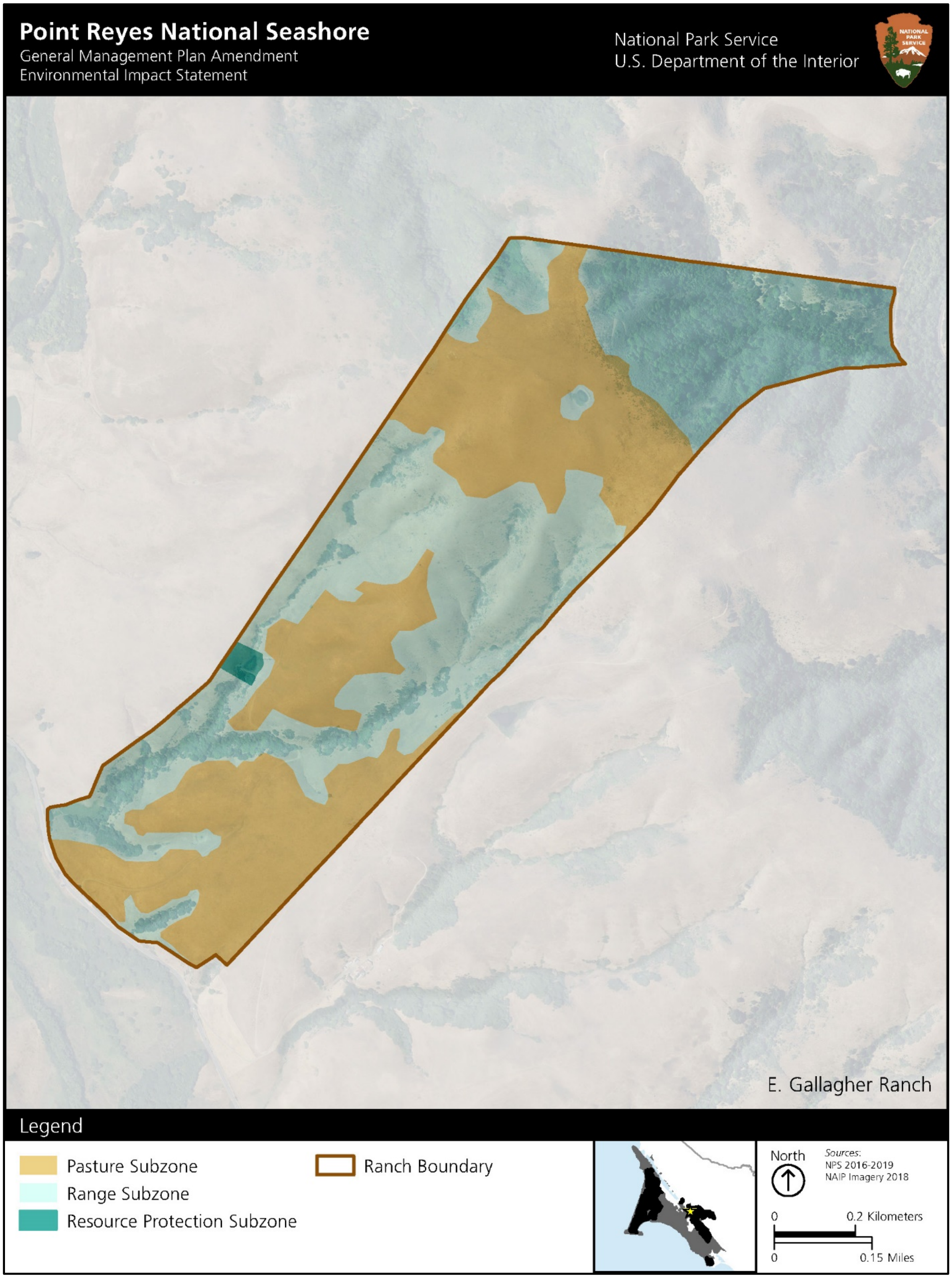


FIGURE 23: E. GALLAGHER RANCH ZONING MAP

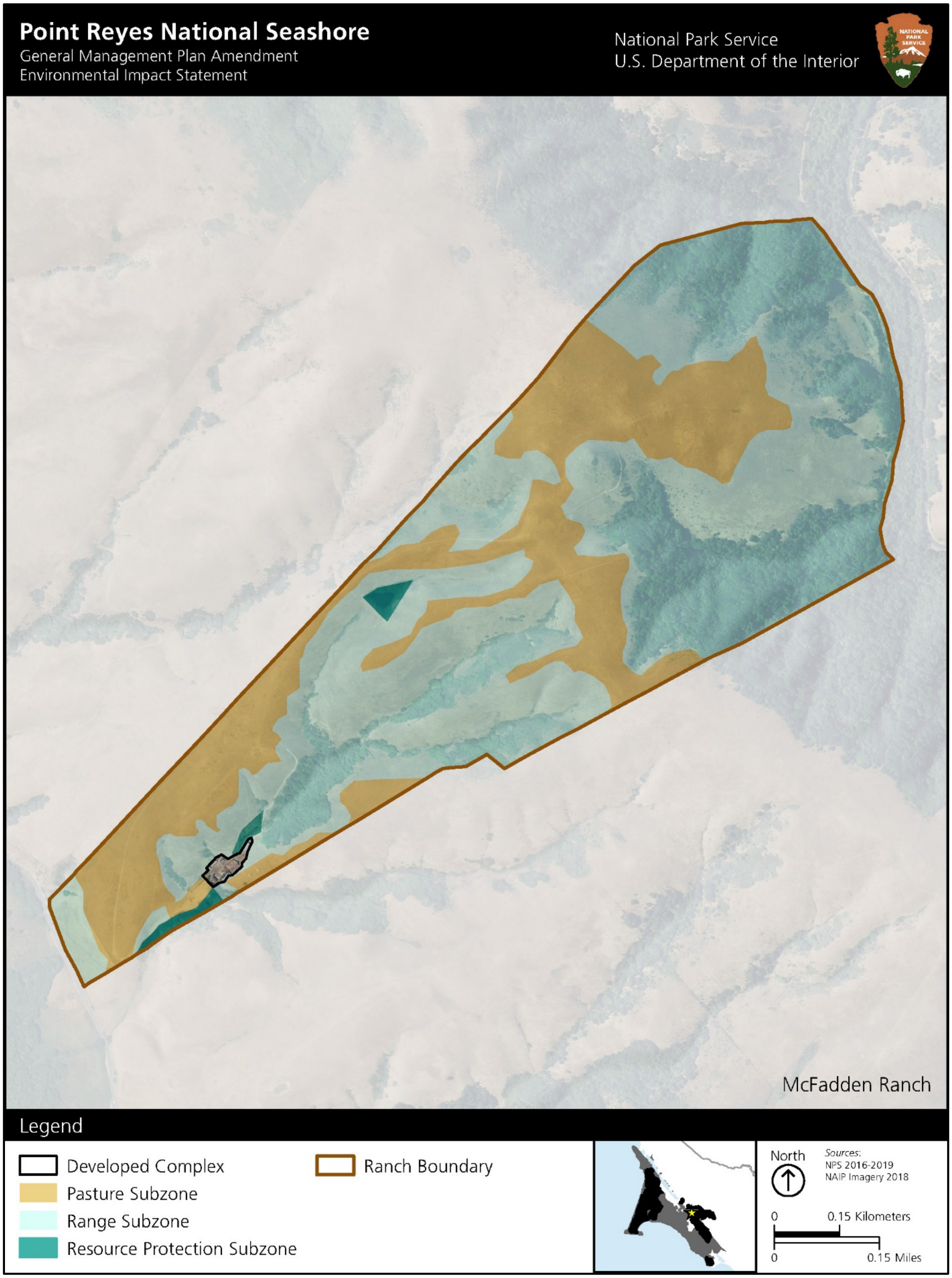


FIGURE 24: MCFADDEN RANCH ZONING MAP

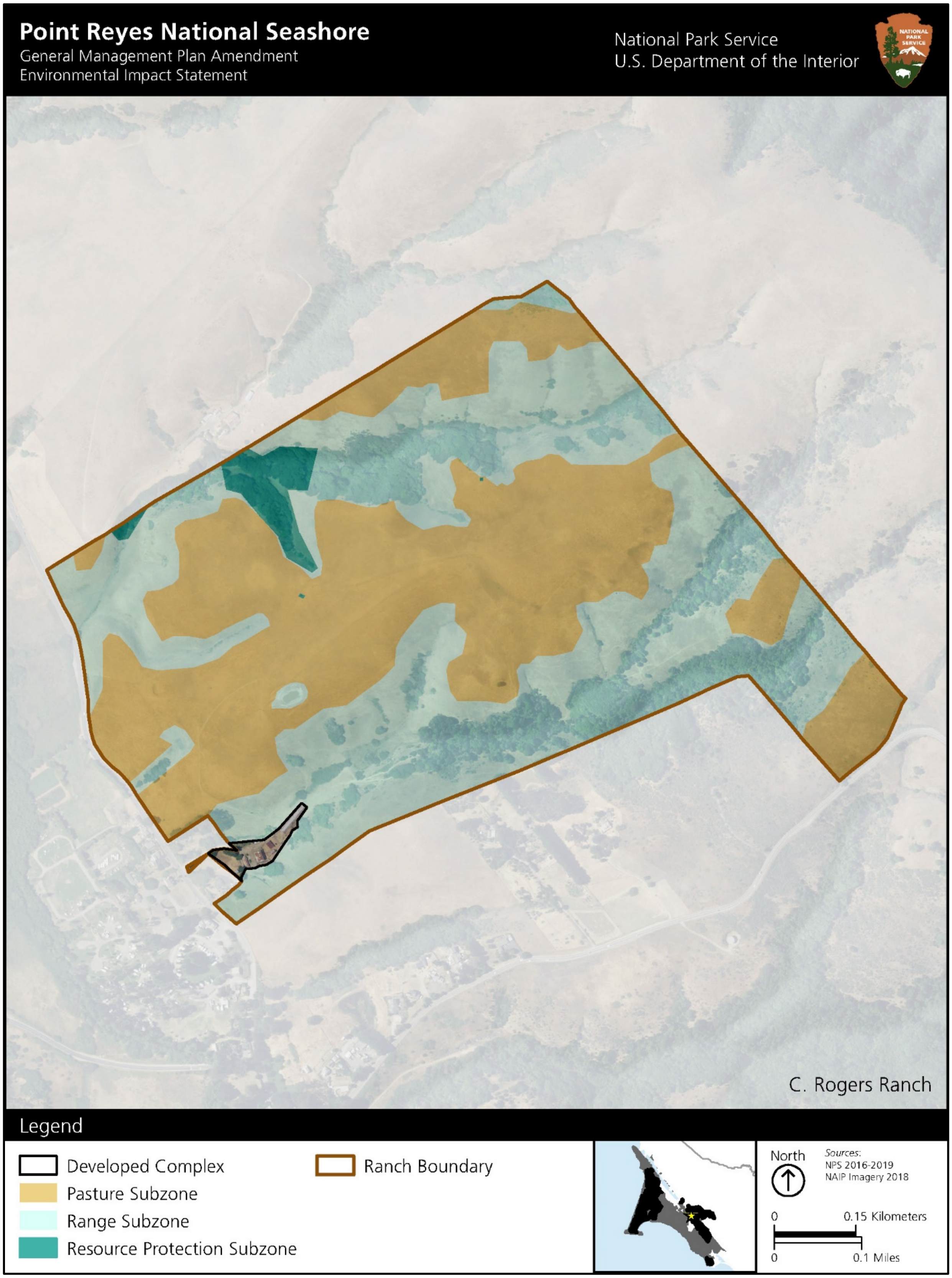


FIGURE 25: C. ROGERS RANCH ZONING MAP

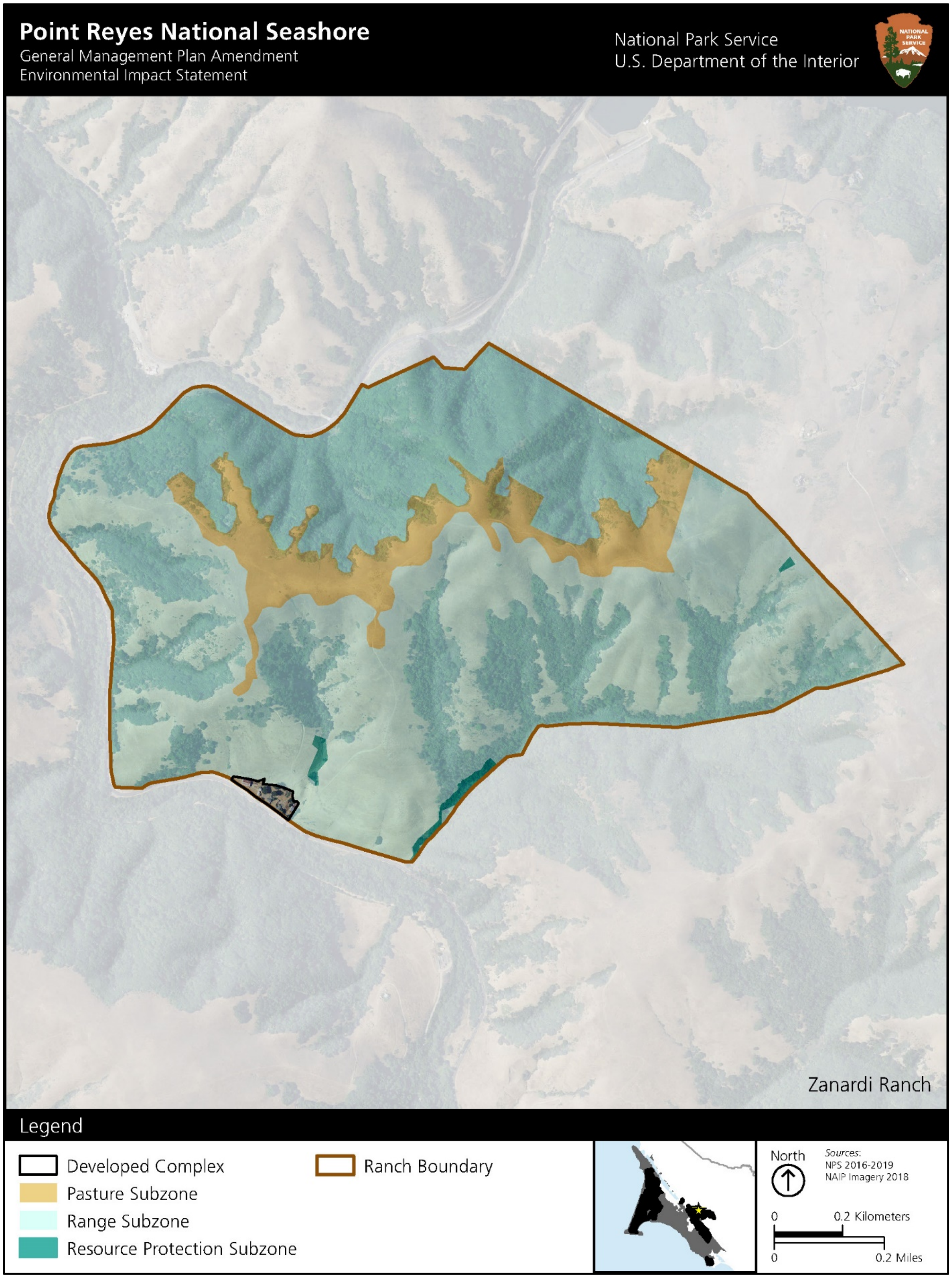


FIGURE 26: ZANARDI RANCH ZONING MAP

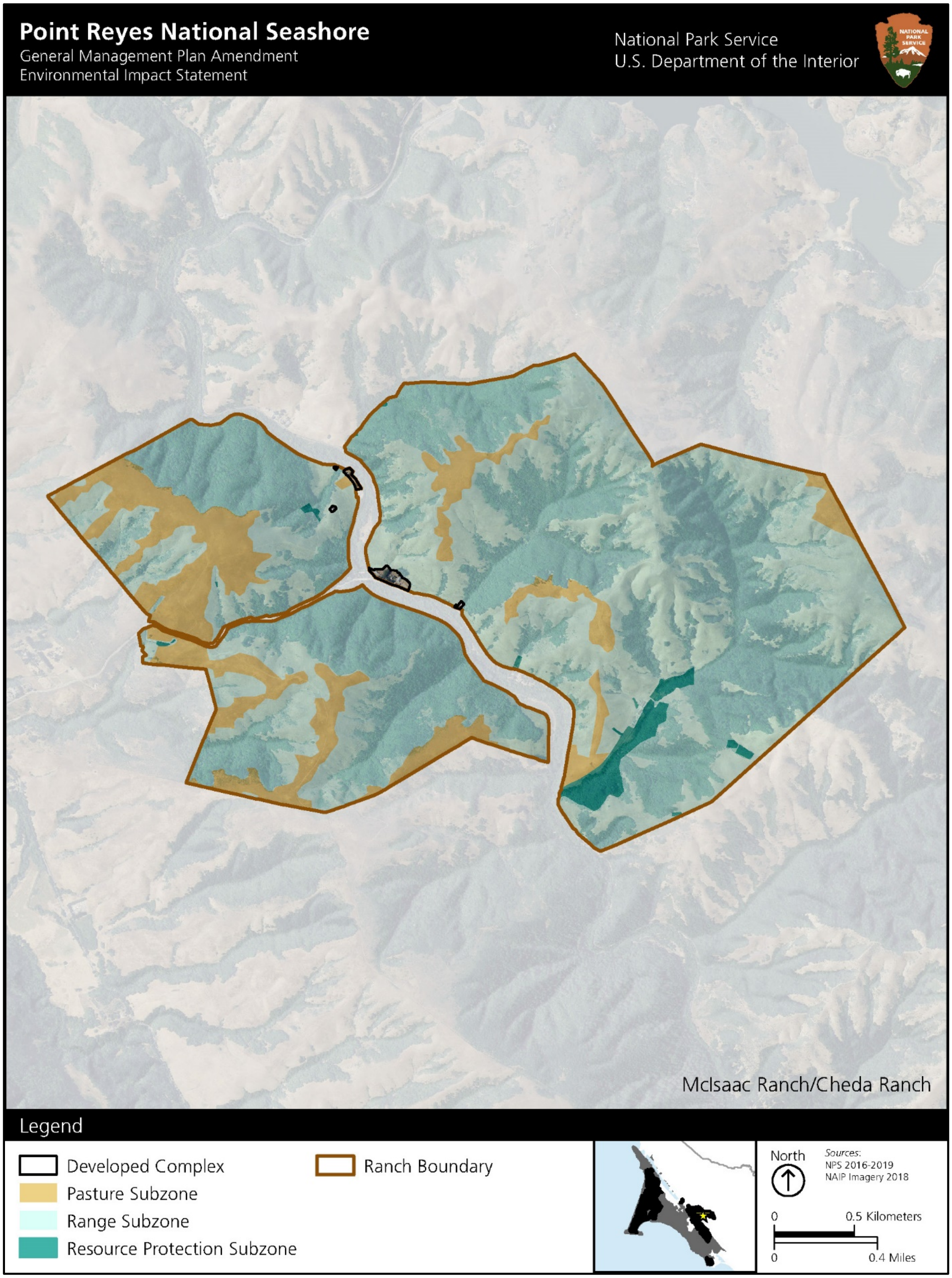


FIGURE 27: MCISAAC RANCH/CHEDA RANCH ZONING MAP

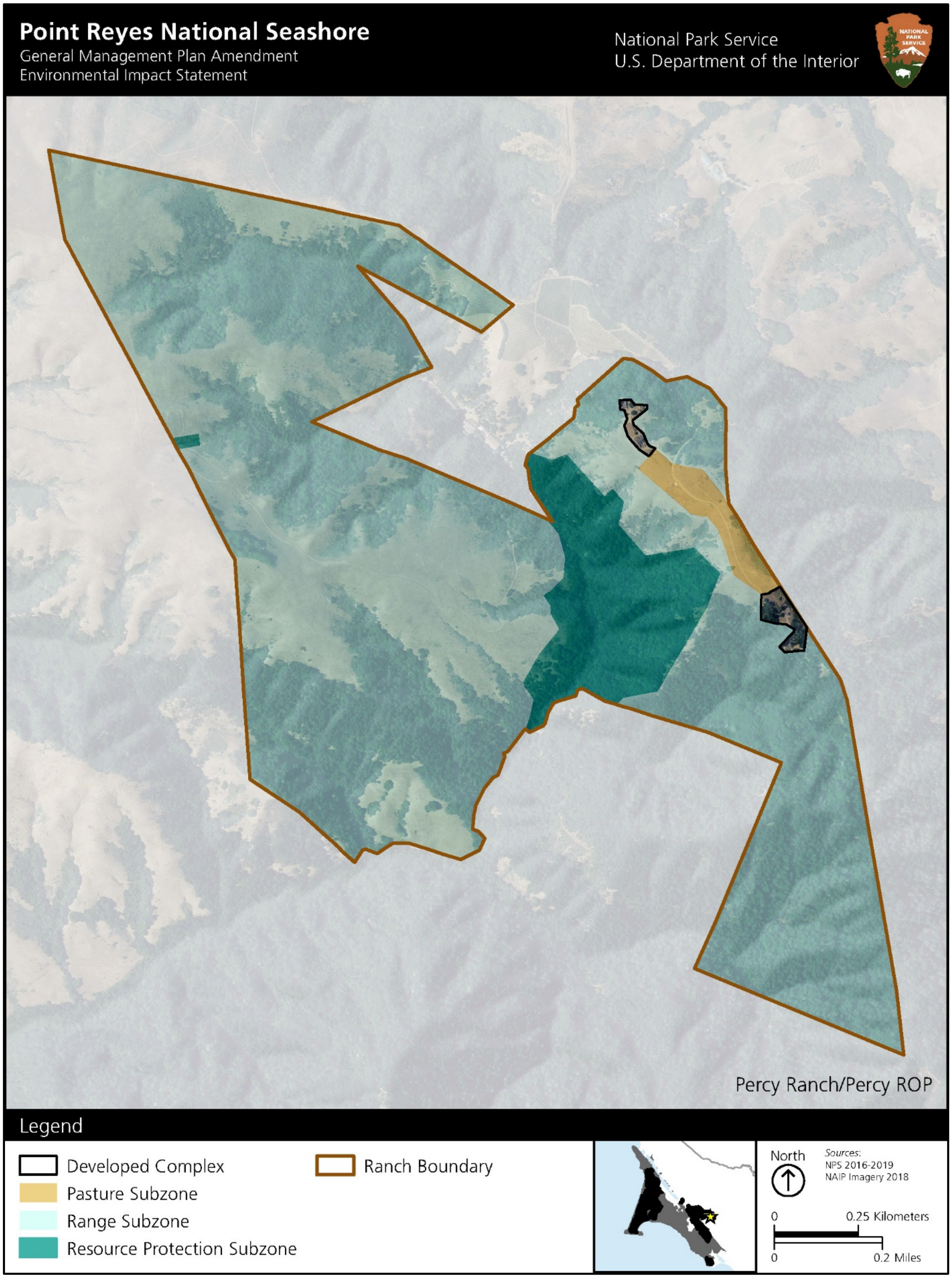


FIGURE 28: PERCY RANCH/PERCY ROP ZONING MAP

FIGURE 29: STEWART RANCH/LUPTON/TRUTTMAN ZONING MAP

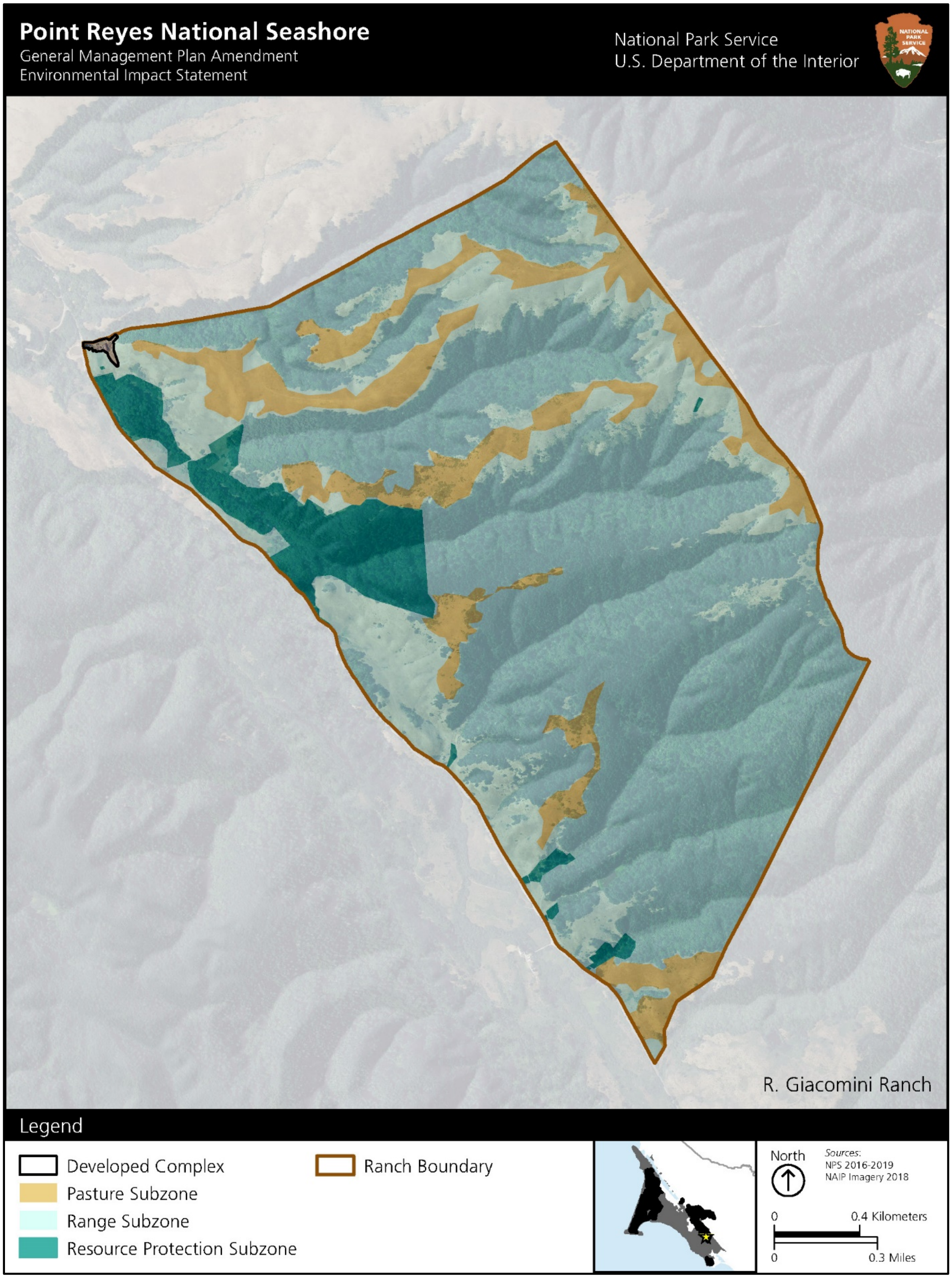


FIGURE 30: R. GIACOMINI RANCH ZONING MAP

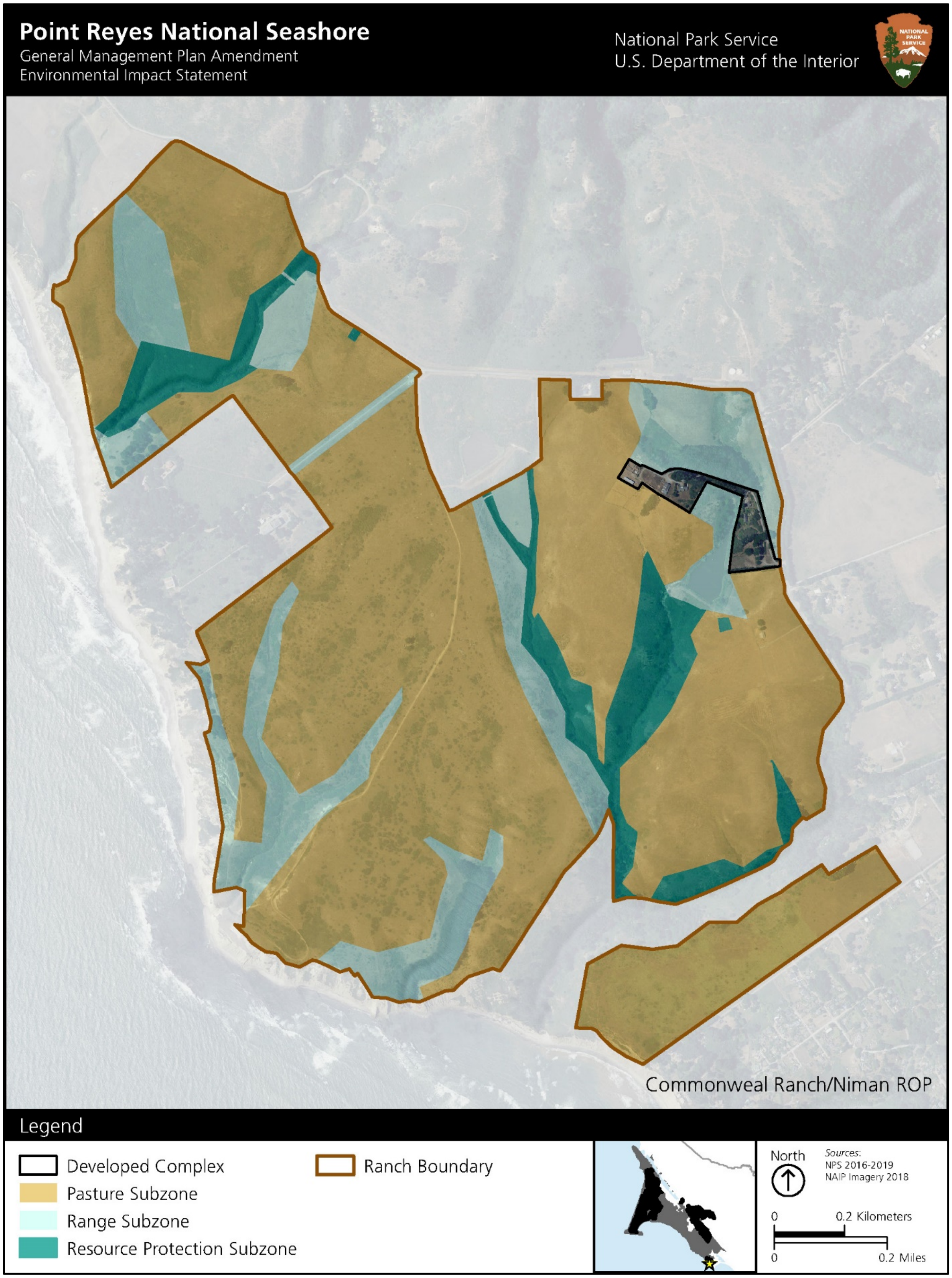


FIGURE 31: COMMONWEAL RANCH/NIMAN ROP ZONING MAP

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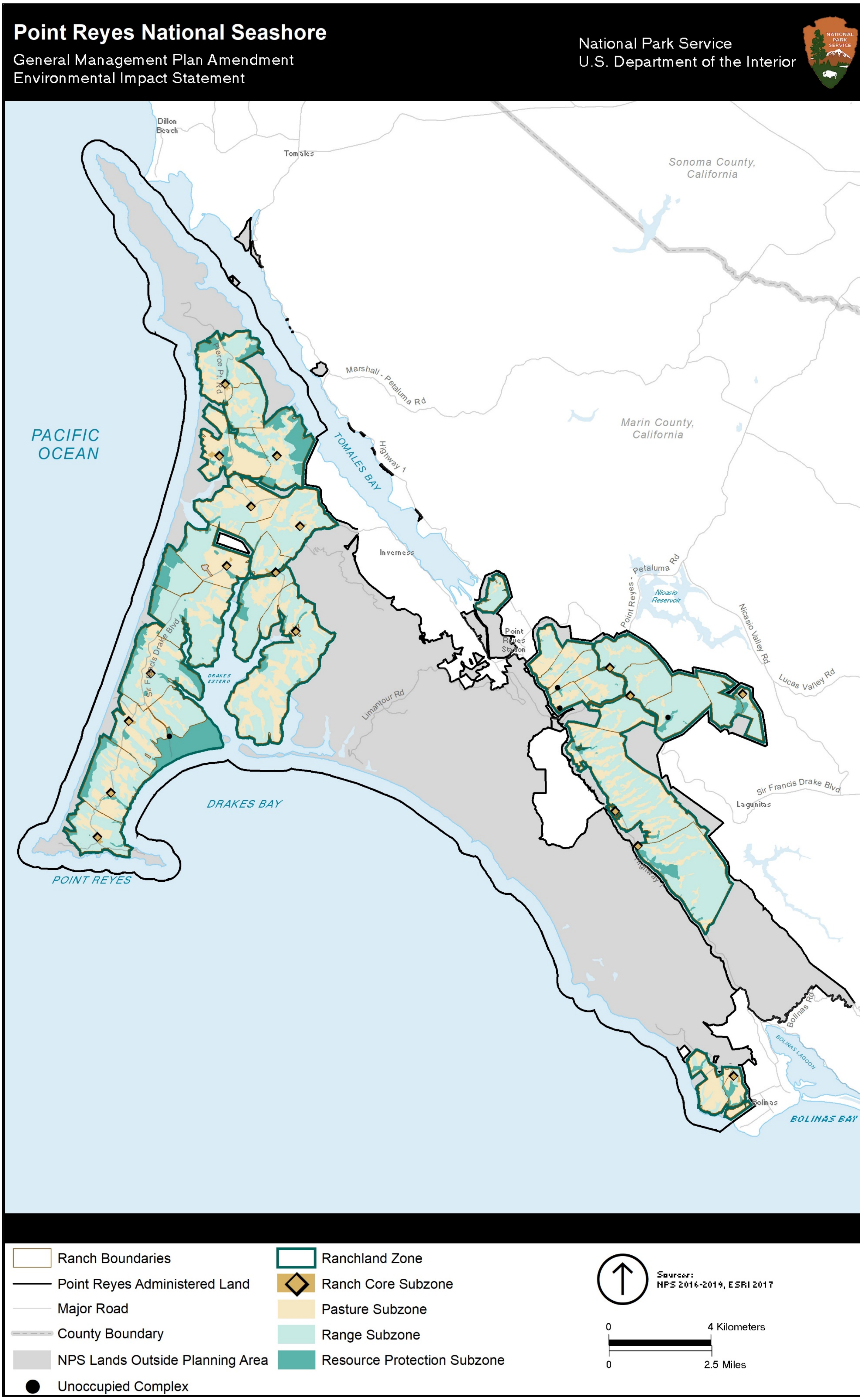

FIGURE 32: ALTERNATIVE C ZONING MAP

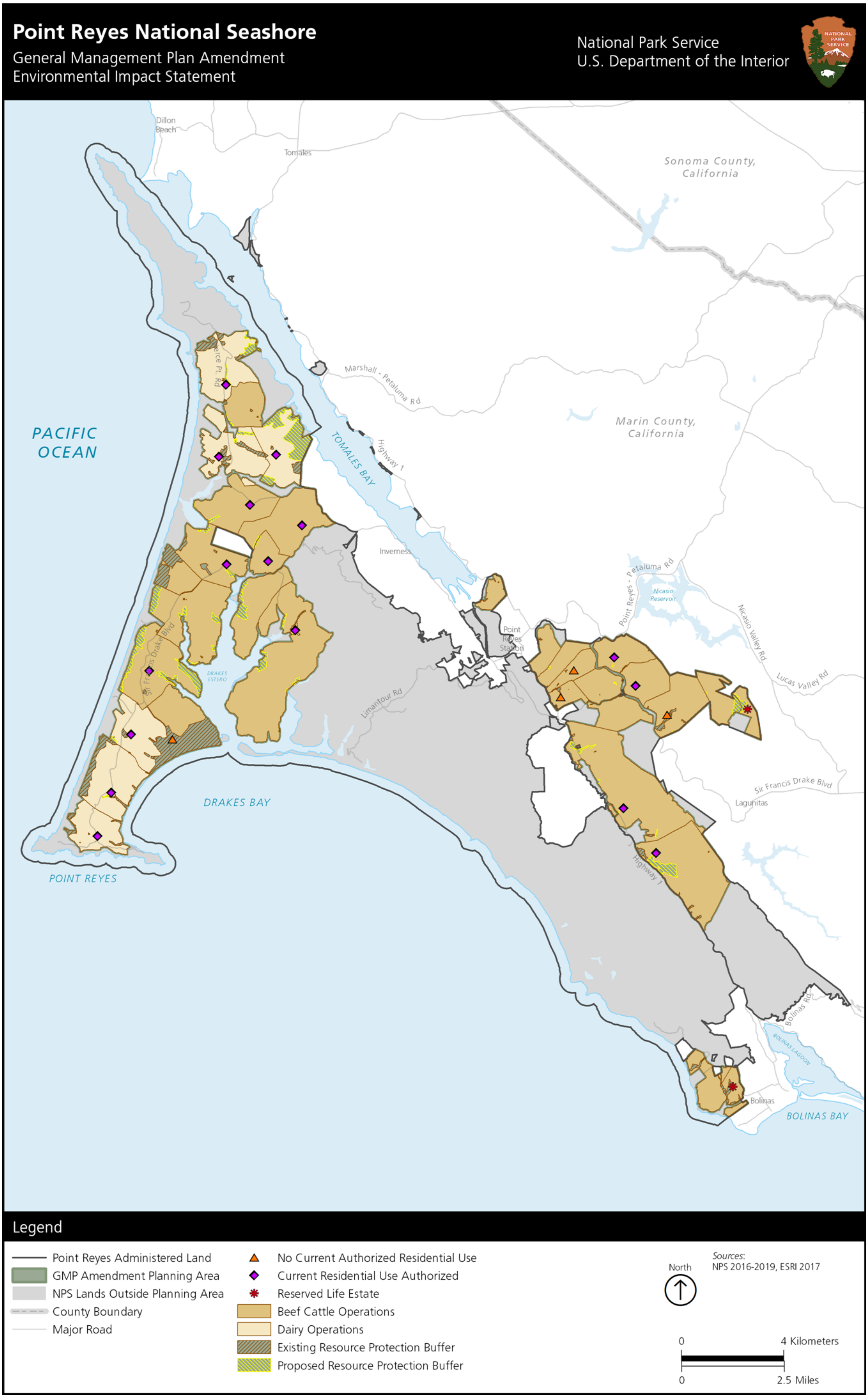

FIGURE 33: ALTERNATIVE C

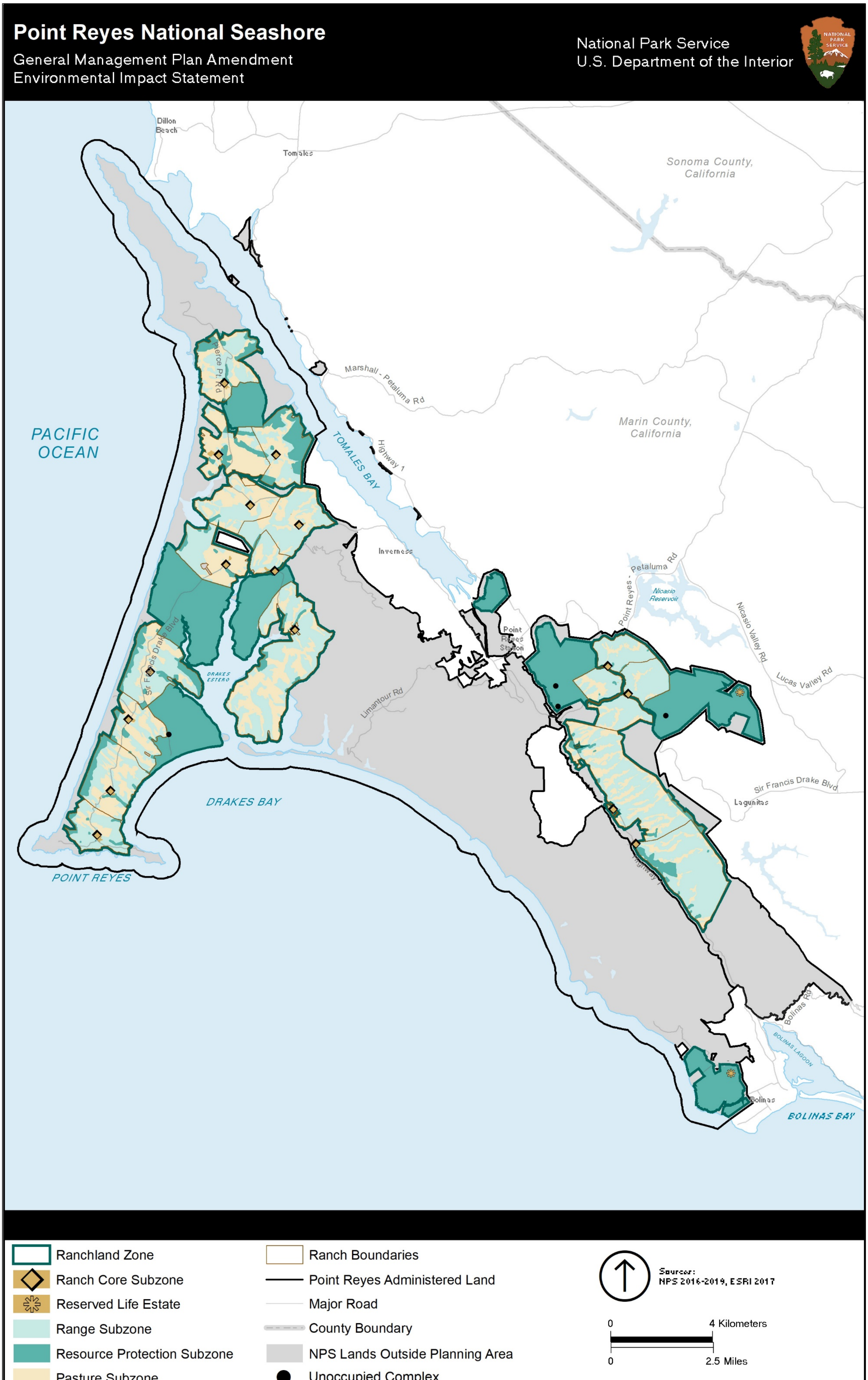

FIGURE 34: ALTERNATIVE D ZONING MAP

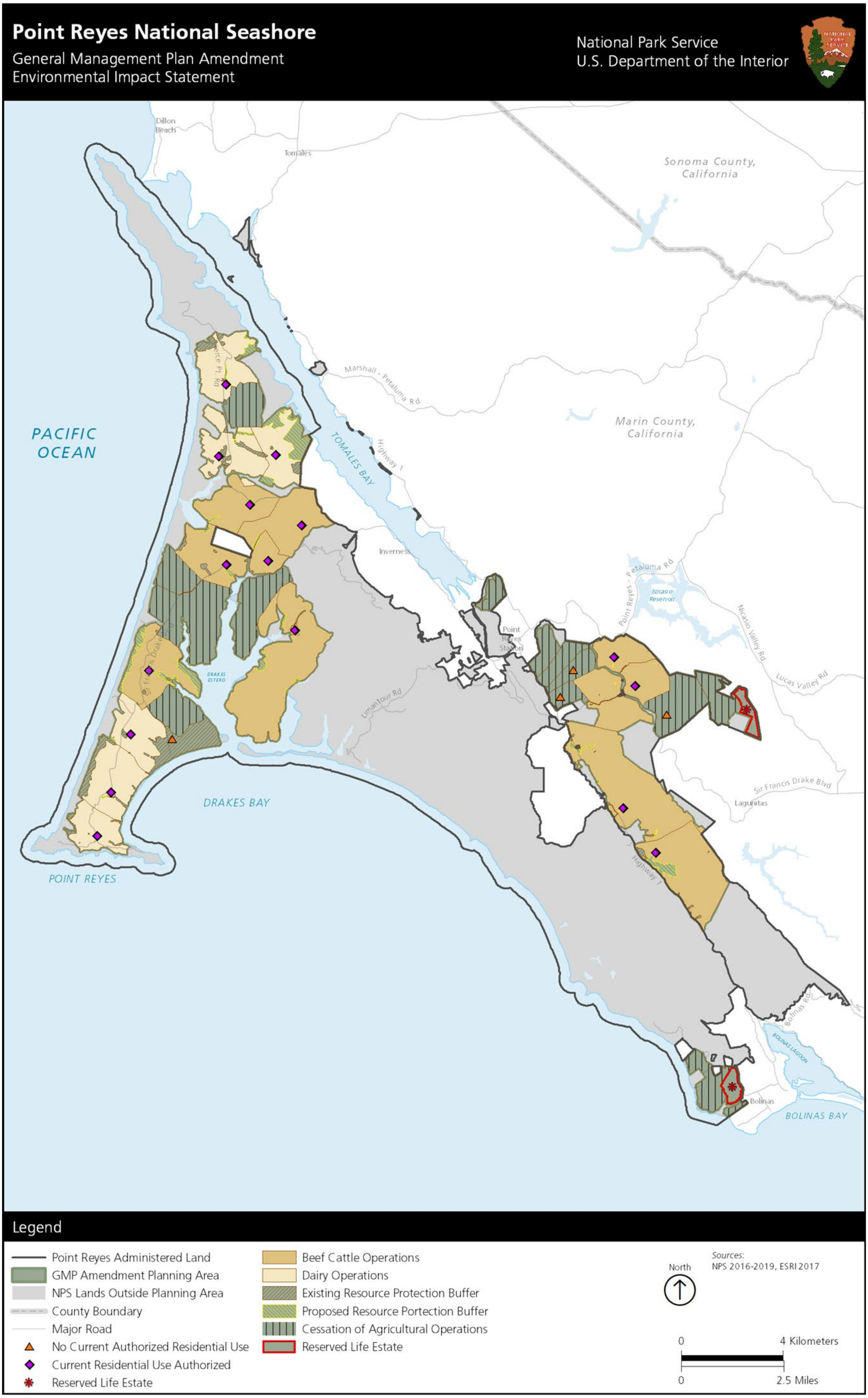

FIGURE 35: ALTERNATIVE D

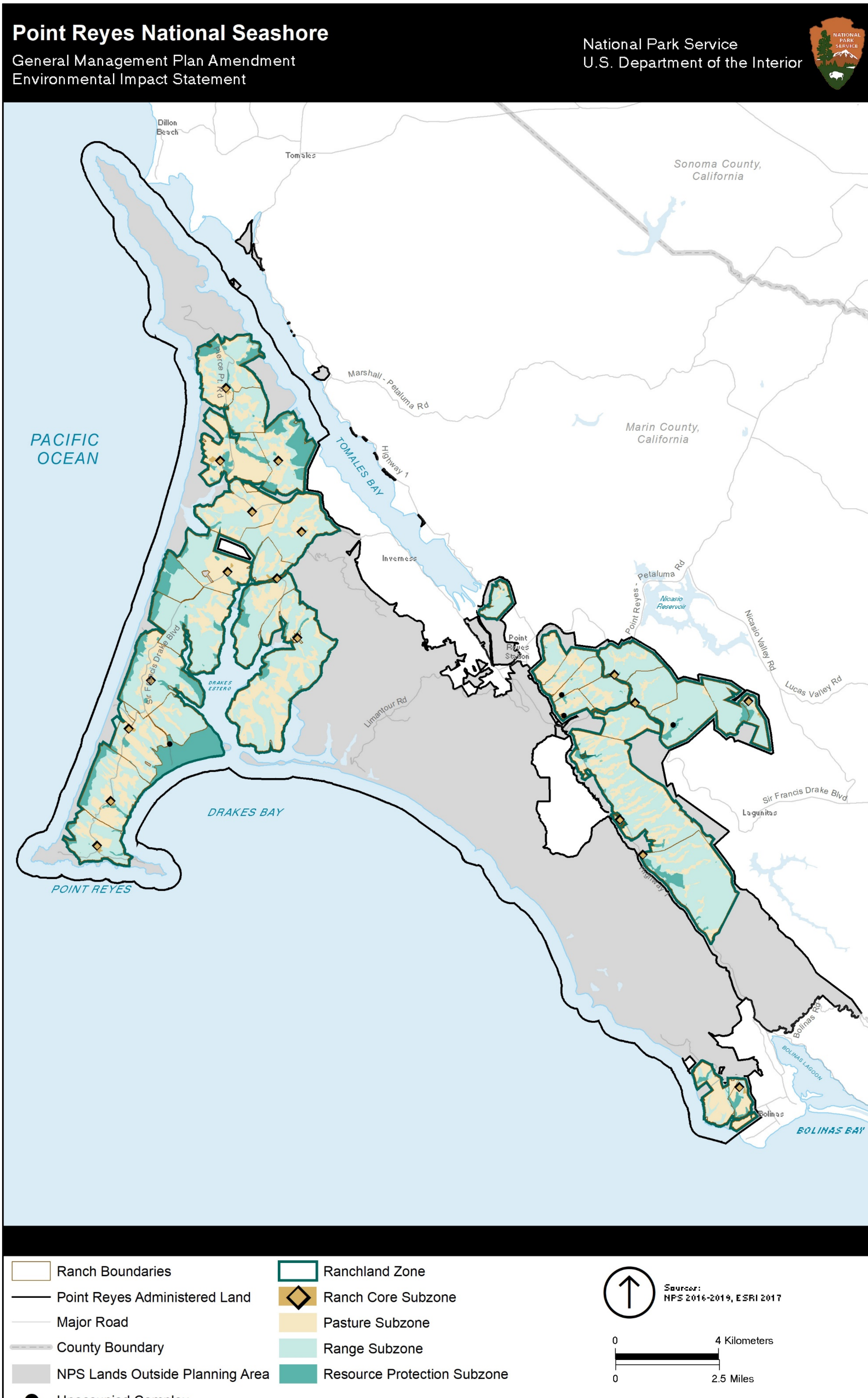

FIGURE 36: ALTERNATIVE E ZONING MAP

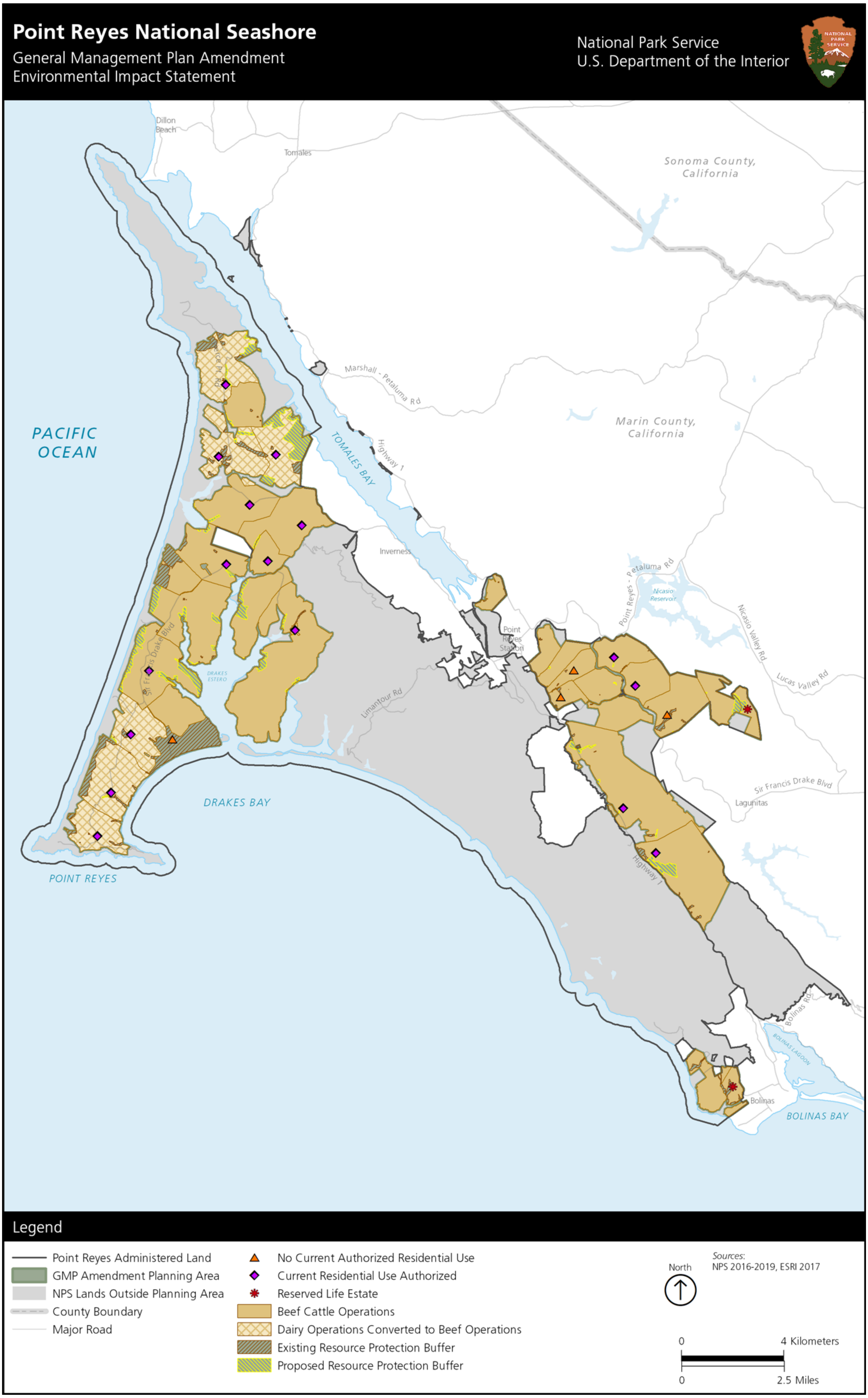

FIGURE 37: ALTERNATIVE E

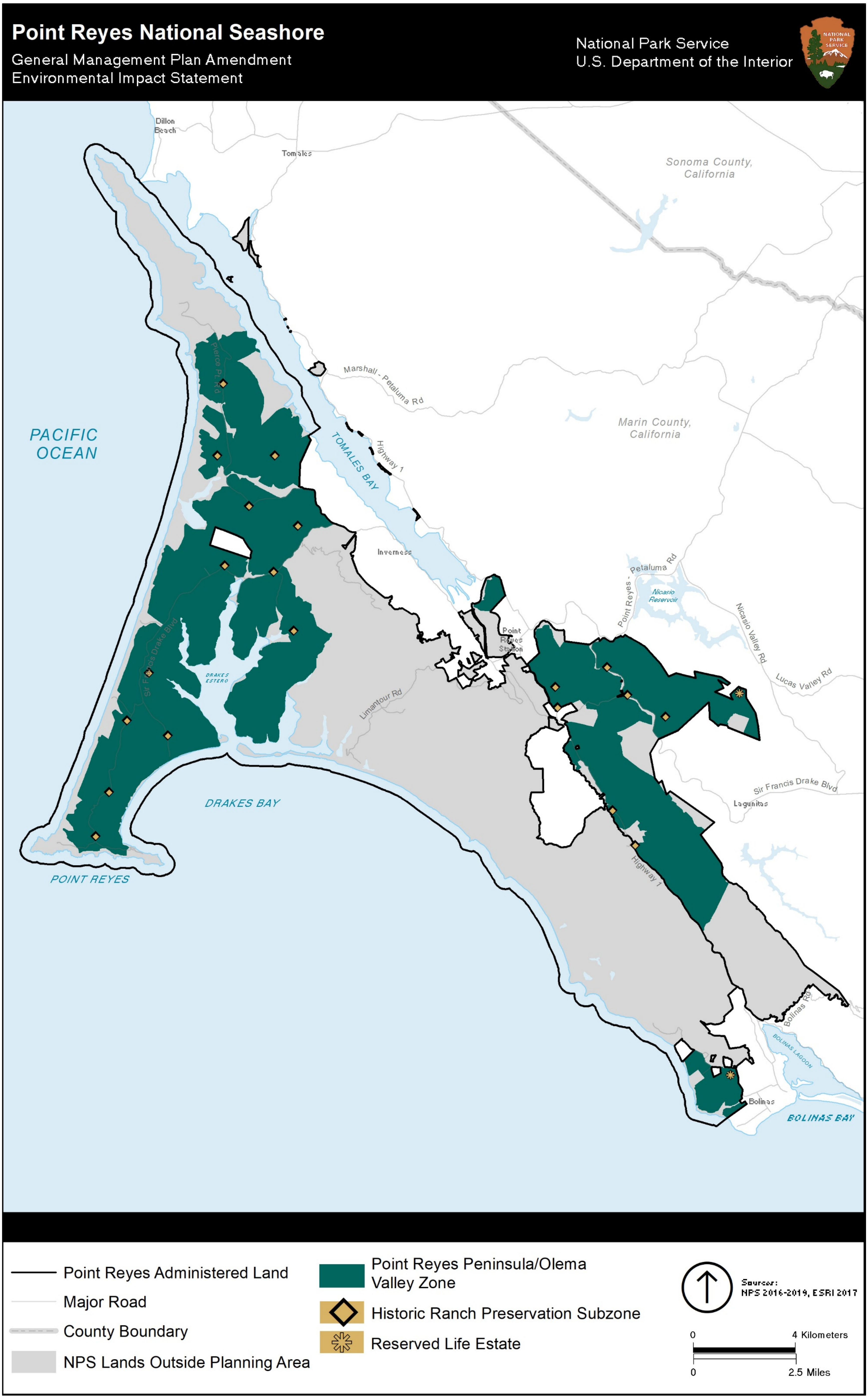

FIGURE 38: ALTERNATIVE F ZONING MAP

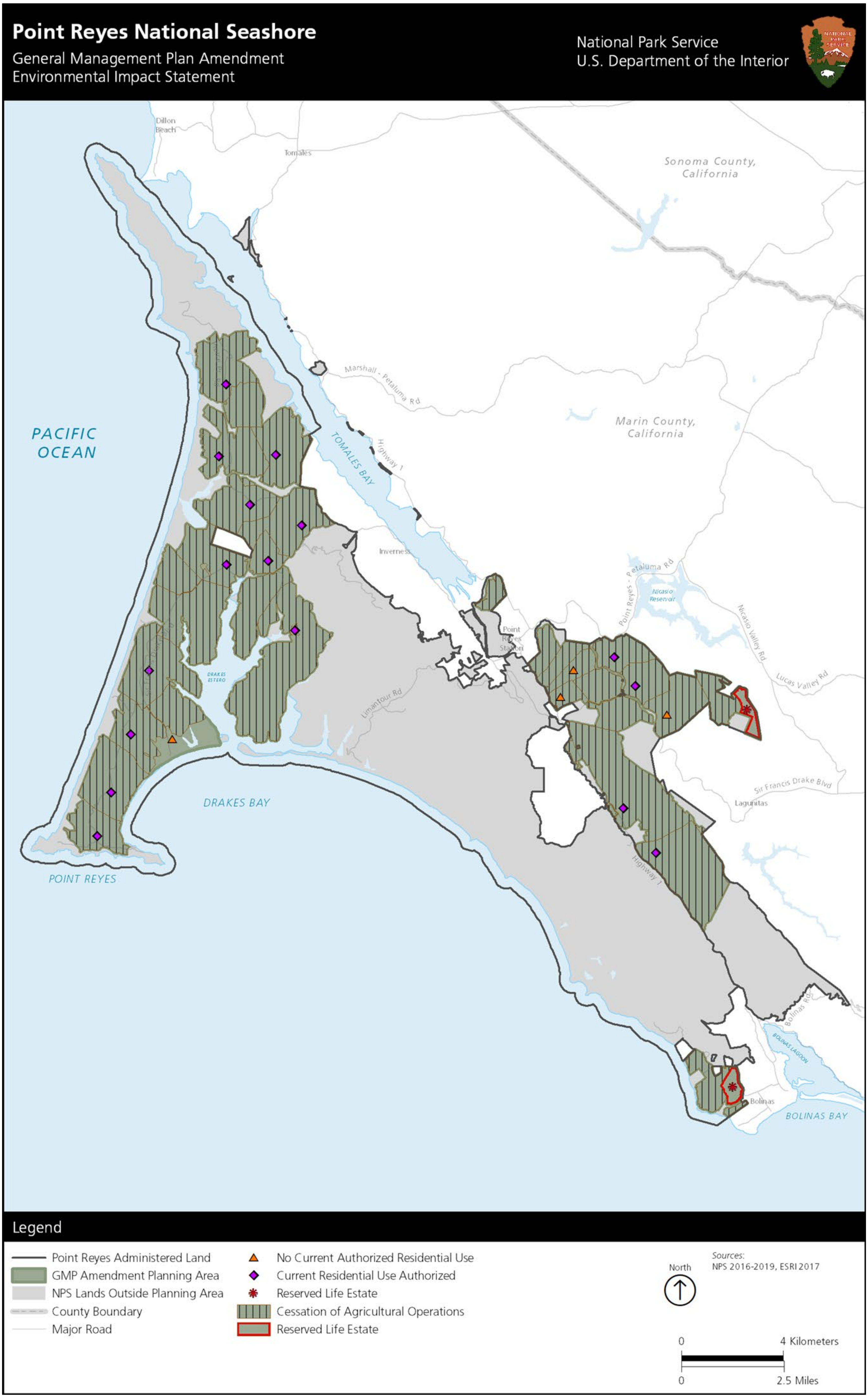

FIGURE 39: ALTERNATIVE F

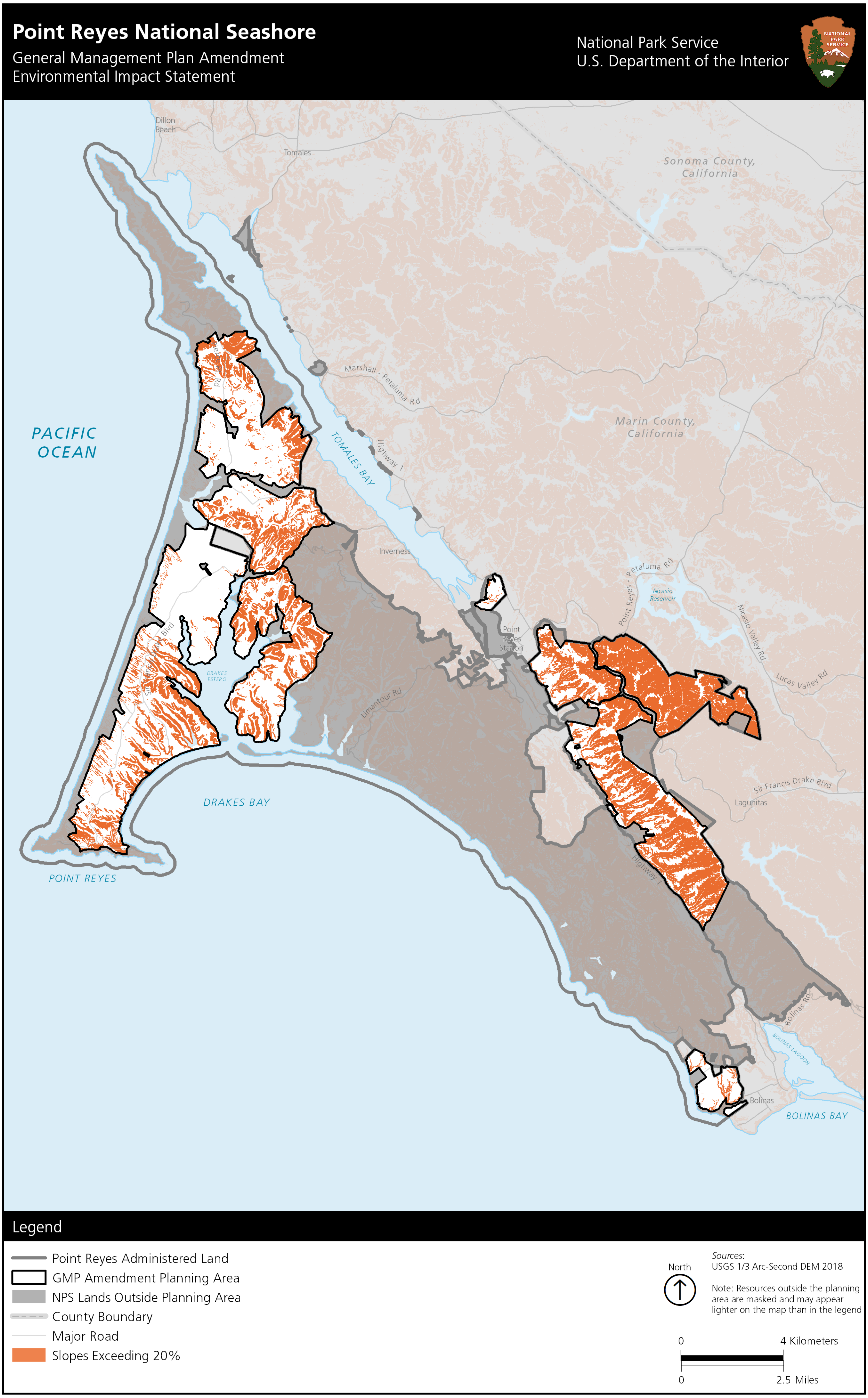

FIGURE 40: SLOPES GREATER THAN 20% IN THE PLANNING AREA

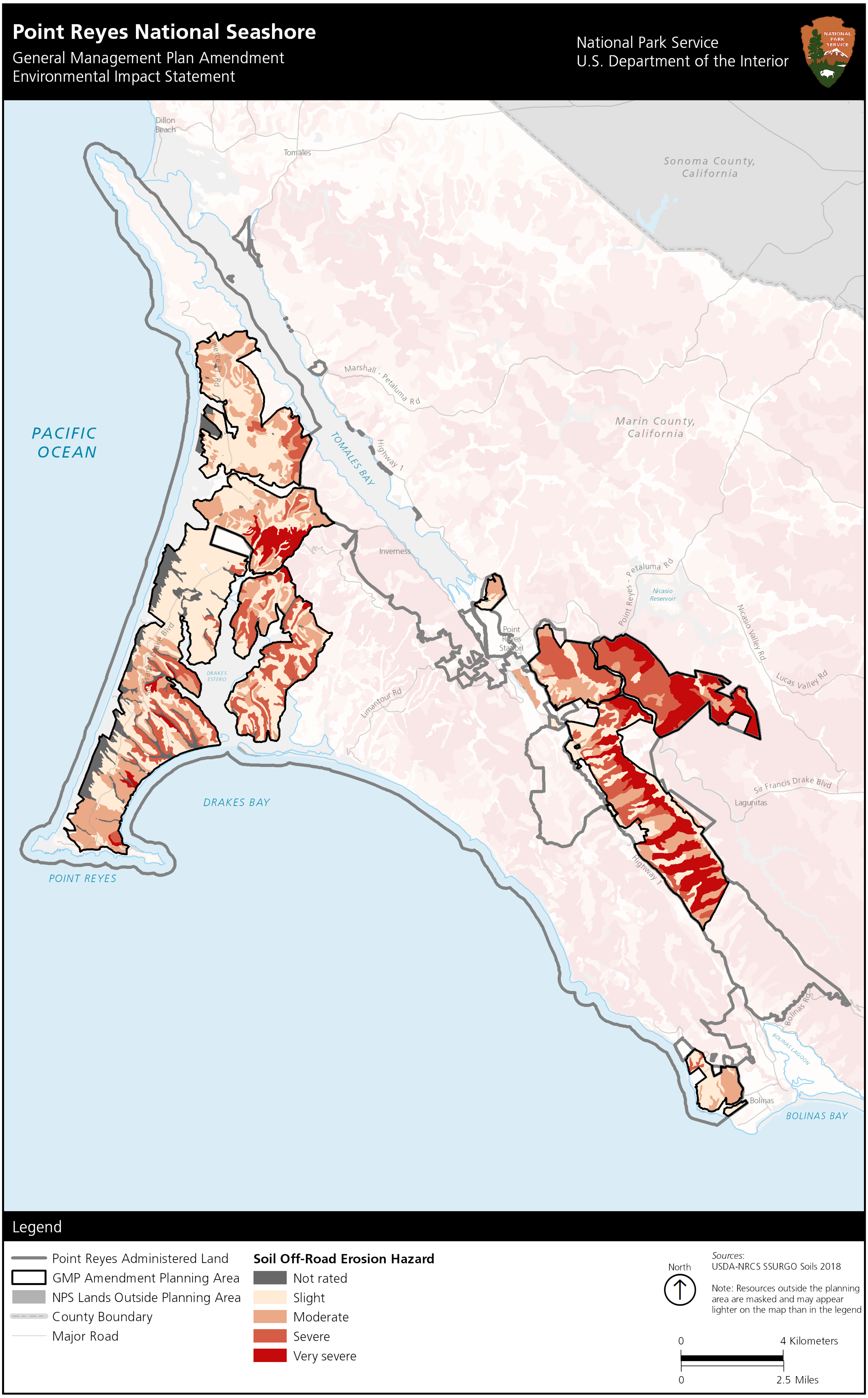

FIGURE 41: SOIL EROSION HAZARDS IN THE PLANNING AREA

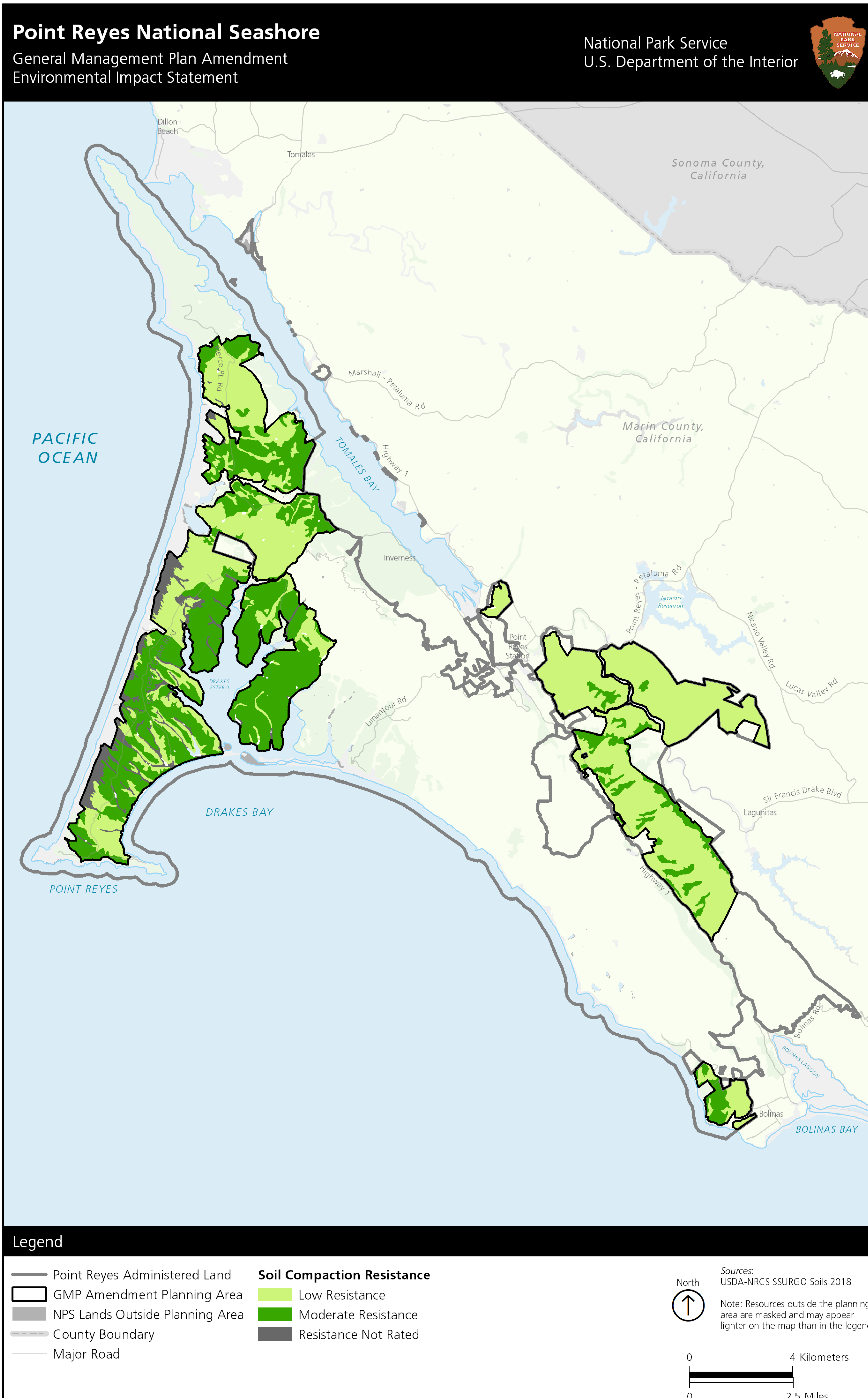

Figure 42: Soil Compaction Resistance in the Planning Area

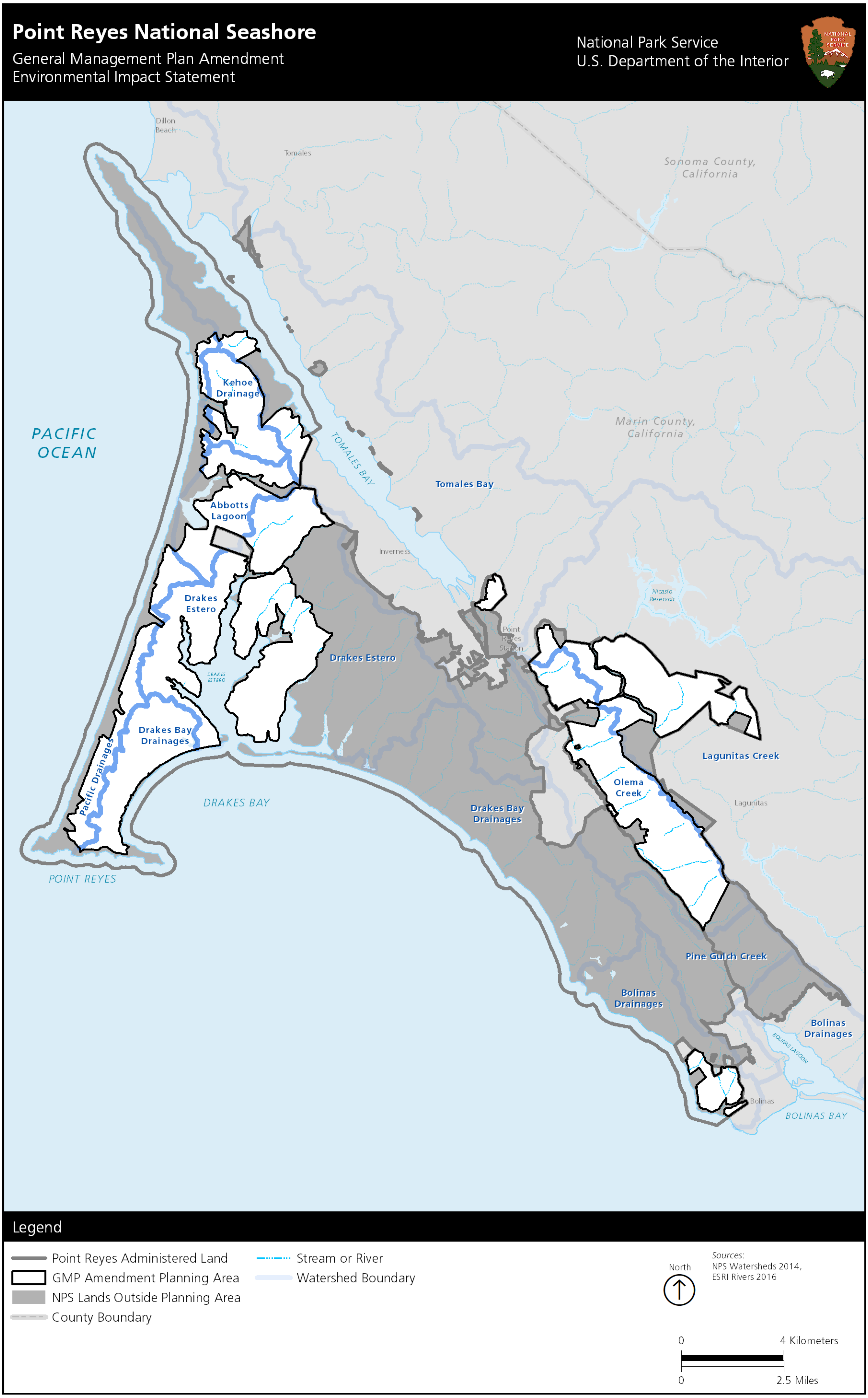

FIGURE 43: HYDROLOGY IN THE PLANNING AREA

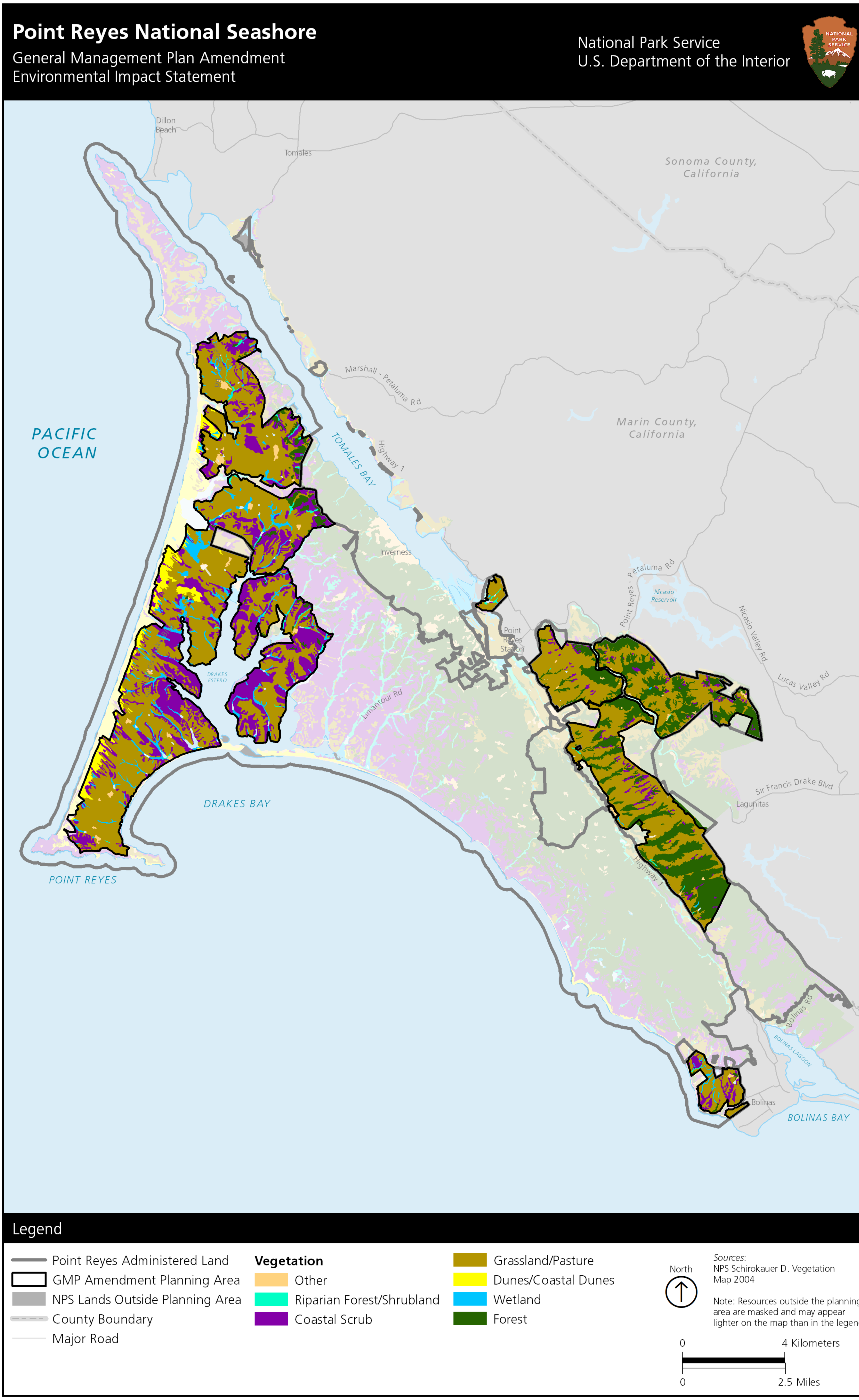

Figure 44: Vegetation in the Planning Area

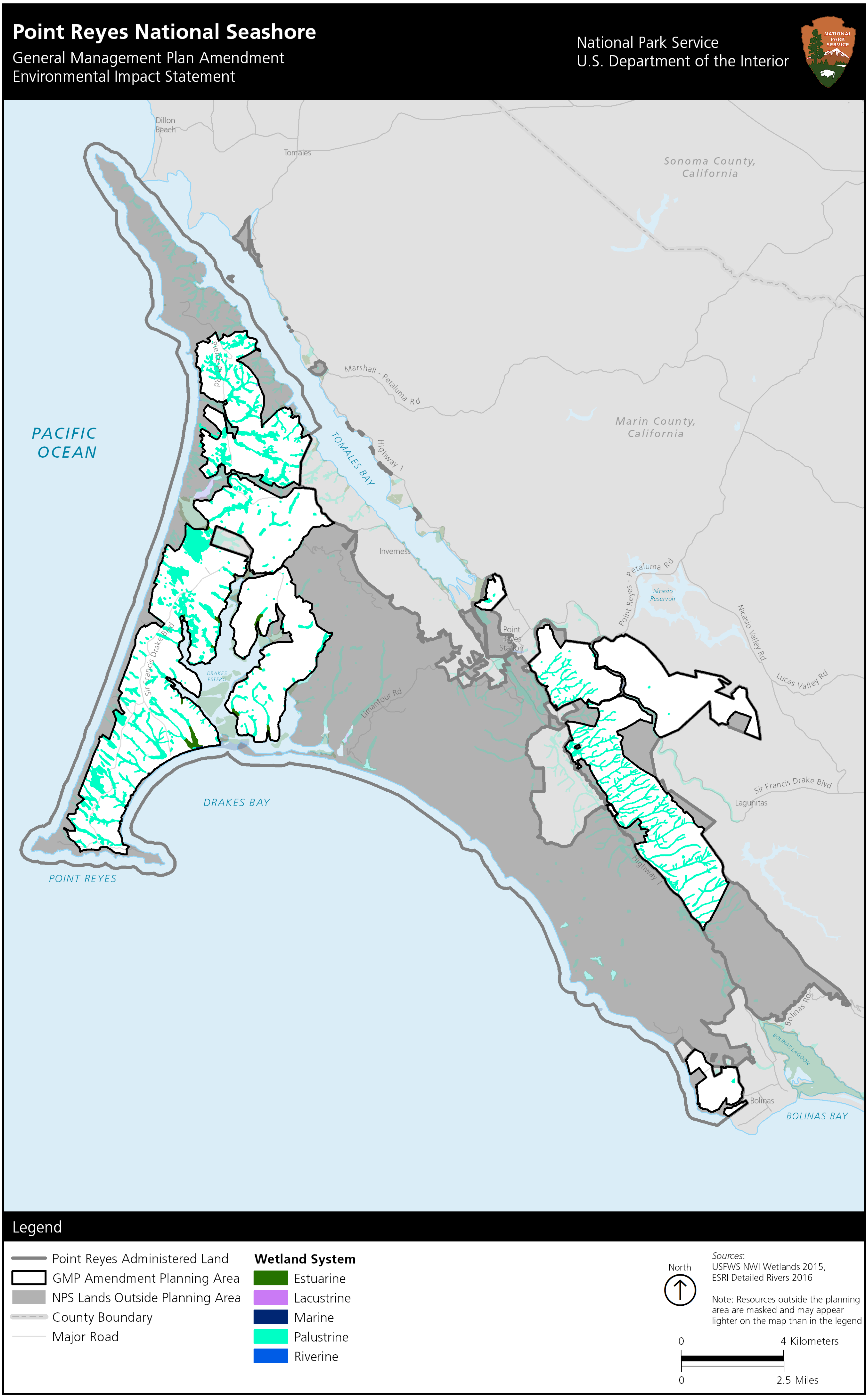

Figure 45: Wetlands in the Planning Area

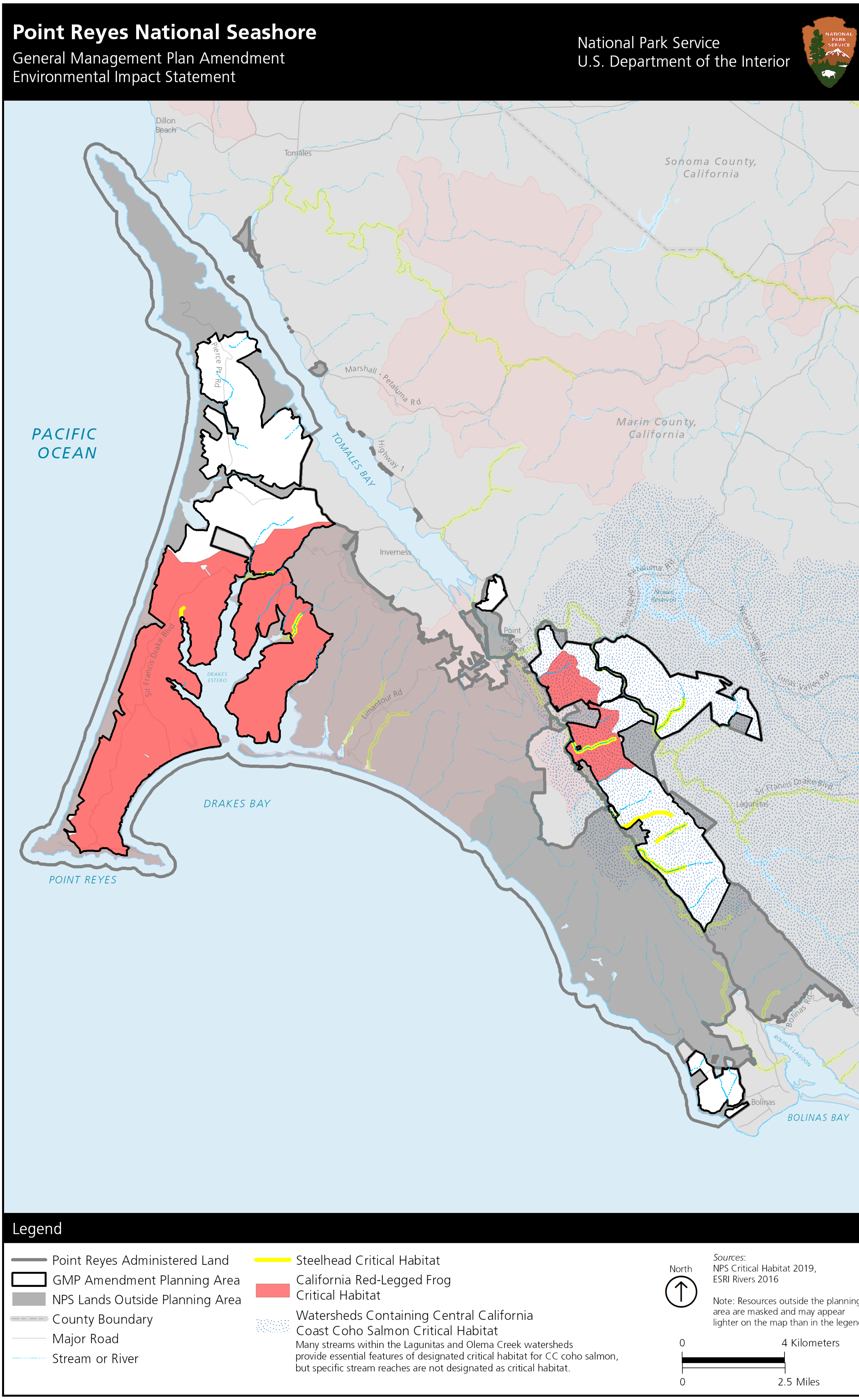

FIGURE 46: CRITICAL HABITAT IN THE PLANNING AREA

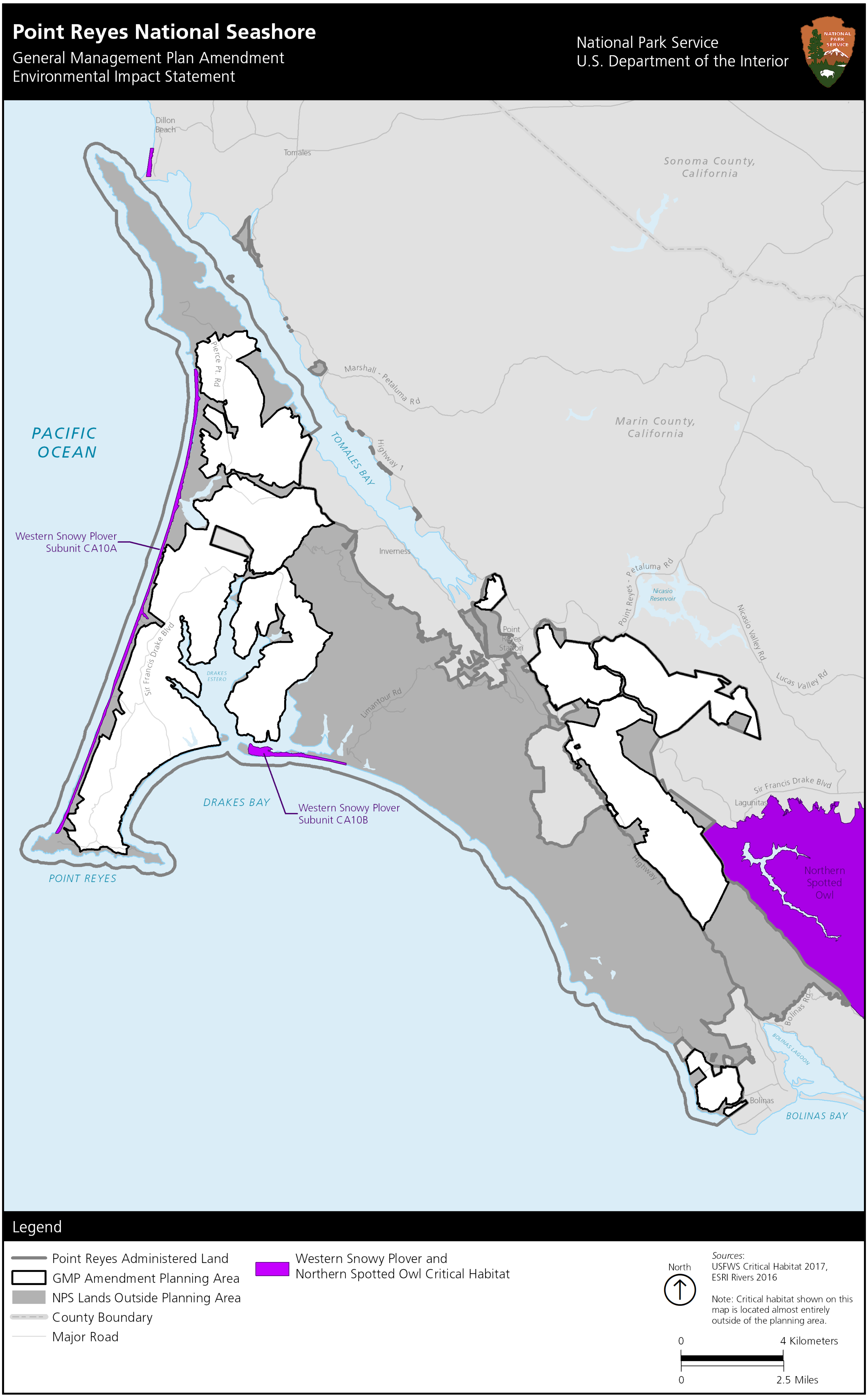

FIGURE 47: CRITICAL HABITAT FOR AVIAN SPECIES IN THE PLANNING AREA

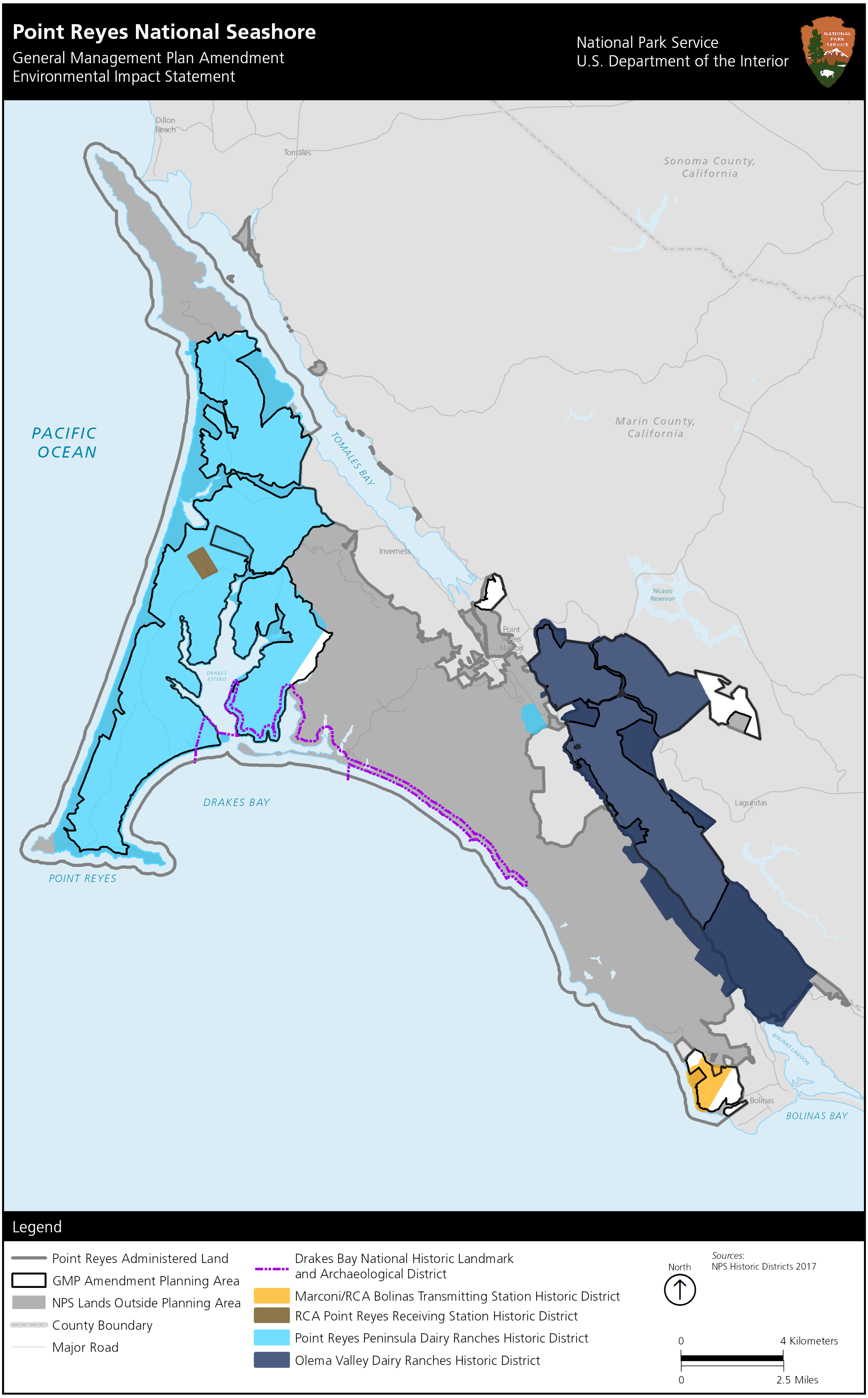

FIGURE 48: HISTORIC DISTRICTS IN THE PLANNING AREA

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APPENDIX B—ACRONYMS AND ABBREVIATIONS, REFERENCES, INDEX

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Appendix B: Acronyms and Abbreviations, References, Index

Acronyms and Abbreviations

1980 GMP	1980 *Point Reyes National Seashore General Management Plan*
2014 GMP	2014 *Golden Gate National Recreation Area and Muir Woods National Monument General Management Plan*
ASBS	Area of Special Biological Significance
AQRV	air quality related values
AU	animal unit
AUM	animal unit month
AVSO	(The US Department of the Interior) Appraisal and Valuation Services Office
BA	Biological Assessment
BMP	best management practice
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWD	chronic wasting disease
dv	deciviews
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
FMV	fair market value
FR	Federal Register
GHG	greenhouse gas
GPS	global positioning system
gpd	gallons of water per day
GMP Amendment	General Management Plan Amendment
I/O	Input-Output
IPM	Integrated Pest Management
IVUMC	Interagency Visitor Use Management Council

kg-N/ha/yr	kilogram of nitrogen per hectare per year
kg-S/ha/yr	kilogram of sulfur per hectare per year
lease/permits	agricultural lease/special use permits
LQ	location quotient
NAAQS	national ambient air quality standards
National Register	National Register of Historic Places
NASS	(USDA) National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NH_3	ammonia
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
north district of Golden Gate	north district of Golden Gate National Recreation Area
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NPS	National Park Service
NRCA	Natural Resources Condition Assessment
NRCS	(USDA) Natural Resources Conservation Service
O_3	ozone
park	Point Reyes National Seashore and the north district of Golden Gate National Recreation Area
PCE	primary constituent elements ‘
PG&E	Pacific Gas & Electric
PM	particulate matter
$PM_{2.5}$	particulate matter of 2.5 micrometers in diameter or less
PM_{10}	particulate matter of 10 micrometers in diameter or less
Point Reyes	Point Reyes National Seashore
ppb	parts per billion
ppm-hrs	parts per million-hours
PZP	pellucida
RDM	residual dry matter
ROA	ranch operating agreement
RUO	Reservation of Use and Occupancy
San Francisco RWQCB	San Francisco Bay Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide

SPAWN	Salmon Protection and Watershed Network
SWRCB	State Water Resources Control Board
TMDL	total maximum daily loads
Tule Elk Management Plan/EA	*Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment*
U.S.C.	United States Code
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	volatile organic compound

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APPENDIX C—ISSUES AND IMPACT TOPICS NOT CARRIED FORWARD FOR DETAILED ANALYSIS

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APPENDIX C: ISSUES AND IMPACTS TOPICS NOT CARRIED FORWARD FOR DETAILED ANALYSIS

Other Listed Species

The National Park Service (NPS) evaluated the potential impacts on a number of federally listed and state-listed species to determine whether potential impacts warranted full analysis in the general management plan amendment (GMP Amendment) and environmental impact statement (EIS) for Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively referred to as the park). Table 4 of appendix I provides a list of all of the federally listed threatened and endangered wildlife in the park and the rationale for why they were or were not analyzed in the EIS. Generally, species were dismissed from further analysis if (1) their habitat is not present in the planning area, (2) the species does not occur in the planning area, or (3) the species and/or its habitat is present in the planning area, but actions proposed in the EIS do have the potential to affect the species.

Soundscapes

In accordance with NPS *Management Policies 2006* and Director's Order 47: *Sound Preservation and Noise Management*, an important part of the NPS mission is to preserve the natural soundscapes associated with national park system units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in the national park system units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequency, magnitude, and duration of human-caused sound considered acceptable varies among national park system units and potentially throughout the park—being generally greater in developed areas and less in undeveloped areas such as wilderness areas. Noise associated with continued ranching activities includes exhaust systems, water pumps, all-terrain vehicles, and other equipment. These ongoing activities and any new activities considered are not expected to change the existing soundscape. Firearm noise associated with potential tule elk management would be include noise associated with the discharging of firearms.

Noise impacts related to continued ranching activities or tule elk management activities are addressed in the context of the analysis of impacts on wildlife and visitor use and experience. Consideration of noise impacts on species of special concern and visitor experience are addressed in relevant sections. No long-term changes to the soundscape are expected under an alternative with continued ranching or from tule elk management. Under an alternative with no or reduced ranching, noise associated with ranching activities would be reduced, and there could be benefits to the soundscape. As a result, this topic was dismissed from further analysis.

Wilderness

No potential designated wilderness occurs in the planning area and the actions considered in the EIS would not affect adjacent wilderness areas; therefore, wilderness was dismissed from detailed evaluation in the EIS.

Archeological Resources, including Impacts on the Drakes Bay Historic and Archaeological District

The Drakes Bay Historic and Archaeological District was designated a National Historic Landmark in 2012 under criteria 1, 2, and 6 under the National Historic Landmark thematic framework category of Peopling Places, in the areas of significance of maritime history, exploration, and archeology-historic-aboriginal and archeology-historic-nonaboriginal. The district is a nationally significant 16th century landscape associated with the earliest interactions between Europeans and native peoples. Significant under National Register criteria A, B, and D, the landscape includes 15 California Indian sites, the likely site of Francis Drake's 1579 landing in California, and the 16th century shipwreck of the Spanish galleon San Agustin. The district is generally located along Drakes Bay, which is characterized by the bay itself, the estuaries or esteros, and the rolling hills and cliffs along the shoreline. Lack of development has kept this landscape much the same as it was in the 16th century, when Drake arrived, sheltering in the cove of the bay.

Because all documented sites in the planning area are excluded from ranching activities and park protocols would be implemented immediately upon discovery of unknown archeological resources, impacts on archeological resources are not anticipated to occur as a result of the actions considered in the EIS. For these reasons, archeological resources were dismissed from detailed evaluation in the EIS.

Health and Safety

Health and safety issues associated with some of the actions under consideration include visitor safety, use of herbicides, and measures considered for tule elk management. Park staff and contractors are responsible for public safety and must provide adequate area closures, monitoring, and signage to ensure that visitors understand safety precautions. As a result, implementing mitigation measures would avoid health and safety issues related to the actions considered in the EIS, so this topic was dismissed from further analysis.

Resources including Energy Conservation Potential and Sustainability

Pursuant to NPS *Management Policies 2006* (NPS 2006), "The National Park Service will conduct its activities in ways that use energy wisely and economically. Park resource and values will not be degraded to provide energy for NPS purposes. The Service will adhere to all federal policies governing energy and water efficiency, renewable resources, use of alternative fuels, and federal fleet goals as established in the Energy Policy Act of 1992." Therefore, this topic was dismissed from further analysis.

Marine Resources

Generally, the actions proposed in the EIS would not affect marine resources because they would occur outside the planning area. In cases where a particular resource may be affected, it is included for analysis under other resource topics (i.e., salt marshes are covered under vegetation). Therefore, marine resources as a stand-alone topic was dismissed from detailed analysis in the EIS.

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APPENDIX D—MANAGEMENT ACTIVITY STANDARDS AND MITIGATION MEASURES

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Appendix D: Management Activity Standards and Mitigation Measures

Introduction

The management activities as described below are analyzed in the draft environmental impact statement (EIS) for a general management plan amendment for Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (collectively referred to as the park). These management activities are grouped into broad categories referred to as *activity types*, for example, *road upgrade and decommissioning* (table D-1). This appendix was adapted from numerous compliance documents, including the Marin Resource Conservation District Permit Coordination Program (which was established to streamline permitting for many of the activity types listed herein), as well as previous National Park Service (NPS) National Environmental Policy Act compliance for projects, and previous Biological Opinions from US Fish and Wildlife Service and National Marine Fisheries Service. Wherever possible, activity types are also associated with one or more established US Department of Agriculture (USDA), Natural Resources Conservation Services (NRCS), Conservation Practice Standards—technical guidelines for the conservation of soil, water, air, and related plant and animal resources when implementing activities (referred in this document as practices).

The tables below are intended to guide planning, implementation, and operation and maintenance for the park. Specific mitigation measures, listed in table D-11 by activity type (presented at the end of this appendix), would reduce potential impacts on sensitive resources. The mitigation measures were developed to provide a level of impact avoidance and minimization for all management activities and are mandatory when implementing any of the activities. Specific design requirements, avoidance measures, and mitigation measures that apply to all activity types are listed first. Roles and responsibilities for each mitigation measure are also assigned.

To ensure protection of natural and cultural resources, the NPS would streamline the permitting process for typical ranch maintenance activities and would provide consistent guidance to ranchers by using a management zoning framework of Resource Protection, Range, Pasture, and Ranch Core subzones. This zoning framework is based on resource sensitivity. Each of the subzones is based on analysis of topography, existing sensitive resource information, and ranch management activities. By implementing a zoning framework, NPS can better ensure resource protection by directing where more intensive activities are conducted and can accommodate greater operational flexibility for ranchers while protecting park resources. Consistent with the EIS process, certain practices or activities may be authorized only in some specific subzones. The Resource Protection and Range subzones generally contain known sensitive resources and/or slopes greater than 20%, and activities in these subzones would be the most limited.

In addition, all management activities must fit within their individual maximum size limits; individual activities or projects that exceed the maximum limits do not qualify coverage through the EIS. A *project* may constitute implementation of one or more practices or management activities listed below. The collective activities grouped to form a project must meet size limitations to qualify for implementation. For example, a road upgrade project to address erosion from a ranch road could require use of (1) Access Road Upgrades with (2) a lined waterway that would carry excess upland surface runoff to (3) a Structure for Water Control (e.g., a culvert). One project would comprise these three practices.

When developing and implementing projects, NPS would follow these principles to avoid or minimize the potential for adverse impacts:

- Ground and vegetation disturbance would not exceed the minimum area necessary to complete the project. Removal of native trees and shrubs would be minimized and only occur when necessary to meet project objectives.
- Site-specific design plans would show the maximum extent of grading and would include requirements to protect sensitive environmental resources during construction and maintenance activities, including sediment control measures.

- Disturbed areas would be restored to preconstruction or better conditions.
- Prior to beginning work, ranchers and any construction managers would hold a preconstruction meetings with NPS to confirm that all requirements, including mitigations, are in place.
- Construction managers would prepare and implement a spill prevention and clean-up plan, stormwater pollution prevention plan, or similar document for all construction projects. The plan would address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales and silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas.
- Unused materials and construction debris would be disposed of in an environmentally sound manner, and fencing, old silage wraps, and storage materials would be reused when possible.
- Activities (e.g., harvesting, mowing, shrub management, and seeding) would not occur during rainy or saturated soil conditions.
- Planning would consider methods available to achieve objectives and use the method(s) least disruptive to the habitat of endangered or sensitive species. If sensitive habitats or species near to proposed work must be avoided, the area would be flagged and/or a NPS representative would be present onsite to denote sensitive resources. The parties implementing the project would avoid all NPS-delineated sensitive resources.
- The spread or introduction of invasive plant species and other noxious weeds would be avoided to the maximum extent possible by protecting areas with established native vegetation; implementing preventative measures, such as use of certified weed-free materials and inspection and cleaning of all equipment before entering or exiting sites during construction; restoring disturbed areas with native species where appropriate; and performing post-project monitoring and controlling exotic species.
- Ranchers would employ IPM strategies (i.e., prevention, avoidance, monitoring and suppression) to prevent or mitigate pest management risks for identified natural resource concerns.
- As needed, ranchers would seek technical assistance from the local USDA, NRCS, or Resource Conservation District offices because the relevant practices needed at a given ranch depend on project layout, topography, soil types, and other factors.
- NPS would oversee any use of biological control agents.
- NPS would monitor and maintain all erosion control systems to ensure that issues can be addressed before failure.

Agencies with potential jurisdiction over these activities include the US Fish and Wildlife Service, National Marine Fisheries Service, Regional Water Quality Control Board, and California Coastal Commission. These agencies may stipulate additional requirements for management activities or projects. All actions would adhere to stipulations within the biological opinions issued under the general management plan amendment, state and federal water quality laws and the terms of any applicable permits, including the State Water Resources Control Board's Conditional Waiver of Waste Discharge Requirements and the General Waste Discharge Requirement for Confined Animal Facilities.

As noted in the Marin Permit Coordination Program (Marin Resource Conservation District 2018), consideration would be given to reducing wildland fire hazards when implementing all activities by:

- removing dry, combustible vegetation from the construction site with specific focus on the staging areas for heavy equipment prior to construction activities
- ensuring vehicles are not parked in areas where exhaust systems can contact combustible materials
- ensuring fire extinguishers and fire suppression tools are available on the site when working in high fire hazard areas

As part of the planning and implementation of these projects, the following cultural resource considerations are required.

- Construction activities would avoid impacts on archaeological resources, ethnographic resources, and other cultural resources that may be adversely affected by construction activities. If an area has not been previously surveyed for cultural resources, a survey by a qualified cultural resources specialist may be required to determine whether any previously unknown cultural resources occur in the planning area.
- In the event that possible human remains, Native American artifacts, or concentrations of historic artifacts are discovered during construction, work in the area must cease immediately and the park's Cultural Resources Division must be notified for an evaluation of the discovery.

The estimated number of individual projects to be implemented is up to 24 per year.

The park would work with ranchers during annual meetings to identify projects and consolidate and coordinate review of ranch projects to complete compliance and authorize implementation.

D-1: Management Activities by Activity Types

Activity Type	Description	Associated NRCS Practice(s)
Ranch Infrastructure		
Road Upgrade and Decommissioning	Improvements to an existing road network for the purpose of preventing erosion and protecting water quality that may include re-grading surfaces (e.g., out-sloping, crowning, in-sloping); construction of water bars, rolling dips, or critical dips; removal or addition of roadside ditches to assist with stormwater drainage; installation or repair of ditch relief culverts or critical culverts; removal of a screen or installation of a trash rack at a culvert inlet; construction of cross-road drains; and protection of ecologically sensitive, erosive, or potentially erosive sites.	Access Road (560) Trails and Walkways (575) Structure for Water Control (587) Road Closure and Treatment (654)
Infrastructure Management	Management activities to protect water quality and reduce erosion, including heavy use area protection, establishment of suitable vegetation to convey surface water at a nonerosive velocity using a broad and shallow cross section to a stable outlet, strips of vegetation to filter pollutants, roof and covers, and roof runoff structures to divert clean water away from potential pollutant sources.	Heavy Use Area Protection (561) Roof and Covers (367) Roof Runoff Structure (558) Grassed Waterway (412) Filter Strip (393)
Fence	This practice facilitates the accomplishment of management goals and objectives by providing a means to control movement of animals and people, including vehicles.	Fence (382)

Activity Type	Description	Associated NRCS Practice(s)
Livestock Water Supply	Actions to provide a dependable supply of water for livestock, including the collection system (e.g., pipeline, trench, appurtenances below ground). Implementation may require shallow digging/trenching for removal/installation of piping and associated equipment. This practice may include installation of an underground outlet to safely disperse concentrated runoff.	Spring Development (574) Livestock Pipeline (516) Underground Outlet (620) Watering Facility (614) Pumping Plant (533)
Pond Restoration	Pond restoration activities may include structural component repair including spillways, alternative pipe outlets for water flow, and embankment repair, as well as obstruction removal and pond desiltation as necessary to maintain the pond.	Pond Restoration (378[R])
Vegetation Management		
Upland and Riparian Vegetation Management and Planting	Plant establishment to stabilize a disturbed area, reduce stormwater flow velocity and surface flow erosion, encourage infiltration, and enhance wildlife habitat. Actions may include planting a vegetative buffer along a field perimeter to filter runoff exiting the area; establishing native grasses, forbs, shrubs, or trees in disturbed or eroding areas; planting permanent vegetation at a pipe or underground outlet; consistent with historic landscape, alignment, and species, maintenance of a dense line of vegetation to function as a wind break/habitat enhancement/barrier to noise or to increase carbon storage capacity; establishing perennial or self-sustaining vegetation across fields used as rangeland; and replacing invasive species and potential disease-host plants with native species.	Critical Area Planting (342) Range Planting (550) Riparian Herbaceous Cover (390) Riparian Forest Buffer (391) Windbreak/ Shelterbelt Establishment (380) Tree/Shrub Establishment (612)
Mowing	The timely cutting, and in some cases removal of, herbaceous vegetation for forage, control of herbaceous weeds, and woody (nonherbaceous) plants including those that are invasive and noxious.	Brush Management, Mechanical (314-A) Herbaceous Weed Treatment (315)
Integrated Pest Management (IPM)	Managing pest infestations (including weeds, insects, and diseases) to reduce adverse effects on environmental resources. The removal or control of herbaceous weeds including invasive, noxious, and prohibited plants, to enhance accessibility, quantity, and/or quality of forage and/or browse; restore or release native or create desired plant communities and wildlife habitats consistent with the site potential; protect soils and control erosion; reduce fine fuel loads and wildfire hazard.	IPM (595)

Activity Type	Description	Associated NRCS Practice(s)
Prescribed Grazing	Managing the harvest of vegetation with grazing and/or browsing animals with the intent to achieve specific ecological management objectives including one or more of the following: ▪ Improve or maintain desired species composition, structure, and/or vigor of plant communities ▪ Improve or maintain surface and/or subsurface water quality and/or quantity ▪ Improve or maintain riparian and/or watershed function ▪ Reduce soil erosion and maintain or improve soil health ▪ Improve or maintain the quantity, quality, or connectivity of food and/or cover available for wildlife ▪ Manage fine fuel loads to achieve desired conditions	Prescribed Grazing (528)
Waterway Management		
Waterway Stabilization	Stabilization of a gully or downcutting channel by installing a structure to control the grade and/or stabilize the slope. Implementation may require some grading and installation of brush, erosion-control fabric, rock, or timber structures that do not impound water but rather allow water to be conveyed in a stable manner. Actions may include installing a rock weir to control and slow in-channel flow; adding rock to stabilize a gully draining towards a stream channel; lining an eroding swale or diversion ditch; rock armoring an eroding ditch; armoring below an outlet; installing an energy dissipater at a spillway or pipe outlet to a channel; and stabilizing and protecting streambanks through laying back the bank, bioengineering, or vegetated rock installation.	Grade Stabilization Structure (410) Lined Waterway Or Outlet (468)
Stream Crossing	Installation of a ford, bridge (channel-spanning when feasible), or culvert crossing for people, livestock, equipment, or vehicles where necessary for access over an intermittent or perennial watercourse to protect water quality, habitat, and species.	Stream Crossing (578)

Activity Type	Description	Associated NRCS Practice(s)
Other Activities (applicable only on ranches where currently authorized)		
Manure and Nutrient Management	Installation of practices that improve management of manure, thereby resulting in improved water and/or air quality conditions. Actions include installation of manure/liquid separators, composting pads, techniques resulting in a reduction of greenhouse gas emissions, such as conversion from dairy flush to scrape systems, and the proper transfer of liquid manure to avoid impacts on environmentally sensitive areas. Agricultural management practices to protect water quality, such as the amount (rate), orientation, collection, placement, and timing of animal manure, residue, and amendments on the soil surface year-round while limiting soil-disturbing activities to only those necessary to place nutrients and condition residue.	Nutrient Management (590) Composting Facility (317) Waste Treatment (629) Waste Separation Facility (632) Waste Transfer (634) Waste Storage Facility (313)
Forage Production, including Silage, Haylage and Hay	Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, silage, haylage, or hay, production, and the timely cutting and removal of forage from the field while limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface. On dairies, nutrient management may also be included as a soil amendment for forage production.	Forage and Biomass Planting (512) Forage Harvest Management (511) Residue and Tillage Management/ No-Till (329)

Authorization of diversification activities would be evaluated based on rancher proposals. The general types of diversification activities that could be authorized are discussed in the EIS, and general mitigation measures are included in table D-11 (presented at the end of this appendix). Additional mitigation measures could be required dependent on the proposal and diversification activity type.

Detailed Descriptions of Activities

Ranch Infrastructure

Road Upgrades and Decommissioning. Road upgrade and decommissioning activities are intended to improve roadway stability and durability, limit road damage during all types of weather conditions, and prevent polluted runoff from entering sensitive environments. Roadways that are no longer needed for land management purposes should be decommissioned to protect water quality and restore habitat connectivity. Implementation typically requires use of heavy equipment, and improvements often involve multiple installations spread out over a long stretch of road. Four road improvement practices are included in this activity type—Access Road, Trails and Walkways, Structure for Water Control, and Road Closure and Treatment. Note that installation of bridges placed at top-of-bank to allow safe passage for livestock, pedestrians, equestrians, and farm vehicles is included in the Stream Crossing practice described below.

Access Road (560). An access road is a fixed route for equipment and other vehicles used for agricultural and resource management activities. Access roads range from single-purpose, seasonal roads designed for low speed and rough driving conditions to all-purpose, all-weather roads. This practice is intended to make improvements to existing roads used for moving livestock, vehicles or equipment and may include surface grading to effectively drain water. Water bars and rolling dips may be installed along roadways to redirect water off the road before it can concentrate and lead to erosion of the road surface or gully formation. Roadside ditches may be added, removed, or modified to improve water conveyance.

The Access Road practice does not include construction of new roads, addition of asphalt or concrete to existing roads, widening roadways, or increasing weight-bearing capacity of bridges. An exception may include construction of a short segment of new access road where a segment of existing roadway is relocated or extended out of a sensitive area to protect natural resources.

Culverts may be installed or replaced under the road to provide or improve drainage. Although culverts would generally 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 would be placed in a well-vegetated area that would not be subject to erosion, or the outlet would 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.

Trails and Walkways (575). This practice applies to a *trail*, a feature with a vegetated or earthen surface, or to a *walkway* that has an artificial surface. Upgrades include improvement of an existing travel lane on agricultural lands for livestock, pedestrians, and off-road vehicles used exclusively for agricultural purposes (e.g., farm all-terrain vehicles that are not designed for use on public roads) to traverse difficult, ecologically sensitive, or erosive terrain. The Trails and Walkways practice may also improve access to forage or water and to agricultural or maintenance operations. The practice does not apply to roads constructed for movement of equipment or nonagricultural vehicles. Any required culverts would be designed to carry, at a minimum, a 2-year, 24-hour flow, although, if watershed conditions or anticipated usage warrant, a larger storm-event design may be utilized.

Structure for Water Control (587). Structures for water control cover a number of water management system activities to convey water, control the direction or rate of flow, maintain a desired water surface elevation, or measure water. The practice is intended to remove culverts entirely where possible and is limited to:

- removing or replacing existing culverts in streams and other waterways when they are either not functioning properly or are a barrier to aquatic passage
- constructing new culverts to properly convey overland or concentrated water flow into a drainage or under a road, for example, as part of an improvement design for an access road

Careful consideration would be given to addressing upslope sources of flow that are causing the need for a culvert (i.e., rather than replacing an undersized or defective culvert in an in-sloped road with a properly sized, functioning culvert, the road would be out-sloped to eliminate the need for the culvert). As with the Access Road practice, culverts would generally be sized for a 25-year, 24-hour event. However, smaller culverts may be used (minimum 10-year storm capacity and not less than 12 inches in diameter) if topography and overflow facilities exist to prevent damage from larger storms or if on-site conditions preclude use of a larger culvert.

Road Closure and Treatment (654). The Road Closure and Treatment practice involves decommissioning and abandoning roads, trails, and landings (table D-2). Closure and decommissioning would include a range of activities, such as blocking the entrance to eliminate vehicle access, revegetation and water barring to reduce runoff, removal of fills and culverts, establishment of drainages, and full obliterations through recontouring and restoring natural slopes.

Treatments to restore vegetative cover, natural topography, and surface hydrology would result in stable slopes and would be compatible with existing land uses in the vicinity.

TABLE D-2: SIZE LIMITATIONS PER PROJECT FOR ROAD UPGRADES AND DECOMMISSIONING

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Access Road	2 miles	2 acres	N/A	Road lengths are of disturbed area only; length of road network treated may be greater.
Trails and Walkways	2 miles	2 acres	N/A	Lengths are of disturbed area only; length of trail network treated may be greater.
Structure for Water Control	200 feet	0.25 acre	500 cubic yards	Culverts that require permits would be designed and stamped by a licensed engineer, geologist, or landscape architect or a qualified NRCS engineer.
Road Closure and Treatment	2 miles	2 acres	N/A	Up to 1,000 feet of channel may be dewatered at each site or current regulatory standards.

Infrastructure Management activities protect heavily used areas by preventing erosion and degradation of critical infrastructure, separating clean runoff from potential pollutant sources, and preventing flooding in ranch core areas. These could include establishment of suitable vegetation to convey surface water at a nonerosive velocity using a broad and shallow cross section to a stable outlet, strips of vegetation to filter pollutants, roof and covers and roof runoff infrastructure and placement of materials to stabilize a ground surface.

Heavy Use Area Protection (561). The Heavy Use Area Protection practice is implemented to protect and improve water quality by providing a stable, noneroding surface for areas frequently used by animals, people, or vehicles. Commonly used treatments include vegetative cover, surfacing with suitable materials (e.g., concrete pad, gravel), or installing needed structures (e.g., roof, drainage and stable outlet, or vegetative filter strip)

This practice is often used to provide surface stability in areas where concentration of livestock is causing a resource concern. These include feeding areas, portable hay rings, watering facilities, feeding troughs, and mineral areas where provision must be made for the collection, storage, utilization, and treatment of manure and contaminated runoff.

Roof and Covers (367). A roof and cover system consists of a rigid, semi-rigid, or flexible manufactured membrane, composite material, or roof structure installed on an existing structure or waste management facility to divert clean water from animal management areas, waste storage facilities, or gutters and downspouts to prevent the escape of gases from waste facilities or to exclude precipitation from these facilities. It may also involve attaching downspouts into a subsurface drainage system. The Roof and Covers practice is a component of an agricultural waste management system.

Roof Runoff Structure (558). A roof runoff structure is made of various components that collect, control, and convey precipitation runoff from a roof; components of this practice can include gutters, downspouts, rock-filled trenches or pads, and subsurface drains or outlets (table D-3). The practice applies where roof runoff from precipitation needs to be diverted away from structures or contaminated areas. Roof runoff water that becomes contaminated by contact with animal waste would be diverted to an established manure pond or to a field for land application. Roof runoff water can be collected and used for many purposes. For example, nonpotable water can be used for irrigation.

TABLE D-3: SIZE LIMITATIONS PER PROJECT FOR OPERATIONS MANAGEMENT

Item	Practice Acres	Additional Criteria
Heavy Use Area Protection	N/A	--
Roof and Covers	N/A	--
Roof Runoff Structure	N/A	No capture of roof runoff for use as potable water is authorized.

Waterway Vegetation and Planting

Waterway vegetation and plantings are used in areas where added water conveyance capacity and vegetative protection are needed to prevent erosion and improve runoff water quality through infiltration that removes sediment, other suspended solids, and dissolved contaminants in runoff (table D-4). The waterway vegetation and plantings activity includes two practices—Grassed Waterway and Filter Strip. Installation of waterway vegetation and plantings would often require grading and use of equipment.

Grassed Waterway (412)

Installation of a vegetated, shaped or graded waterway is used to convey surface water at a nonerosive velocity using a broad and shallow cross section to a stable outlet. This practice is designed to reduce erosion in a concentrated flow area in order to reduce sediment and other substances delivered to receiving waters. Vegetation may act as a filter to remove some of the sediment, although this is not the primary function of a grassed waterway; see the Filter Strip practice below.

A grassed waterway would be designed to convey the peak runoff expected from a 10-year, 24-hour storm. Capacity may be increased, as needed, to account for potential volume of sediment expected to accumulate between planned maintenance activities. Design criteria include minimum depth, width, and side slopes to provide stability; selection of a stable outlet, such as another vegetated channel, earthen ditch, grade stabilization structure, or filter strip; and requirements to ensure successful vegetation establishment. Other considerations may consist of incorporation of wildlife habitat benefits, such as connectivity or use of plantings to attract pollinators, as well as use of water-tolerant vegetation and invasive species control. Grassed waterways would not be used as field roads or turn-rows and would not be crossed by heavy equipment when wet.

Filter Strip (393)

Filter strips are permanent areas of vegetation designed to remove both suspended and dissolved sediment, organic matter, and other pollutants from runoff and wastewater. This practice would generally be used between high use agricultural lands and environmentally sensitive areas. When the field or high use area borders are located such that runoff occurs as sheet flow, coarser-grained sediments are filtered and deposited.

Potential pollutants are removed from runoff through infiltration, absorption, adsorption, decomposition, and volatilization, thereby protecting water quality downstream. When established, filter strips may also reduce erosion.

TABLE D-4: SIZE LIMITATIONS PER PROJECT FOR WATERWAY VEGETATION AND PLANTING

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Grassed Waterway	2,000 feet	1 acre	500 cubic yards	Length is of disturbed area only; length of area treated may be greater.
Filter Strip	2,000 feet	N/A	N/A	Filter strips may not be installed in riparian zones.

Fence (382)

Fencing is used to facilitate the accomplishment of conservation objectives by providing a means to control the movement of animals, people, and vehicles (table D-5). The practice includes both digging/trenching for post holes and installation of above-ground fencing. It can be used for livestock management in a rotational grazing program, to restrict access to an area being revegetated, and to restrict access livestock access to sensitive resources, such as riparian areas or creeks. Based on objectives, fences may be permanent, portable, or temporary. Fencing materials, type, and design of fence installed would be of a high quality and durability designed to meet the management objectives and site challenges. Fences would be located and installed to meet appropriate NPS wildlife and land management needs and requirements.

TABLE D-5: SIZE LIMITATIONS PER PROJECT FOR OPERATIONS MANAGEMENT

Item	Practice Acres	Additional Criteria
Fence	N/A	Livestock fencing must be wildlife-friendly (382D), unless otherwise approved by NPS.

Livestock Water Supply

Unrestricted livestock access to waterways can lead to potential resource degradation, including alterations to bank stability, water quality, riparian vegetation, and wildlife habitat. Alternative water sources can address potential adverse environmental effects of unrestricted livestock access. Over time, many ranches have developed springs, ponds and other water sources to meet livestock watering and associated ranch infrastructure needs.

Livestock water supply activities include the following practices: Spring Development, Livestock Pipeline, Underground Outlet, Watering Facility, and Pumping Plant (table D-6). Collection of water from springs and seeps provide a reliable supply that can be directed to a livestock pipeline, often with the aid of a pump, to move water to areas where it would be useful and can be appropriately managed for livestock and wildlife use. Underground outlets are often used in conjunction with a pipeline to prevent erosion and polluted runoff.

Spring Development (574)

The Spring Development practice is used to improve the distribution of water or to increase the quantity of water available for livestock and wildlife. Piping is installed from water-bearing soil and rocks to a trough or tank away from the spring. A wooden or concrete box or plastic pipe backfilled with gravel (spring box) may also be installed to hold the water before distribution. In some cases, horizontal drilling may be used to tap into the water source. The area around the spring or seep would be fenced to control livestock access and improve habitat values. The Spring Development practice is included in the EIS for circumstances where the practice would have minimal effects on spring or adjacent wetland habitat or involves redevelopment of an existing spring and would provide water quality improvements to nearby waterways. Spring development would use an excavation process that does not result in placement of fill in or around spring areas, although fencing would be installed to exclude livestock from the area.

Livestock Pipeline (516)

Livestock pipelines convey water from a source of supply to a point of use in order to direct livestock away from springs, streams, and other waterbodies. Livestock pipelines may be made of flexible conduit materials, such as plastic, steel, or ductile iron pipe. Appurtenances used with pipelines may include inlets, outlets, check valves, backflow prevention devices, booster pumps, pressure tanks, surge tanks, air chambers, and pressure or air relief valves. Pipelines would be placed only in or on soils suitable for the type of material selected. Steel pipe installed above ground would be galvanized or insulated with a suitable protective paint coating. Plastic pipe installed above ground would be resistant to ultraviolet light throughout the intended life of the pipe, or measures would be taken to protect the pipe from damage due to ultraviolet light.

Buried pipelines would minimize ground disturbance. Buried pipe would be installed at sufficient depth below the ground surface to provide protection from hazards imposed by traffic loads, farming operations, freezing temperatures, or soil cracking, as applicable. Pipelines would have sufficient strength to withstand all external loads on the pipe for the given installation conditions. Horizontal drilling may also be used where appropriate.

Underground Outlet (620)

An underground outlet is a conduit or system of conduits installed below the ground to convey surface water to a suitable outlet where the discharge can occur without causing damage by erosion, polluted runoff, or flooding. The design capacity of an underground outlet would be based on size of the structure or feature that it serves and its intended purpose. It may be designed to function as the only outlet or in conjunction with other types of outlets. Components of underground outlets, including inlet collection boxes and conduit junction boxes, would be designed with sufficient size to allow efficient maintenance and cleaning operations.

Watering Facility (614)

This practice involves the installation of water storage tanks (rainwater and groundwater supply) or water troughs and a plumbed pumping system to deliver water at a designed pressure and flow rate. This can include minor grading, shaping, and construction of a pad for the tank or troughs.

A watering facility is used to provide livestock and/or wildlife with drinking water to meet daily needs. Proper location of troughs would improve animal distribution and vegetation. A watering facility is sometimes installed to keep livestock out of streams and other surface water areas where water quality is a concern.

This practice applies to all land uses where there is a need for a watering facility for livestock and/or wildlife, where there is a source of water that is adequate in quantity and quality, and where soils and topography are suitable for a facility.

The water source may be a well, spring, stream, pond, municipal water supply, or other source. A tank can be installed to store water to supply the trough.

Pumping Plant (533)

A pumping plant is a facility that delivers water at a designed pressure and flow rate to meet a conservation need. Components of the facility include the required pump, associated power unit, plumbing, and necessary appurtenances. It also may include on-site fuel or energy sources and protective structures. The power supply for a pumping plant may come from line power, photovoltaic panels, or water-powered pumps (hydraulic rams) with generator backup.

A pumping plant may be installed for a wide variety of conservation purposes. This includes, but is not limited to, delivery of water for irrigation or livestock, maintenance of critical water levels in wetland sites, transfer of wastewater for utilization as part of a waste management system, and facilitation of drainage by removal of surface runoff or groundwater. When planning the installation of a pumping plant, consideration would be given to the potential effects on ground and surface water from water removal or delivery, as well as ways to protect the pumping plant from damage by livestock, freezing temperatures, and flooding.

TABLE D-6: SIZE LIMITATIONS PER PROJECT FOR ALTERNATIVE WATER SUPPLY PRACTICES

Item	Length	Disturbance Area	Soil Disturbance (cubic yards)	Additional Criteria
Spring Development	N/A	0.05 acre	75	Springs would not provide water for recreation or construction activities.
*Livestock Pipeline; see also in-stream limitations below	6,000 feet	--	1,500	Limited to 50 feet across per channel.
*Pipelines Located In-Stream or in the Riparian Zone	250 feet	100 square feet	15	Included in the totals listed above.
Underground Outlet	100 feet	0.1 acre	100	Pipelines and underground outlets installed in a stream would not include grouted rock, headwalls, or similar features. All outlets would have animal guards that allow passage of debris while blocking entry of animals large enough to restrict the flow in the conduit.
Watering Facility	N/A	N/A	N/A	Troughs would be constructed with wildlife ramps.
Pumping Plant	N/A	N/A	N/A	Maximum pump size is 3 horsepower; maximum pump rate is 10 gallons per minute.

Pond Restoration (378[R])

The Pond Restoration practice is limited to restoration and maintenance of existing water impoundment structures (table D-7). No new in-stream ponds or restoration activities that would involve an increase in the original area or storage capacity of a pond are authorized.

The purpose of this practice is to improve water availability for livestock, as well as available water and habitat for fish and wildlife, and to maintain or improve water quality. It would be used to repair emergency spillways, provide alternative pipe outlets for water flow, and remove built-up silt to restore the pond's original storage capacity. Material excavated from the pond would be securely compacted onto the pond berm or placed in an upland area where it would not be washed back into the pond or into an adjacent waterway by rainfall, or it would be legally disposed of off-site. Placement in wetlands would be prohibited. Timing of pond maintenance and restoration activities should be late summer, when water levels are lowest, or when the pond is dry.

TABLE D-7: SIZE LIMITATIONS PER PROJECT FOR AQUATIC HABITAT IMPROVEMENT

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Pond Restoration	Up to 300 feet of spillway	1 acre	N/A	▪ No new or enlarged ponds are allowed. ▪ No more than 3,000 cubic yards of fill removed from pond under any single project ▪ Timing of pond maintenance and restoration activities should be late summer, when water levels are lowest, or when the pond is dry

Vegetation Management

Upland and Riparian Vegetation Management and Planting

The upland and riparian vegetation management and planting activities include the following practices: Critical Area Planting, Range Planting, Riparian Herbaceous Cover, Riparian Forest Buffer, Windbreak and Shelterbelt Establishment, and Tree and Shrub Establishment. The purposes of vegetation management and plantings are to:

- restore, enhance, or create desired plant communities and fish and wildlife habitats
- protect soils, control erosion, reduce sediment, and improve water quality
- improve accessibility, quantity, and quality of forage and browse for livestock and wildlife
- improve air quality
- sequester carbon

The practices support establishment of adapted perennial or self-sustaining vegetation, such as grasses, forbs, legumes, shrubs, and trees using species approved by NPS. Herbicides and other biological treatments (e.g., grazing) may be used to control or eliminate invasive, noxious, or toxic infestations. NPS IPM regulations and mitigation measures would be followed when herbicides are used. Biological treatment plans for upland and riparian vegetation management would provide references for containment and management or control of target species; kind of grazing animals to be used; timing, frequency, duration, and intensity of grazing or browsing; desired degree of grazing or browsing use for effective control of target species; maximum allowable degree of use on desirable nontarget species; and precautions or requirements associated with the selected treatments. Vegetation management activities may include minor grading or digging to remove roots and prepare the area for planting.

Critical Area Planting (342). Critical area planting is the establishment of permanent vegetation on sites that have, or are expected to have, high wind or water erosion rates, and that have physical, chemical, or biological conditions that prevent the establishment of vegetation with normal seeding/planting methods. The practice may be used to stabilize stream and channel banks and pond and other shorelines. Permanent vegetation may include trees, shrubs, vines, grasses, forbs, or legumes depending on the site characteristics and management objectives. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources. It can be used to replant areas where invasive vegetation has been removed or as an ancillary to stream restoration activities. Native plants characteristic of the local habitat type would be used when implementing and maintaining this practice in the Range subzone.

Range Planting (550). The Range Planting practice involves the establishment of adapted vegetation on grazing land. The practice applies to rangeland, native or naturalized pastures, grazed forest, or other suitable areas where the principal method of vegetation management is grazing. Range planting is commonly used where existing stands of vegetation are inadequate for natural reseeding to occur and can be used to increase carbon sequestration. Plantings commonly include grasses, forbs, legumes, shrubs, and trees that are selected based on site-specific characteristics, erosion control and water quality improvement goals, wildlife values, carbon sequestration goals, and other management objectives such as restoration of a plant community similar to the Ecological Site Description reference state for the site or the desired plant community, or to provide or improve forage for livestock. Seeded species would be approved by NPS. Successful establishment of seeded species may require rest from grazing. Other practices, such as Herbaceous Weed Control, may be used to ensure successful planting.

Riparian Herbaceous Cover (390). Riparian herbaceous cover involves establishment and maintenance of grasses, grass-like plants, and forbs that are tolerant of intermittent flooding or saturated soils and that are established or managed in the transitional zone between terrestrial and aquatic habitats. This practice would be used on lands along watercourses or at the boundary of waterbodies or wetlands where the natural or desired plant community is dominated by herbaceous vegetation; the ecosystem has been disturbed, and the natural plant community is missing, changed, or has been converted to high maintenance vegetation; or invasive species dominate. The purposes of this practice include provision of food and shelter; shading of aquatic substrate; access to adjacent habitats and pathways for movement by resident and nonresident aquatic, semiaquatic, and terrestrial organisms; improvement and protection of water quality; stabilization of streambanks and shorelines; and increased net carbon storage in the biomass and soil.

Plant selection would focus on native perennial plants that are adapted to site and hydrologic conditions and provide the structural and functional diversity preferred by fish and wildlife likely to benefit from the installation of the practice. In areas where native seeds and propagules are present, passive regeneration may be used in lieu of planting; however, planting would be required if no native seed bank is present. Plantings would be protected until the desired plant community is well established; protection measures may include plant shelters, wire mesh, weed-free mulching around the plant base to inhibit grass and weed growth, or preventing wildlife or cattle from accessing newly planted areas through use of exclusionary fencing.

Riparian Forest Buffer (391). The establishment of riparian forest buffers serves to reduce sediment, nutrient, and other contaminant loading to streams and waterbodies and to improve wildlife habitat. This practice would be used to create shade to lower water temperatures, to provide a source of detritus and large woody debris for fish and other aquatic organisms, and to improve overall riparian habitat and travel corridors for wildlife. It would be applied on stable areas adjacent to waterbodies and consist of native vegetative plantings ultimately resulting in forest canopy and understory development. Riparian forest buffers would be planted with native species characteristic of the local habitat type. Planting layout would be designed in such a way as to minimize maintenance and the potential for flooding.

Windbreak and Shelterbelt Establishment (380). Windbreaks are documented as features within the historic landscape. Maintenance of historic windbreaks would be encouraged under this practice.

Consistent with the cultural landscape designation, alignment and species should be consistent with the historic condition.

Tree/Shrub Establishment (612). Tree/shrub establishment involves planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration for conservation benefits, which include establishing forest cover, enhancing wildlife habitat, controlling erosion, improving water quality, capturing and storing carbon, and conserving energy. Tree/shrub establishment can be applied on any site capable of growing woody plants. Species selection, site preparation, planting date and methodology, and tree spacing would vary depending on the planned purpose and site conditions. Planting of any nursery stock must be conducted consistent with park policies related to Phytophthora.

Size Limitations per Project for Upland and Riparian Vegetation Management and Planting—There are no size limitations on Upland and Riparian Vegetation Management and Planting. However, the following limitations on vegetation removal apply to all the activities:

- No more than 0.10 acre of native riparian trees, shrubs, or woody perennials may be removed from a stream area, and only if the area would be replanted with native vegetation.
- Where the area contains a mix of native and invasive species, no more than 0.25 acre of vegetation may be treated or removed from a streambank or stream channel, and only if the area would be replanted with native vegetation where appropriate.
- Outside riparian areas and other sensitive habitats, native vegetation may be removed only if replanting with native vegetation is completed at the site.
- Where the area is exclusively nonnative species, up to five acres of riparian vegetation may be removed and/or treated.

Mowing

Mowing involves the timely cutting, and in some cases removal of, herbaceous vegetation for forage, control of herbaceous weeds, and woody (nonherbaceous) plants including those that are invasive and noxious. The Mowing activity type may be used for Brush Management (314-A), Herbaceous Weed Treatment (315) (see Integrated Pest Management). Mowing would not occur during fire weather watches or Red Flag Warnings.

Brush Management, Mechanical (314-A). This practice involves the management or removal of woody (nonherbaceous or succulent) plants including those that are invasive and noxious. Brush management is used to control woody plants on a site where they exceed the desired or expected amount. Brush management would be designed to achieve the desired plant community based on species composition, structure, density, and canopy (or foliar) cover or height. Brush management would generally be considered in the pasture subzone and would require site specific analysis related to desired objectives. NPS may consider proposals for brush management in the Range subzone under limited circumstances. Any brush management would be conducted outside of bird nesting season. If authorization for brush management is granted, ranchers would be responsible for maintenance of desired conditions for the treated area on an annual basis.

Herbaceous Weed Treatment (315). The removal or control of herbaceous weeds including invasive, noxious and prohibited plants. The purpose of this practice is to enhance accessibility, quantity, and/or quality of forage and/or browse; restore or release native or create desired plant communities and wildlife habitats consistent with the site potential; protect soils and control erosion; reduce fine fuel loads and wildfire hazard; and control pervasive plant species to a desired level of treatment that would ultimately contribute to creation or maintenance of an ecological site description of *steady state*, addressing the need for forage, wildlife habitat, and/or water quality; and improve rangeland health. Herbaceous weed control would be applied in a manner to achieve the desired control of the target species and protection of desired species. This would be accomplished by mechanical methods, but could also be used with chemical, or biological methods either alone or in combination following Integrated Pest Management procedures.

Dependent on timing of removal, some weeds with forage value may be taken off site for consumption by cattle. Pending NPS approval, herbaceous weed treatment may be conducted by ranch operators within pasture, range and ranch core subzones as identified in the Ranch Operating Agreement. NPS and ranch operators may also consider actions to manage herbaceous weeds within the Resource Protection Zone as appropriate.

Integrated Pest Management (595)

A site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. IPM is a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage by cost-effective means while posing the least possible risk to people, resources, and the environment (NPS 2006). The purpose of IPM is to: prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses; prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses; prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact; and prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans. Pest issues would be reviewed on a case-by-case basis. IPM procedures would be used to determine when to implement pest management actions and which combination of strategies would be most effective for each pest situation. All pesticide use must be reported by NPS annually. The decision to incorporate a chemical, biological, or bioengineered pesticide into a management strategy would be based on a determination by a designated IPM specialist that it is necessary and other available options are either not acceptable or not feasible. Pesticide applications would only be performed by or under the supervision of certified or registered applicators licensed under the procedures of a federal or state certification system.

Prescribed Grazing (528)

Managing grazing and/or browsing animals with the intent to achieve specific management objectives. This practice would be conducted in coordination with NPS as a part of a conservation management system to achieve one or more of the following: improve or maintain desired species composition, structure, and/or vigor of plant communities; improve or maintain quantity and/or quality of forage for grazing and browsing animals' health and productivity; improve or maintain surface and/or subsurface water quality and/or quantity; improve or maintain riparian and/or watershed function; reduce soil erosion and maintain or improve soil health; improve or maintain the quantity, quality, or connectivity of food and/or cover available for wildlife; and manage fine fuel loads to achieve desired conditions.

Waterway Management

Stream Crossing (578)

The purpose of the Stream Crossing practice is to install a permanent stabilized area or structure across a perennial or intermittent watercourse to provide access for people, livestock, equipment, and vehicles and to protect water quality through reducing potential for delivery of sediment and other pollutants into the water during use of the crossing (table D-8). Stream crossings include stabilized areas, such as fords, wet crossings, and structures (e.g., bridges and culverts). Bridges authorized under this activity would fully span the watercourse from top-of-bank to 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 would be used often, as in a dairy operation, a bridge or culvert would often be required. Implementation of stream crossings may require grading and use of mechanized equipment.

Stream crossings would be designed to account for site conditions and accommodate sediment transport and passage of large woody materials. Proposed sites would first be evaluated to determine whether a crossing is necessary, or if other activities or management strategies can be used in lieu of the crossing.

For crossings where installation of a structure (e.g., bridge or culvert) is determined to be necessary, the site would be evaluated to determine potential flood stages and discharge, hydraulics, fluvial geomorphic conditions, sediment transport and flow continuity, and movement of woody and organic material. In addition, habitat requirements of aquatic and terrestrial species that may be affected by construction of the crossing would be assessed.

Waterway Stabilization

Waterway stabilization activities include two practices: Grade Stabilization Structure and Lined Waterway/Outlet, which are used to stabilize grade, prevent channel downcutting, reduce erosion and undermining of creek banks, avoid formation or advancement of gullies, and reduce sediment delivery to receiving waters. The practices can also be used to remediate sediment aggradation in channels that may be limiting aquatic passage and to install hydraulic alterations designed to maintain the water table. Implementation of waterway stabilization measures would generally require grading and use of heavy equipment.

TABLE D-8: PCP SIZE LIMITATIONS PER PROJECT FOR INDIVIDUAL STREAM CROSSINGS

Length	Disturbance Area	Soil Disturbance	Additional Criteria
150 feet (per structure)	1 acre	250 cubic yards	Crossings would be designed to require the minimum amount of dewatering, not to exceed 500 feet of channel unless regulatory standards allow more. Bridges would be designed and stamped by a licensed California engineer or a qualified NRCS engineer. Culverts that require permits shall be designed and stamped by a licensed engineer, geologist, or landscape architect or a qualified NRCS engineer. Stream crossings in a salmonid-bearing stream must be 1,500 meters (4,921 feet) apart. Crossings in a nonfish bearing stream must be at least 100 feet apart (NOAA Fisheries 2016).

An assessment of the erosion sites would be conducted in sufficient detail to identify the causes contributing to the instability (e.g., livestock access; watershed alterations resulting in significant modifications of discharge or sediment production; in-channel modifications such as gravel mining, headcutting, and water level fluctuations; increased runoff due to development in the watershed; or degradation due to channel modifications). Waterway stabilization measures would be designed to avoid creation of unstable conditions upstream or downstream. Design considerations would include an evaluation of the effects of work on existing channel morphology, hydrology, and structures (e.g., culverts, bridges, buried cables, pipelines, and irrigation flumes); current and future sediment transport; and upstream improvements or structural measures.

To protect water quality and the integrity of the structure, an energy dissipater would be provided at the outlet of any grade stabilization structure or lined waterway in areas where concentrated drainage may cause erosion and sedimentation. Otherwise, outlets would be directed to well-vegetated locations. Toe erosion would be stabilized by treatments that redirect the stream flow away from the toe or by structural treatments that armor the toe. Where toe protection alone is inadequate to stabilize the bank, the upper bank would be shaped to a stable slope and vegetated or would be stabilized with structural or soil-bioengineering treatments. Geotextiles or properly designed filter bedding would be incorporated with structural measures in locations where materials could migrate from behind the stabilization structure.

This activity is intended to promote biotechnical approaches; hard structural solutions would be recommended only in unusual circumstances and would require justification in order to secure approval. Grade stabilization and stream channel stabilization structures that involve riprap, rock, or other structural components used to prevent localized stream erosion, sediment transport, or movement may be used when biotechnical approaches are not feasible or effective. However, use of rock to facilitate natural stream processes and dynamics with the purpose of achieving stream equilibrium between erosional and depositional processes is acceptable. This activity is intended to utilize in-stream structures made of natural materials such as boulders and logs to provide channel stability; no gabions, grouted rock, or concrete would be used in any waterway, and use of chemically treated timbers is prohibited.

Grade Stabilization Structure (410)

A grade stabilization structure is used to control grade or stabilize a slope or downcutting channel, manage gully erosion, and eliminate erosional headcutting and formation or advancement of gullies (table D-9). This practice refers to vegetation, erosion-control fabric, rock, or timber structures that do not impound water but rather allow water to be conveyed in a stable manner that results in reduced erosion and improved downstream water quality. Installation would involve grading and bioengineering techniques for placement of rock or geotextile fabric and revegetation to stabilize the eroding area or prevent headcuts from moving further upslope. Design considerations would include water quantity and quality, as well as the visual quality of downstream water resources.

Lined Waterway/Outlet (468)

A lined waterway or outlet has an erosion-resistant lining of rock, erosion control/reinforcement fabric, or other permanent material designed to convey runoff without causing erosion or flooding (table D-9). This practice is used to provide safe conveyance from diversions, terraces, or other concentrated water sources on sites where it is not practical to establish or maintain a grass-covered waterway; it is not used for irrigation water conveyance or in a natural watercourse. Lined waterways would be used in areas where:

- concentrated runoff, steep grades, wetness, seepage, or piping are causing erosion
- soils are highly erosive or other conditions are present that preclude use of vegetation only to prevent erosion
- limited space is available, and a lining is required to address higher velocities

TABLE D-9: SIZE LIMITATIONS PER PROJECT FOR WATERWAY STABILIZATION

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Grade Stabilization Structure	1,000 feet	1.5 acres	1,000 cubic yards	No more than 350 cubic yards of fill per rock structure. This practice would be sized to match the dimensions of the channel or gully and would be neither larger nor smaller than required to achieve stability.

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Lined Waterway / Outlet	500 feet	2 acres	2,000 cubic yards	No longer than 500 feet per project. If used, concrete must cure for a minimum of 30 days or be coated with an agency-approved sealant until it is dry before being allowed to interface water.

Other Activities (Applicable only on Ranches Where Currently Authorized)

Manure Management

Manure management activities are intended to protect water and air quality while improving soil conditions for forage production. These practices apply specifically to dairies as they must manage the waste generated from operations. Actions include installing composting pads and manure/liquid separators; using techniques that reduce greenhouse gas emissions, such as conversion from dairy flush to scrape systems; and properly transferring liquid manure to avoid affecting environmentally sensitive areas. Manure management activities include the following practices: Nutrient Management, Composting Facility, Waste Treatment, Waste Separation Facility, Waste Transfer, and Waste Storage Facility. Manure management activities are subject to regulation by the Regional Water Quality Control Board's Waiver of Waste Discharge Requirements.

Nutrient Management (590). Nutrient management involves development of a plan to manage the amount (rate), source, placement (method of applications), and timing of plant nutrients and soil amendments to all lands where plant nutrients and soil amendments are applied. The purpose of nutrient management is to minimize nonpoint-source pollution to surface and groundwater, to properly use compost as a soil amendment, to protect air quality, and to maintain or improve soil and crop conditions. The type, amount, and timing of nutrients and soil amendments would be based on soil testing, planned crop yield, growing season of target plants, and carbon sequestration goals and potentials.

Nutrient management activities would include a budget for nitrogen and, if needed, for phosphorus and potassium, that considers all potential sources of nutrients, including, but not limited to, green manures, legumes, crop residues, compost, animal manure, organic by-products, organic matter, soil biological activity, and irrigation water. Compost application rates would be consistent with established agronomic practice and applicable water quality regulations. On organic operations, the nutrient sources and management must be consistent with the USDA, National Organic Program. Nutrient management plans are also required for dairy operations as a condition of the Regional Water Quality Control Board's Waiver of Waste Discharge Requirements.

Composting Facility (317). A composting facility is a structure to contain and facilitate controlled aerobic decomposition of manure or other organic materials into biologically stable organic matter that is suitable for beneficial reuse. It is designed to produce a soil amendment that adds organic matter and beneficial organisms to the soil, provides slow-release plant-available nutrients, reduces greenhouse gas emissions from waste material decomposition, and improves soil condition. Composting can be used to reduce water pollution potential and improve handling characteristics of organic waste materials, to repurpose organic waste into animal bedding, and to suppress potential plant and animal pathogens. Consideration for such infrastructure would be limited to the Ranch Core subzone and would require additional evaluation if the structure consisted of more than a concrete pad (e.g., walls and roof) for managing compost.

The structure of a composting facility is typically a concrete pad with concrete or wood walls. It may also include a roof and a drain to outlet leachate into a vegetated swale, or otherwise stable area. Design considerations would include landscape features to buffer prevailing winds, minimize odor transport, and protect visual resources; equipment access; and a determination if a heavy use area apron is needed to properly manage the compost.

Waste Treatment (629). Waste treatment involves the mechanical or biological treatment of agricultural waste. The waste treatment practice is used to:

- improve ground and surface water quality by reducing the nutrient content, organic strength, and pathogen levels of agricultural waste
- improve air quality by reducing odors and gaseous emissions
- produce value-added by-products
- facilitate desirable waste handling, storage, or land application alternatives

This practice applies where a new technology can be used to manage the form and characteristics of agricultural waste to prevent it from becoming a nuisance or hazard, or where changing the form or composition provides additional use alternatives. This practice would be part of an agricultural waste management plan.

Waste Separation Facility (632). A solid/liquid waste separation facility is a filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from a liquid waste stream. This practice applies where solid/liquid separation would:

- remove solids from the liquid waste stream and allow further treatment processes to be applied to the separated materials
- reduce problems associated with solids accumulation in liquid storage facilities
- reduce solids in stored liquids so liquids can be recycled for other uses
- assist with partitioning nutrients in the waste stream to improve nutrient management

The type of solid/liquid separation facility that is selected would depend on the separation efficiency needed, the available space, and the planned use of the separated material. Consideration for such infrastructure would be limited to the Ranch Core subzone.

Waste Transfer (634). Waste transfer is a system of structures, pipes, or conduits installed to convey wastes or waste byproducts from the agricultural production site to storage, treatment, or application; it may involve one to several practices, such as various types of structures, pipelines, and pumps. The purpose of the practice is to transfer animal waste, bedding material, spilled feed, wastewater, and other residues associated with animal production to a storage/treatment facility or to agricultural land for application. Generated material is conveyed from the source to a storage/treatment facility or a loading area and from storage/treatment to an area for use.

The system design would include items necessary for the safety of humans and animals, including fencing, ventilation, and warning signs. The design would also include measures to prevent tractors or other equipment from slipping into waste collection, storage, or treatment facilities. This practice is only one component of a manure management system.

Waste Storage Facility (313). A waste storage facility is an impoundment or containment made by constructing an embankment, by excavating a pit or dugout, or by fabricating a structure. The waste storage facility provides temporary storage of manure, agricultural by-products, wastewater, or contaminated runoff and allows agricultural operation management flexibility for waste use. Storage structure types include liquid waste storage ponds or tanks and solid waste stacking structures.

Facility planning would incorporate environmental concerns, economics, the overall waste management system plan, and safety and health factors. The design of waste storage structures would depend on the intended storage period; the site location; federal, state, and local laws and regulations; waste type and production rate; equipment limitations; and safety concerns (table D-10).

Forage Production, including Silage, Haylage, and Hay

Forage production involves the timely cutting and removal of forages from fields as hay, haylage, green-chop or silage. This activity is authorized only in specific areas of Point Reyes with an NPS- or NRCS-approved plan. The purpose of silage is to optimize yield and quality of forage for livestock and promote vigorous plant re-growth. The activity involves establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production while limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year-round. The promotion of desired plant species growth is often conducted in conjunction with the Nutrient Management practice.

All permits that allow silage or row crops would be required to obtain a conservation plan from NRCS or NPS. These plans would identify requirements such as silage crop residue cover, cut stubble height, row spacing, disc passes, disc depth, and the number of animal days grazed.

TABLE D-10: SIZE LIMITATIONS PER PROJECT FOR MANURE MANAGEMENT

Item	Length	Disturbance Area	Soil Disturbance	Volume	Additional Criteria
Composting Facility	N/A	N/A	N/A	25,000 cubic yards	Required setback of 100 feet from nearest surface waterbody or the nearest water supply well. A lesser setback may be allowed by the San Francisco Bay Regional Water Quality Control Board if NPS can demonstrate that the groundwater, geologic, topographic, and well construction conditions at the site are adequate to protect water quality (SWRCB 2015).
Waste Treatment	N/A	N/A	N/A	N/A	Same as composting facility

Item	Length	Disturbance Area	Soil Disturbance	Volume	Additional Criteria
Waste Separation Facility	N/A	N/A	N/A	N/A	Required setback of 100 feet from any down gradient surface waters, open tile line intake structures, sinkholes, agricultural or domestic well heads, or other conduits to surface water, unless a 35-foot wide vegetated buffer or physical barrier is substituted for the 100-foot setback or alternative conservation practices or field-specific conditions would provide pollutant reductions equivalent or better than the reductions achieved by the 100-foot setback (San Francisco RWQCB 2016).
Waste Transfer	N/A	N/A	N/A	N/A	Same as composting facility
Waste Storage Facility	N/A	N/A	N/A	N/A	Same as composting facility

Forage and Biomass Planting (512)

This practice involves establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, silage, haylage, or hay production to improve or maintain livestock nutrition and/or health, provide or increase forage supply during periods of low forage production, reduce soil erosion, or improve soil and water quality. Planted species would be approved by NPS and not contain species considered noxious or weeds. Planting would occur in the fall using a no-till seed drill, which may be conducted in combination with nutrient management under a plan certified by NPS or NRCS. The seeding/planting component of the required plan would address the following elements: site/seedbed preparation, nutrient management (if applicable), methods of seeding/planting, timing of seeding/planting, selection of species, seed/plant source, seed analysis, and rate of seeding/planting.

Forage Harvest Management (511)

This practice involves the timely cutting and removal of forages from the field as hay, green-chop, or ensilage. Forage would be harvested based on stage of maturity, moisture content, length of cut, stubble height, harvest interval to achieve optimal use (i.e., silage, haylage, hay), plant community, and stand life. Approaches to minimize harvest impacts on wildlife should be considered when using this practice (e.g., harvest timing, cutting procedures, and cover patterns). Storage of harvested forage would use associated runoff management system and/or waste storage facility practice standards to avoid seepage. The harvest management component of the required NRCS or NPS certified plan would address the following elements: goals, objectives, and specific purpose, method of harvest, stage of maturity, optimal harvest moisture content, length of cut, stubble height to be left, harvest interval, and contaminant avoidance recommendations.

Residue and Tillage Management/ No-Till (329)

This practice limits soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface to reduce sheet, rill and wind erosion, reduce tillage-induced particulate emissions, maintain or increase soil health and organic matter content, increase plant-available moisture, and reduce energy use. Soil disturbance is limited to the methods of planting/seeding under the forage and biomass planting practice. Residues would be distributed evenly over the entire field and maintain a minimum of 60% residue cover on the soil surface throughout the year. Approaches to minimize harvest impacts to wildlife should be considered (e.g., leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover for one or more years). Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10% of the field may be tilled for this purpose.

TABLE D-11: MITIGATION MEASURES

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Ensure use of heavy machinery is performed by experienced operators and ensure heavy machinery: ▪ avoids steep slopes (20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ is kept at least 10 feet from any cliffs or steep banks ▪ is only allowed based on daily fire danger rating ▪ avoids woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ is cleaned before arrival at the park; upon arrival; is inspected to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; is removed from NPS property if deficient and properly clean it at the expense of the contractor before returning to NPS property; and is cleaned before moving between sites and before storing to control the spread of plant diseases, insects, and weeds ▪ avoids significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoids waterbodies and riparian zones ▪ avoids lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	All	Soils Vegetation Wildlife	All	University of California 2006 NPS Pitt, Burgy, and Heady 1978
Prepare and implement a spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas	All	Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) NPS

Mitigation Measure	Activity Types	Resources	Subzone	Reference
▪ prohibit petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life from passing into, or being placed where it can pass into the waters of the state ▪ require operators to have emergency spill clean-up gear (spill containment and absorption materials) and fire equipment available on site at all times ▪ use or store petroleum-powered equipment in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: – ensure that all vehicles and equipment on the site do not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel – perform fueling outside the riparian corridor ▪ If needed, design a contained area located at least 100 feet from a watercourse for equipment storage, short-term maintenance, and refueling; if possible, prohibit these activities from taking place on the project site ▪ immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence ▪ ensure that all spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries are collected, stored, and recycled as hazardous waste off site ▪ ensue that dry cleanup methods (i.e., absorbent materials, and/or rags) are available on site ▪ inspect vehicles each day for leaks and repair immediately ▪ conduct major vehicle maintenance and washing off site				

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Restrict vehicles and equipment to one principal access route, preferably one that has been used for past activities Stage all vehicles and equipment on roads, in specified staging areas, or on existing disturbed ranch operation sites	All	Air Soils Vegetation Visitor Use and Experience Water Wildlife	All	Marin PCP 2018 (BIO-3, Protect Wetlands) NPS
If access through a wetland is necessary, determine the timing of access to minimize disturbance (typically later summer is the dry time) Use low ground pressure, rubber-tired equipment	All	Vegetation Water	All	Marin PCP 2018 (BIO-3, Protect Wetlands)
Ensure erosion control and sediment detention measures are available on site at all times and are in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway When requested by project regulators, inspect (NPS staff or a qualified designee) in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly	All	Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits If rain occurs while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind Install silt fencing or wattles on contour around all stockpile locations	All	Air Water	Pasture and Ranch Core	Marin PCP 2018 (HYD-2, Protect Water Quality, Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Permanent fill of wetlands is not authorized without consultation and issuance of regulatory permits from the US Army Corps of Engineers and/or Regional Water Quality Control Board.	All	Vegetation Water	All	Marin PCP 2018 (BIO-3, Protect Wetlands)
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities during the dry season, generally June 1 through October 31; exceptions may be made in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species Note that (1) work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by project regulators	All	Soils Water Vegetation Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)
Perform work in and around areas that may support bird nesting before March 15 or after July 31	All	Wildlife (Birds)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Conduct preconstruction breeding bird surveys for projects with construction activities occurring from March 15 through July 31 for special-status birds, migratory birds, and raptors (surveys for raptors would be required for work beginning as early as February 1) Conduct these preconstruction surveys in all locations identified by a qualified biologist. Conduct the surveys within two weeks prior to initiation of vegetation clearing, tree removal and trimming, or other construction activities Note that the results of surveys would be reviewed by NPS prior to any work authorization. If nests are identified by the biologist, NPS would work with the rancher to identify appropriate avoidance measures and buffers. Determinations of the appropriate measures would be based on the nesting species, sensitivity, listing status. If the biologist finds no active nesting or breeding activity, NPS may authorize work to begin	All	Wildlife (Birds)	All	Marin PCP 2018 (BIO-1j, Protect Nesting Birds during Construction)
Ensure that the following protection measures for American badgers are implemented for activities: ▪ for all projects requiring disturbance to open grasslands or low-growing vegetation habitats, conduct a preconstruction survey for the American badger prior to beginning work ▪ if any badgers are documented in the project area or within 500 feet of it, establish and maintain buffer zones until the badgers have vacated the area ▪ do not begin working in the buffer zone until the area is cleared by the project biologist ▪ develop, in consultation with NPS, and implement additional protection measures, which may include larger buffer zones or relocations, as required	All	Wildlife (American Badger)	All	Marin PCP 2018 (BIO-1n, Protect American Badger)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter Ensure that exclusion fencing is highly visible and its installation is overseen by the project biologist Restrict openings to areas of construction site access Note that the purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats	All	Wildlife	All	Marin PCP 2018 (BIO-1c Avoid Listed Special-status Wildlife Species)
Design projects in potential CRLF habitat to minimize disturbance to vegetation near or in permanent and seasonal pools of streams, marshes, ponds, or shorelines with extensive emergent or weedy vegetation	All	Wildlife (CRLF)	All	Marin PCP 2018 (BIO-1g, Protect California Red-legged Frog)
If a project site occurs in potential CRLF habitat, conduct (project biologist) a preconstruction survey of potential CRLF habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for the CRLF no more than 48 hours before the start of construction activities Look (project biologist) for individual frogs, evaluate the likelihood of usage, and determine whether additional biological monitoring is needed during construction to ensure that individuals present are be removed or avoided	All	Wildlife (CRLF)	All	Marin PCP 2018 (BIO-1g, Protect California Red-legged Frog)
Monitor (project biologist) initial ground-disturbing activities within 300 feet of CRLF habitat and halt work activities that may adversely affect the CRLF until it no longer occupies the project area Note that relocation of CRLF can performed only by individuals, who are approved in advance by CDFW and USFWS	All	Wildlife (CRLF)	All	Marin PCP 2018 (BIO-1g, Protect California Red-legged Frog)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
If suitable CRLF breeding habitat is present, only conduct project activities between July 1 and October 15 to avoid impacts on breeding CRLF or egg masses	All	Wildlife (CRLF)	All	Marin PCP 2018 (BIO-1g, Protect California Red-legged Frog)
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until July 1 and complete work by October 15 Note that (1) work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from project regulators	All	Wildlife (CA freshwater shrimp, Salmonids)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)
Ensure reconnaissance-level surveys are performed by project biologist to determine whether suitable habitat for Myrtle's silverspot butterflies are present in the project area If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, ensure the project biologist performs a survey to determine presence or absence using widely accepted scientific protocols if suitable habitat for listed butterflies is present, make sure to: – conduct project work with minimum soil compaction and disturbance – wherever possible, conduct work with hand tools	All	Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)
Protect host plants for listed butterflies, including *Sedum spathulifolium* and *Viola adunca*, with a clearly demarcated 20-foot buffer zone	All	Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Closely monitor treated areas for pest plant invasion after construction, mechanical and burn treatments, aeration, and seeding Establish a monitoring plan to detect and eradicate any weeds including: ▪ employing an early detection, rapid response approach to any previously undetected aggressive weedy species observed, once the plant's species identification and non-native status have been confirmed ▪ following best available weed-specific technical guidance current at the time of implementation	All	Vegetation	All	
To the extent feasible, replace all plants disturbed project activities with a species palette similar to that of the removed vegetation or with species that are appropriate to the site conditions and are native to the project watershed Otherwise, obtain source plants from Marin County or southern Sonoma County; for plants from more distant sources, obtain NPS's preapproval Use native plant species with high wildlife and/or pollinator values to the extent feasible	All	Vegetation	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)
Complete revegetation as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain When timing does not coincide with suitable planting windows for permanent vegetation, use a temporary cover (e.g., weed-free mulch or weed-free straw) to protect soil until permanent vegetation can be established Use non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) in limited instances in conjunction with native species to provide fast-establishing, temporary cover for erosion control	All	Air Vegetation Water	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Soil amendments are typically not needed for establishment of native vegetation in intact native soils, so if soils have been disturbed and require additional organic matter or nutrients to support native plants, use limited organic, weed-free amendments to help establish restoration vegetation Organic fertilizers may be used only above the normal high water mark of any adjacent waterways, so if fertilizers are to be used around a listed plant, consult (project manager) with a qualified biologist or range scientists to establish a buffer zone Do not allow the use of chemical fertilizers	All	Air Vegetation Water	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)
If vegetation in habitats identified by a qualified biologist as sensitive or native riparian trees greater than 4 inches diameter at breast height are removed, replace with native species appropriate to the site Outside riparian areas and other sensitive habitats, if trees over 6 inches diameter at breast height are cut, replace with native species appropriate to the site	All	Vegetation	All	Marin PCP 2018 (BIO-2a, Compensate for Loss of Riparian Habitat and Other Sensitive Natural Communities)
Because native trees are susceptible to disturbance from grading and compaction, especially in the root crown area referred to as the Root Protection Zone (RPZ), avoid conducting work in the RPZ wherever possible and do not work in the RPZ when soils are wet Note that the RPZ is defined as 1.5 times the dripline radius measured from the tree trunk and extending approximately three feet below the soil surface Clearly demarcate the outer extent of the RPZ with exclusionary fencing to keep construction vehicles and activities away from tree roots	All	Vegetation	All	Marin PCP 2018 (BIO-2b, Avoid Work in or Compensate for Impacts on Native Tree Root Protection Zone)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
If work must occur in the RPZ, wrap all tree trunks up to 8 feet high or the height of the equipment working in the area Use protection materials that may include wood boards or heavy-duty rubber matting Install trench plates or heavy mulch when heavy equipment is working in the RPZ Cut all roots larger than 1 inch with a clean, sharp saw Prune no more than 20% of live foliage in one year.	All	Vegetation	All	Marin PCP 2018 (BIO-2b, Avoid Work in or Compensate for Impacts on Native Tree Root Protection Zone)
Remove no more than 0.10 acre of native riparian trees, shrubs, or woody perennials for a single project	All	Vegetation Water	All	Marin PCP 2018 (BMP VM-1 Project areal limitations on vegetation management)
Remove no more than 0.25 acre of vegetation from a streambank or stream channel where the area contains a mix of native and invasive species	All	Vegetation Water	All	Marin PCP 2018 (BMP VM-1 Project areal limitations on vegetation management)
Revegetate soil exposed during construction and soil above rock riprap using native seed casting In general, plant interstitial spaces between rocks riparian vegetation such as willows Use hydromulching (NO SEED INCLUDED) as a soil stabilization technique as allowed	All	Air Water	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)
Design culverts to minimize habitat fragmentation and barriers to aquatic movement Note that channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible	Road Upgrade and Decommissioning Stream Crossing Infrastructure Management Waterway Stabilization	Wildlife (Salmonids, Fish)	All	Marin PCP 2018 (BMP DC-3 Required design considerations for roads, culverts, and stream crossings to protect sensitive biological resources and water quality).

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Adhere to the *wildlife friendly* USDA, NRCS, specifications (382D) for fence construction, unless otherwise approved by NPS Minimize the number of internal wire strands to the extent practicable	Fencing	Wildlife	All	Karhu 2008; Paige 2012; Weigand 2008
Ensure livestock water supply activities include: ▪ using buried pipelines to minimize ground disturbance ▪ installing buried pipe at minimum sufficient depth (typically 18" or less) below the ground surface to provide protection from hazards imposed by traffic loads, farming operations, freezing temperatures, or soil cracking, as applicable ▪ using pipelines of sufficient strength to withstand all external loads on the pipe for the given installation conditions. ▪ if the action includes installing a trench, placing the top 6 inches of excavated soil to one side and the remaining soil to the other side of the trench; when refilling the trench, placing the top 6 inches of soil back on top of the final fill to retain the existing native seed bank and to return the surface to existing condition and grade ▪ keeping trench width to the minimum necessary to allow for pipeline installation ▪ equipping the pipe leading from the spring to a tank or trough with a valve or overflow to allow water to return to the spring when the tank or trough is full ▪ conducting work during driest time of the year (August to first fall rains) ▪ placing any material excavated from springs or ponds during development on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less ▪ conducting spring maintenance activities with hand tools whenever possible	Livestock Water Supply		All	NPS

Mitigation Measure	Activity Types	Resources	Subzone	Reference
For pond restoration activities: ▪ ensure that maintenance activities are conducted either when a pond has dried out completely, or during the driest period of the year in September or October (late August is an option if necessary, but not preferred) ▪ ensure that no mowing occurs around ponds unless pre-approved by NPS ▪ avoid excavation below original pond depth ▪ provide sloping or benched sides with shallow areas and keeping deep areas at least a yard deep ▪ use spoils from the ponds to buttress the berm; otherwise, place excess soils in an NPS-identified area for stockpiling or spreading ▪ place excavated material on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less ▪ install a staff gage in the pond before construction begins to monitor water level ▪ if the pond has existing emergent vegetation, maintain 10% to 35% cover	Pond Restoration	Soils Water Wildlife (CRLF)	All	NPS
Unless otherwise stated on the Practice Requirement sheet or seeding plan, ensure the timing of seeding is in the fall before October 15 Only use local (collected in Marin County) genotypes of native species seed certified to be free of noxious weed seeds or with species on the park's approved seed species list (based on information provided by the USDA, NRCS Plant Materials Program, unless otherwise approved by NPS Adjust seeding rates for soil textural differences and the pure live seed rating Only conduct seeding using no-till drill or broadcast methods and using only broadcast methods on sites with a high risk of soil erosion	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	Air Soils Vegetation	Pasture	NPS 1990 DEFRA 2009 USDA-NRCS 2010 University of California 2006

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Inspect seeding area the year prior to seeding to identify potential weed problems and to control weeds during planting and throughout the first growing season	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	Vegetation	Pasture	University of California 2006
Restrict or reduce grazing in the two years of establishment at least until the seedlings have completed their growth for the first growing season	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	Vegetation	Resource Protection	USDA-NRCS 2003
Select seed species and their cultivars based on: ▪ climatic conditions, such as annual precipitation, distribution, growing season length, tolerance of temperature extremes, and the USDA, NRCS, plant hardiness zone ▪ soil condition and landscape position attributes, such as pH, available water holding capacity, aspect, slope, drainage class, fertility level, salinity, depth, flooding and ponding, and levels of phytotoxic elements that may be present	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	Vegetation	All	USDA-NRCS 2010
With the exception of silage harvest and management of certain weed species as approved by NPS, time mowing to minimize resource impacts: ▪ August 1–October 15 (or first autumn rains, whichever comes first) is preferred to avoid impacts to ground nesting birds and California red-legged frog (CRLF) ▪ March 15–July 31 (bird nesting season) is limited to removal of vegetation less than 8 inches in height or can take place only if bird nesting surveys are completed	Mowing Forage Production, including Silage, Haylage and Hay	Vegetation Wildlife (Birds, CRLF)	All	USDA-NRCS 2003

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Do not mow in the Range subzone without prior NPS approval Do not cut down trees in the mowing area Do not mow in wetlands and maintain a 35-foot buffer between wetlands and mowed areas, leaving in place scattered islands of brush to service as a corridor for wildlife species that inhabit brushy habitat NPS staff will monitor to ensure mowing does not exceed the agreed-upon area	Mowing Forage Production, including Silage, Haylage and Hay	Vegetation Water	Range	NPS
As appropriate, attach flushing bars to the mower to help to flush birds and mammals (especially deer and rabbit) before the mower reaches them and mow from the middle to the outside to minimize impacts	Mowing Forage Production, including Silage, Haylage and Hay	Wildlife (Birds and Mammals)	Pasture	Green n.d.; Hyde and Cambell 2012; Ochterski 2006; USDA-NRCS 2009
Use rotational mowing practices (i.e., early, late, or rested), which can maintain grassland communities in various stages of growth and vegetative diversity, thus potentially providing more nesting habitat for grassland birds Do not mow at night due to the risk of higher wildlife mortality	Mowing Forage Production, including Silage, Haylage and Hay	Wildlife (Birds)	Pasture	Hyde and Cambell 2012; USDA-NRCS 2009; Ochterski 2006
For shrub management, generally apply one or more initial treatments to remove existing shrubs, followed by periodic or ongoing management to prevent subsequent re-establishment, as defined in the ROA Apply follow-up spot treatment methods when woody vegetation is recovering or small and is the most vulnerable to treatment	Integrated Pest Management Mowing Upland and Riparian Vegetation Management and Planting	Vegetation	Pasture and Range upon site specific approval	
Limit shrub management efforts to areas previously occupied by grassland, as shown by historical photographs, or to soil types appropriate to support grassland, according to the USDA, NRCS, soil survey and associated ecological site descriptions	Mowing Upland and Riparian Vegetation Management and Planting	Vegetation	Pasture, Range upon site specific approval	

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Limit shrub treatment areas to those identified by NPS biologists as acceptable based on: ▪ the absence of endangered species and significant wildlife and plant communities, including areas with high concentrations of nesting birds ▪ appropriate ratio and spatial arrangement of grassland and woody vegetation at the site and landscape scale to provide food, shelter, and cover to shrub-dependent wildlife and appropriate structure for wildlife that benefit from edge habitat or structural diversity ▪ appropriate size and shape of treated acreage and of any shrubland acreage left untreated ▪ desired age or successional status of remaining shrubland	Mowing Upland and Riparian Vegetation Management and Planting	Vegetation (T&E) Wildlife (T&E)	Range upon site specific approval	
Use operational techniques to prevent livestock predation before it starts and to minimize livestock predation when it does occur by taking into account the surrounding environment, including the native wildlife within it. Husbandry practices include the following: ▪ keep recently castrated/branded/docked animals in an area close to the ranch core for a time to allow healing before putting them out to pasture/rangeland because wounds create odors that attract wildlife ▪ where possible, remove all wastes such as afterbirths and stillborn animals that attract wildlife including ravens ▪ confine young livestock (e.g., calves, lambs, and kids) for approximately two weeks following birth ▪ feed livestock in a manner that discourages or precludes raven access to feed (e.g., use covered feed bunks) ▪ control access to carcasses, grain, and ranch-related and household trash/waste to reduce attracting wildlife, including ravens ▪ promptly remove dead livestock from the park	Integrated Pest Management	Wildlife	Pasture and Ranch Core	ATTRA 2002; BCAC 2011a, 2011b; Boarman et al. 2004; Roth et al. 1999

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Structural measures include the following: ▪ build wildlife-proof structures for poultry using strong wire metal mesh that is firmly secured ▪ enclose poultry in night houses or shelters for species on pasture Electric fencing includes the following: ▪ in smaller areas only, where animals are penned within the Ranch Core subzones, use multiple strands (7 to 9) of high-tensile, smooth wire with alternating charged and grounded wires (beginning with a charged wire on the bottom) ▪ place the bottom wire about 6 inches off the ground to help prevent wildlife from digging under the fence ▪ for best results, install fencing before the wildlife has established a pattern of movement Repellants and frightening devices are designed to discourage or reduce the attractiveness of specific areas to wildlife. They work best for short durations because wildlife can quickly become accustomed to them, and they are best used in combination with other techniques, such as: ▪ putting bells on livestock ▪ parking a vehicle in area of loss by predation, which may temporarily deter predators and is most effective if vehicle is moved often				

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Use the following grazing methods to control weeds to the degree feasible, especially as a follow-up method that minimizes the need for repeated mechanical or chemical applications: ▪ use targeted grazing to impact weedy species when they are vulnerable, using species-specific technical guidance available from sources such as NPS; University of California, Cooperative Extension and Weed Research and Information Center; USDA, NRCS; and DiTomaso et al. (2013) ▪ avoid heavy grazing of infested areas at stages of the weedy species' phenology when herbivory favors increased tillering ▪ encourage vigorous growth of desirable grass species in infested or recently treated areas by maintaining sufficient residual dry matter in fall and winter and by allowing thick grass growth throughout winter	Integrated Pest Management Forage Production, including Silage, Haylage and Hay Upland and Riparian Vegetation Management and Planting	Air Vegetation	All	NPS 1990 DiTomaso et al. 2013
Consider the use of multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment	Integrated Pest Management	Air Vegetation Water		DiTomaso and Johnson 2006 DiTomaso et al. 2013
NPS approval is required for the use of herbicides and application must follow NPS Integrated Pest Management Guidelines and operating procedures. Ensure herbicide storage, transport, mixing, loading, and use complies with state and federal regulations including the California Department of Pesticide Regulation, the Marin County Agriculture Commission's Weed Management Plan, manufacturer's labels and instructions, Safety Data Sheets, and any guidance from a registered Pest Control Advisor (PCA). Ensure application also follows the management practices	Integrated Pest Management	Air Health and Safety Visitor Use and Experience Vegetation Water Wildlife		Marin PCP 2018 (HAZ-1, Ensure Safe Use of Herbicides) Cal-IPC 2015

Mitigation Measure	Activity Types	Resources	Subzone	Reference
presented in Cal-IPC (2015; or future updates), including but not limited to: ▪ developing a safety and record-keeping plan that includes telephone numbers and addresses of emergency treatment centers and telephone number for the nearest poison control center prior to herbicide use. ▪ Maintaining use records for two years after herbicide application. ▪ applying the herbicide most effective and targeted to the specific weed or class of weed, at the time the plant is most vulnerable to treatment ▪ as feasible, combining the herbicide with pre- or post-treatment by other methods to increase effectiveness and minimize the amount of herbicide needed ▪ ensuring the application is performed or overseen by a state-certified applicator ▪ not applying herbicides when wind speed exceeds 10 miles per hour at plant height ▪ not applying herbicides within 24 hours of predicted rainfall or 24 hours after rainfall ▪ not applying herbicides under wet conditions due to dense fog ▪ adding a marker dye to herbicides so that workers can see excessive drift and help avoid non-target areas ▪ ensuring a spill kit ready and carrying soap and water in case of spills on skin or clothing ▪ avoiding broadcast treatments in buffer zones around sensitive habitat locations and features, such as nesting sites ▪ to the degree practicable, limiting the use of herbicides to spot spraying and follow-up treatment (i.e., of cut stumps to prevent regrowth)				

Mitigation Measure	Activity Types	Resources	Subzone	Reference
▪ limiting herbicide use to controlling established stands of noxious species or invasion of exotics into restoration plantings ▪ in riparian environments, using an herbicide without a surfactant that is registered for use in an aquatic environment and on target vegetation; not conducting broadcast spraying; and taking great care to avoid contact with native species ▪ minimizing spot treatment in and around sensitive habitats ▪ avoiding mixing and loading herbicides in sensitive habitats or near waterbodies or significant wildlife and plant communities ▪ applying any extensive treatments in phases so that wildlife can leave areas during treatment ▪ not applying herbicides when wind speed and direction could cause drift to sensitive habitat areas ▪ using herbicides that are approved for use in or near water if applying near surface waters and using herbicides that will not leach into groundwater or remain for long periods in the environment				
Ensure that any use of herbicides conforms to relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates. Consult with a PCA and/or NPS and: ▪ address measures to minimize the use of high-persistence herbicides and the potential for leaching to surface and groundwater, especially in soil types with high leaching potential ▪ for application of herbicides to uplands that may have CRLFs or other rare amphibians present, consider the use of herbicides specifically formulated and approved for use in water ▪ consider the use of pollinator-protective strategies as described in NOAA Fisheries (2014), especially when considering broadcast applications and applications when pollinator host plants are flowering.	Integrated Pest Management	Water Wildlife (CRLF, Fish, Amphibians, Invertebrates Myrtle's Silverspot Butterfly)		Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies) NOAA Fisheries 2014

Mitigation Measure	Activity Types	Resources	Subzone	Reference
▪ minimize the use herbicides or fertilizers in habitat that supports special-status butterflies and do not use herbicides in this habitat during Myrtle's silverspot butterfly flight season (June 15-early September)				
Ensure that in-stream crossings are not designed for placement within 300 feet of known spawning or breeding areas of listed species	Stream Crossing	Wildlife (T&E)	All	Marin PCP 2018 (BMP DC-3 Required design considerations for roads, culverts, and stream crossings to protect sensitive biological resources and water quality).
For pasture and crop fertilization, comply with Nutrient Management Plans and USDA, NRCS, guidelines for nutrient management, including but not limited to: ▪ Develop a nutrient budget that considers all sources of nutrients ▪ evaluate the risks of nitrogen and phosphorus transport using methods cited by USDA, NRCS ▪ conduct pertinent soil analyses to determine the appropriate (and maximum) level of nutrient addition, such as nutrient and pH levels and electrical conductivity, and ensure that the total nutrient loading does not exceed the amount needed to meet crop demand ▪ for cropland applications, maintain soil pH in a range that favors nutrient uptake by crops ▪ do not exceed the University of California guidelines (or industry practice when recognized by the university) for nitrogen, phosphorus, and potassium application rates and noting that lower rates are acceptable ▪ ensure application timing corresponds as closely as practicable with the timing of plant uptake by crops or pasture grasses	Nutrient Management	Air Soils Vegetation Water	Pasture	Marin PCP 2018 (BIO-1b) Sonoma County 2013 USDA-NRCS 2016 USDA-NRCS 2011 CBARCD 2003

Mitigation Measure	Activity Types	Resources	Subzone	Reference
▪ Apply solid or liquid waste discharges to land at rates that are reasonable for crop, soil, climate, special local situations, management system, and type of manure ▪ Apply manure and wastewater discharges to land during non-rainy or non-saturated conditions, ensuring that discharges do not result in runoff to surface waters and that discharges infiltrate completely within 72 hours after application ▪ do not spread compost, manure, or fertilizer when the top 2 inches of soil are saturated or when enough precipitation to cause runoff is forecast ▪ maintain sufficient setbacks (filter strips or otherwise well-vegetated areas) from drainages and waterbodies to prevent pollution and comply with state and federal water quality regulations; setback distance should be greater for steeper slopes, higher levels of nutrients applied, and lower levels of setback ground cover ▪ employ best practices (e.g., USDA-NRCS 2011) to minimize the risk of nutrient runoff in application of liquids, slurry and solids, such as adjusting the thickness of the applied layer of manure and compost relative to slope and setback distance to minimize the chance that material will be washed downhill to waterbodies				
Maintain records—regarding the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event—for at least five years Keep these records with the Nutrient Management Plan	Nutrient Management		Pasture	
Do not spread manure or compost when winds are in excess of 20 miles per hour	Nutrient Management	Air Soils Visitor Use and Experience Water	Pasture	

Mitigation Measure	Activity Types	Resources	Subzone	Reference
For liquid (irrigated) manure application: ▪ avoid saturating the soil ▪ check pipes, hoses, and other irrigation equipment daily for leaks	Nutrient Management	Air Soils Water	Pasture	NHDAMF 2011
When practical, compost manure before spreading to reduce the volume of material	Nutrient Management	Air Soils Water	Pasture	NHDAMF 2011
Generally store organic waste in well-ventilated areas, and take extra safety precautions if handling these materials when stored in ventilated containers	Nutrient Management	Health and Safety	Ranch Core	
As necessary, control excessive fly populations associated with manure storage, in consultation with NPS, using an Integrated Pest Management approach and avoiding wet areas around manure storage where flies may breed	Nutrient Management	Health and Safety Visitor Use and Experience	Ranch Core	NHDAMF 2011
Do not store or apply manure, manured bedding, compost, and process water within a 100-foot setback to any down-gradient surface water unless a 35-foot-wide vegetated buffer or physical barrier (i.e., a berm) is substituted for the 100-foot setback or an alternative conservation practice or field-specific condition is installed that provides pollutant reductions equivalent to or better than achieved by the 100-foot setback Place manure and contaminated bedding materials in contained storage or composting locations for later disposal or composting; ensure such locations have roofs, tarps, or other cover sufficient to keep rainfall out during the rainy season and two to four walls or sides sufficient to keep contents in place	Nutrient Management Diversification (Horse Boarding, Other Livestock)	Water	Ranch Core	Marin PCP 2018 (BIO-1b)

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Set back composting and waste separation facilities at least 100 feet from the nearest surface waterbody and/or the nearest water supply well Note that a lesser setback distance may be allowed by the Regional Water Board if it can be demonstrated that the groundwater, geologic, topographic, and well construction conditions at the site are adequate to protect water quality as described in the SWRCB Compost General Order, 2015 or as revised	Nutrient Management Diversification (Horse Boarding, Other Livestock)	Water	Ranch Core	Marin PCP 2018 (BIO-1b); Marin PCP 2018 (BMP DC-6 Setback from Water Supply Wells at Waste Storage Facilities)
For all permits that allow forage production or row crops, obtain a conservation plan from USDA, NRCS, or NPS which identifies requirements such as silage crop residue cover, cut stubble height, row spacing, disc passes, disc depth, and number of animal days grazed	Forage Production, including Silage, Haylage and Hay Row crops	Air Soils Vegetation Water		NPS 1990 USDA-NRCS 2013
Avoid tilling or if necessary and with prior NPS approval use shallow tillage operations (1 to 2 inches) or operations that do not invert the soil	Forage Production, including Silage, Haylage and Hay	Air Cultural Resources Soil Water	Pasture	USDA-NRCS 2007, 2013
Do not aerate soils, unless soil compaction is demonstrated, which can be predicted using USDA, NRCS, soil maps and measured using a soil cone penetrometer, when soils are saturated and ideally are at field capacity	Forage Production, including Silage, Haylage and Hay	Soils	Pasture	Wynne and Hancock 2008
Design a leachate collection system and install an impermeable cover to minimize the entry of clean rain water from the top of the cover into the leachate collection system Use a minimum cubic foot (7.48 gallons) of leachate storage capacity for each ton of material placed in storage if and when containment becomes necessary	Forage Production, including Silage, Haylage and Hay Nutrient Management	Air Water	Ranch Core	Kammel 1995

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Adhere to the following Livestock Diversification practices specific to the Pasture subzone (if applicable): ▪ avoid heavy or prolonged grazing by sheep and goats in pastures on areas with steep slopes or sparse vegetation ▪ use prescribed controlled grazing practices, such as pasture rotation, for goats and sheep in pastures ▪ locating watering facilities in pastures on areas that promote even grazing distribution by sheep and goats and reduce grazing pressure on sensitive areas ▪ locating watering facilities in pastures away from well heads and install wellhead protection (i.e., fencing) ▪ placing watering facilities, new feed rack, and salt and mineral feeders in pastures a minimum of 300 feet from any riparian or aquatic habitat ▪ regularly moving portable/moveable structures located in pastures for the production of fowl with to avoid or minimize contamination, disease occurrence, and overgrazing ▪ placing portable/moveable structures located in pastures for the production of fowl located within the Pasture subzone a minimum of 300 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September ▪ placing floorless broiler chicken huts located within the Pasture subzone a minimum of 150 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September	Diversification (Horse Boarding, Other Livestock)	Soils Vegetation Water Wildlife	Pasture	USDA-NRCS 2014a; USDA-NRCS 2014b; Casale n.d.; USFWS 2010
As appropriate and consistent with organic standards, vaccinate livestock and fowl if regional disease issues have been identified and administer vaccinations according to manufacturer recommendations	Diversification (Other Livestock)	Wildlife	All	

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Ensure the design, construction, and maintenance of enclosures, buildings, and equipment used for livestock diversification located in the Ranch Core subzone or Pasture zone should: ▪ allow for easy maintenance to allow for good hygiene and air quality ▪ provide shelter from predators and from adverse weather conditions ▪ limit the risk of disease, contamination, and injuries ▪ include the use of fire-resistant materials and properly installed electrical equipment and wiring	Diversification (Other Livestock) Infrastructure Management	Air Wildlife	Ranch Core	
Conduct daily inspections and quickly pick up livestock (i.e., sheep, goat, and hog) and fowl (i.e., chicken) carcasses and dispose of them outside the park Document disposal methods and instances using the USDA-approved methods and emergency action plans if necessary	Diversification (Other Livestock)	Health and Safety Visitor Use and Experience Wildlife	All	
Adhere to the following key points for use of all guard animals: ▪ post signs to alert the public of the presence of guard animals ▪ ensure health and safety by providing adequate food and water, routine vaccinations, de-worming, hoof trimming for donkeys and llamas (ATTRA 2002; BCAC 2011a, 2011b; CDFA n.d.)	Diversification (guard animals) Integrated Pest Management	Visitor Use and Experience Health and Safety Wildlife	Pasture and Ranch Core	ATTRA 2002; BCAC 2011a, 2011b; CDFA n.d.; Green and Woodruff 1999; Iowa State University 1994; MDC 1996; USDA-APHIS 2002; Van Bommel 2010;

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Adhere to the following key points for use of guard dogs (ATTRA 2002; BCAC 2011a, 2011b; CDFA n.d.; Green and Woodruff 1999; MDC 1996; Van Bommel 2010; USDA-APHIS 2002): ▪ select a suitable breed for guard dogs, such as the Maremma-Abbruzzi, Akbash, Kuvasz, Anatolian Shepherd, Great Pyrenees, or Kommondor and purchase from a reputable breeder ▪ properly train the dog to understand commands made by owner(s) ▪ rear singly, from 8 weeks of age, with the animals the dog is guarding and minimize human contact ▪ ensure some (limited) human contact to adequately socialize the dog and avoid aggressive behavior toward humans—10 minutes twice day for a puppy and once a day for an adult on pasture is typically enough contact ▪ monitor and correct any undesirable behavior ▪ do not feed any raw food Adhere to the following key points for use of llamas (ATTRA 2002; BCAC 2011b; CDFA n.d.; Iowa State University 1994; MDC 1996): ▪ use gelded adult male llamas, nonbreeding females, or females with young ▪ use only one llama per pasture ▪ monitor for aggressive behavior toward humans ▪ feed with the animals they are guarding Adhere to the following key points for use of donkeys (ATTRA 2002; BCAC 2011b; CDFA n.d.; MDC 1996) ▪ select donkeys from medium- to large-size stock ▪ use jennies and geldings (Jacks are usually too aggressive) ▪ feed with the animals they are guarding ▪ use only one donkey per pasture				

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Adhere to the Livestock Diversification practices specific to the Ranch Core subzone: ▪ place watering facilities, new feed rack, salt and mineral feeders, corrals, and feed storage facilities based on operational needs ▪ regularly clean and disinfect livestock and fowl housing, processing areas, and equipment as needed to reduce or prevent the spread of disease and pathogens by: – removing debris – cleaning surfaces – disinfecting surfaces	Diversification (Other Livestock)	Water	Ranch Core	USDA-NRCS 2014c Gourley 2014
Implement dust control measures, such as wetting down paddocks and riding arenas, especially on dry, windy days Consider using low-dust or no-dust footing materials to control dust while reducing water use	Diversification (horse boarding)	Air Soils	Ranch Core	
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season	Diversification (horse boarding and other livestock) Infrastructure Management	Soils Water		CBARCD 2001
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands Minimize the amount of: ▪ water used by using sponges or hoses equipped with shut-off or low-flow nozzles ▪ soap used, especially soap with surfactants	Diversification (horse boarding) Infrastructure Management	Water	Ranch Core	CBARCD 2001

Mitigation Measure	Activity Types	Resources	Subzone	Reference
Adhere to the Ranch Core diversification consideration for row crops: – as part of any row crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate – use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late fall and use certified weed-free straw if purchased from outside the park or from a different ranch – incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin) – use nonlethal wildlife control (i.e., scarecrows or decoys and control garden debris) because lethal control of wildlife is prohibited – store harvested crops in enclosed structures (i.e., buildings, barrels, crates)	Diversification (Row crops)	Air Soils Vegetation Water Wildlife	Ranch Core	Sonoma County 2013
Plant cover crop or cover soils with straw mulch and use at least 30% cover in fallow crop areas throughout the rainy season (until April 1)	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	Air Soils Water		Sonoma County 2013
For row crop diversification, conduct tilling activities row crop areas, such as ripping, disking, or harrowing, after August 20 and before the first rains or November 1	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	Soils Water Wildlife	Ranch Core	NPS 1990

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APPENDIX E—PUBLIC USE AND ENJOYMENT DETAIL

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APPENDIX E: PUBLIC USE AND ENJOYMENT DETAIL

This appendix contains potential recommendations that the Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively referred to as the park) would consider to implement the programmatic guidance described in chapter 2 of the draft environmental impact statement (EIS) for a general management plan amendment (GMP Amendment) related to facilitating public use and enjoyment of the planning area. The recommendations presented below would most likely require additional site-specific planning and environmental documentation, including National Environmental Policy Act compliance, and cost estimates before project implementation could occur. Similarly, implementation of the actions and developments proposed in the EIS depends on funding available at the time of need. The approval of this GMP Amendment does not guarantee that the funding and staffing needed to implement the GMP Amendment would be immediately forthcoming. Instead, it establishes a vision of the future that will guide future management of the planning area.

Development of Trails and Trail-Based Recreation Additional Detail

The following section describes potential routes the park would consider to implement the programmatic recommendations contained in chapter 2 of the EIS. Potential routes to implement the general recommendations above could include:

On the Point Reyes Peninsula:

- Connect L Ranch Road to Pierce Point Road using an old road grade to allow bicycles to ride a large loop using these two roads and to facilitate access between Marshall Beach and Pierce Point Road. This connection ultimately could be extended to create a loop that connects Pierce Point Road to Sir Francis Drake Boulevard using old alignments.
- Connect Kehoe Trail to L Ranch Road using an old road alignment through K Ranch.
- Create a loop with the Estero Trail and Home Ranch roads and consider alignments around the core of Home Ranch.
- Create a new trail alignment that highlights Drakes Estero. Also consider using this opportunity to pilot a project that provides for a more self-guided discovery with parking at Bull Point and signage that encourages people to reach the Estero without a formalized trail. This approach would be for pedestrian use only and could help the park determine the feasibility of less-structured exploration to key destinations in other areas.
- Connect Drakes Beach to Drakes Estero using an old ranch road.
- Connect the Drakes Estero Trailhead to N Ranch Roads to create a loop.
- Enhance access and provide interpretation of the former life-saving station and the Point Reyes Naval Radio Compass Station listed on the National Register of Historic Places.
- Create a loop from D Ranch to Barries Bay—only under alternative C and alternative F, because of the potential to disturb elk.

In the Olema Valley and north district of Golden Gate lands:

- Improve and promote loop trail opportunities that connect the Olema Valley Trail and the Bolinas Ridge Trail.
- Extend the Bolinas Ridge Trail north of Sir Francis Drake Boulevard and connect the Bolinas Ridge Trail to Five Brooks using an existing ranch road.
- Create trails on ranch roads in the north district of Golden Gate northeast of Sir Francis Drake Boulevard, using the former Cheda Ranch complex as a trailhead.

Potential trailhead improvements could include:

- Improve parking for the Bolinas Ridge Trail on Sir Francis Drake Boulevard.
- Formalize Platform Bridge parking.
- Create a trailhead in the former Cheda Ranch complex.
- Expand the Randall Trailhead to provide for additional parking.
- Improve parking to facilitate visitor access to the tree tunnel and create a more comprehensive visitor experience to this increasingly popular park destination. Include updated interpretation and additional facilities, such as restrooms, that may be needed to support visitation.
- Create a trailhead on Sir Francis Drake Boulevard for hiking to the Naval Radio Compass Station, a National Register of Historic Places property (see recommendation above).

APPENDIX F—PRESERVATION AND MAINTENANCE GUIDELINES FOR RANCH BUILDINGS UNDER AGRICULTURAL LEASE PERMIT

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APPENDIX F: PRESERVATION AND MAINTENANCE GUIDELINES FOR RANCH BUILDINGS UNDER AGRICULTURAL LEASE/PERMIT

The maintenance activities described below, which are analyzed in the draft environmental impact statement for a general management plan amendment for Point Reyes National Seashore and the north district of Golden Gate National Recreation Area, would be authorized maintenance activities after specific plans are reviewed by the National Park Service (NPS) and incorporated into Ranch Operating Agreements. Maintenance activities that are not consistent with the type, scale, or impact of those described below would require further environmental review prior to authorization by NPS. The activity types described below are consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and *Guidelines for Rehabilitating Historic Buildings*. Maintenance requirements differ depending on whether the building to be treated is designated as historic or non-historic. Those requirements for both historic and non-historic buildings are outlined below. Ranch maps indicating the historic status of ranch buildings would be included in each Ranch Operating Agreement for reference.

Activity Type	Historic Buildings	Non-historic Buildings
Treatment approach	▪ The character defining materials and features of historic buildings shall be protected and maintained while allowing for limited replacement of damaged and deteriorated materials and those alterations that support the continued use of buildings in ranch operations.	▪ Non-historic buildings shall be protected and maintained in a manner that supports their continued use in ranch operations and does not detract from the historic setting.
Exterior siding maintenance activities	▪ Structure siding shall be annually inspected and maintained to prevent water and moisture from entering buildings or causing deterioration of the siding material, paint, structural integrity, or appearance. ▪ Siding shall be clean and free of encroaching vegetation growth. ▪ Siding and other exterior surfaces shall be painted every 15 years or more often if necessary. ▪ Repair or replacement of deteriorated siding shall be conducted in accordance with NPS specifications using the same size, style, type, and grade of material as exists on the building/structure. ▪ Drainage features that divert water from siding materials shall be maintained in good functioning condition to prevent deterioration of siding materials and structural systems.	▪ Structure siding shall be annually inspected and maintained to prevent water and moisture from entering buildings or causing deterioration of the siding material, paint, structural integrity, or appearance. ▪ Siding shall be clean and free of encroaching vegetation growth. ▪ Siding and other exterior surfaces shall be painted every 15 years or more often if necessary. ▪ Repair or replacement of deteriorated siding shall be conducted in accordance with NPS specifications using material appropriate to the building/structure and compatible with the historic setting. ▪ Drainage features that divert water from siding materials shall be maintained in good functioning condition to prevent deterioration of siding materials and structural systems.

Activity Type	Historic Buildings	Non-historic Buildings
Exterior finish maintenance activities	▪ Buildings shall be painted or stained periodically to maintain a neat appearance and protect underlying materials from decay or deterioration. ▪ Paint finishes shall match the existing color or another color that is appropriate to the building type and the character of the pastoral landscape. ▪ Building or surfaces that are traditionally not painted, such as galvanized metal siding or roofs, may be left unpainted.	▪ Buildings shall be painted or stained periodically to maintain a neat appearance and protect underlying materials from decay or deterioration. ▪ Paint finishes shall match the existing color or another color that is appropriate to the building type and the character of the pastoral landscape. ▪ Building or surfaces that are traditionally not painted, such as galvanized metal siding or roofs, may be left unpainted.
Roofing maintenance activities	▪ The form of the roof and its decorative and functional features such as cupolas, dormers, fascia, and brackets shall be maintained. ▪ Roofs shall be inspected on at least an annual basis to ensure that roofing materials are intact, free of deterioration that would affect structural qualities, and not jeopardized by adjacent vegetation. ▪ Overhanging tree limbs and vegetation, including moss or fungi accumulation in or on roofing materials, that may cause roof deterioration shall be trimmed/pruned away from the building or structure. ▪ Repairs to roofing shall be done using the same type, style, and color of existing roofing materials. ▪ As a temporary protection measure, leaking roofs shall be protected with a temporary waterproof membrane and a synthetic underlayment, roll roofing, plywood, or a tarpaulin until it can be repaired. ▪ Replacement of the total roof surface shall be done in kind or with compatible substitute material approved by NPS. For large barns/ outbuildings with wood shingle roofing that requires replacement, NPS would consider allowing replacement of this roof surface with corrugated metal roofing or similar material.	▪ Roofs shall be inspected on at least an annual basis to ensure that roofing materials are intact, free of deterioration that would affect structural qualities, and not jeopardized by adjacent vegetation. ▪ Overhanging tree limbs and vegetation, including moss or fungi accumulation in or on roofing materials, that may cause roof deterioration shall be trimmed/pruned away from the building or structure. ▪ Repairs to roofing shall be done using the same type, style, and color of existing roofing materials or NPS-approved replacement materials that are compatible with the historic setting. ▪ As a temporary protection measure, leaking roofs shall be protected with a temporary waterproof membrane and a synthetic underlayment, roll roofing, plywood, or a tarpaulin until it can be repaired. ▪ Replacement of the total roof surface shall be done in kind or with compatible substitute material approved by NPS.

Activity Type	Historic Buildings	Non-historic Buildings
Foundation and structural systems maintenance activities	▪ Buildings shall be inspected for insect and pest control issues on a regular schedule of not less than every five years. All pest control shall be completed in full compliance with the NPS Integrated Pest Management (IPM) Program. ▪ Repairs to building structural systems will be with consistent recognized preservation maintenance methods approved by NPS. For example, weakened structural members can be paired or sistered with a new member, braced, or otherwise supplemented and reinforced.	▪ Buildings shall be inspected for insect and pest control issues on a regular schedule of not less than every five years. All pest control shall be completed in full compliance with the NPS IPM. ▪ Repairs to building structural systems will follow methods approved by NPS. Materials shall be structurally sufficient and compatible with the historic setting, where visible.
Windows maintenance activities	▪ Windows shall be annually inspected and maintained in good, operable condition. ▪ Window frames and sashes may be repaired by patching, splicing, consolidating, or otherwise reinforcing them using recognized preservation methods. Repair may include limited replacement in kind or with a compatible substitute material of the deteriorated, broken, or missing window components. ▪ If windows are too deteriorated to repair, they may be replaced with NPS-approved replacement windows that are compatible with the historic character of the building. ▪ Incompatible, non-historic windows may be replaced with new windows that are compatible with the historic character of the building.	▪ Windows shall be annually inspected and maintained in good, operable condition. ▪ Window frames and sashes may be repaired as necessary. Repair may include limited replacement in kind or with a compatible substitute material of the deteriorated, broken, or missing window components. ▪ Windows may be replaced with NPS-approved replacement windows that are appropriate to the building and compatible with the historic setting.

Activity Type	Historic Buildings	Non-historic Buildings
Entrances and porches maintenance activities	▪ Entrances, porches and their associated features shall be annually inspected and maintained in good condition. ▪ Entrances and porches may be repaired by patching, splicing, consolidating, or otherwise reinforcing them using recognized preservation methods. Repair may include limited replacement in kind or with a compatible substitute material of the deteriorated, broken, or missing components. ▪ If extensive portions of an entrance or porch is too deteriorated to repair, it may be replaced in kind using the physical evidence as a model to replace the deteriorated feature. ▪ If doors are too deteriorated to repair, they may be replaced with NPS-approved replacement doors that are compatible with the historic character of the building.	▪ Entrances, porches and their associated features shall be annually inspected and maintained in good condition. ▪ Entrances and porches may be repaired as necessary. Repair may include limited replacement in kind or with a compatible substitute material of the deteriorated, broken, or missing components. ▪ If extensive portions of an entrance or porch is too deteriorated to repair, it may be replaced following an NPS-approved plan that is appropriate to the buildings and compatible with the historic setting. ▪ If doors are too deteriorated to repair, they may be replaced with NPS-approved replacement doors that are appropriate to the building and compatible with the historic setting.
Gutters and downspouts maintenance activities	▪ Gutters and downspouts shall be maintained in good working order and free of debris. ▪ Gutters may be installed on the exterior of large barns/outbuildings to convey rainwater away from the siding and foundation.	▪ Gutters and downspouts shall be maintained in good working order and free of debris. ▪ Gutters may be installed on building exteriors to convey rainwater away from the siding and foundation.
Floors and floor coverings maintenance activities	▪ Floors and floor coverings shall be annually inspected and maintained to prevent signs of displacement, deflection, water damage, and abnormal deterioration. ▪ Floors and floor coverings shall be maintained to be free of objectionable deterioration and/or excessive water. Hardwood floors, tile, and linoleum coverings shall be maintained using proper sealants and waxes. ▪ Flooring may be repaired by patching, splicing, consolidating, or otherwise reinforcing the materials using recognized preservation methods. ▪ Interior flooring that is too deteriorated to repair may be replaced in kind or with a compatible substitute material.	▪ Floors and floor coverings shall be annually inspected and maintained to prevent signs of displacement, deflection, water damage, and abnormal deterioration. ▪ Floors and floor coverings shall be maintained to be free of objectionable deterioration and/or excessive water. Hardwood floors, tile, and linoleum coverings shall be maintained using proper sealants and waxes. ▪ Flooring may be repaired as necessary. ▪ Flooring that is too deteriorated to repair may be replaced in kind or with a compatible substitute material.

Activity Type	Historic Buildings	Non-historic Buildings
Interior spaces features and finishes maintenance activities	▪ Interior spaces shall be protected and maintained in good condition through regular cleaning and the maintenance and application of appropriate protective coating systems. ▪ Interior features and finishes may be repaired by patching, splicing, consolidating or otherwise reinforcing them using recognized preservation methods. Repair may include limited replacement in kind or with a compatible substitute material of deteriorated, broken, or missing components. ▪ Entire interior features that are too deteriorated for repair may be replaced in kind or with a compatible substitute material using the physical evidence as a model to reproduce the feature.	▪ Interior spaces shall be protected and maintained in good condition through regular cleaning and the maintenance and application of appropriate protective coating systems. ▪ Interior features and finishes may be repaired as necessary. ▪ Entire interior features that are too deteriorated for repair may be replaced with NPS approval.
Mechanical systems including heating, air conditioning, electrical, and plumbing systems	▪ Mechanical, plumbing, and electrical systems shall be inspected annually and maintained through cyclical maintenance. ▪ Mechanical systems may be repaired by augmenting or upgrading system components or replacing deteriorated components.	▪ Mechanical, plumbing, and electrical systems shall be inspected annually and maintained through cyclical maintenance. ▪ Mechanical systems may be repaired by augmenting or upgrading system components or replacing deteriorated components.

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APPENDIX G—INDICATORS, THRESHOLDS, AND VISITOR CAPACITY DETAILS

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Appendix G: Indicators, Thresholds, and Visitor Capacity Detail

Introduction

This appendix provides additional detail related to the identification of and implementation commitments for visitor carrying capacities for the planning area and fulfills the legal requirements to identify visitor capacity at Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively referred to as the park) in the general management plan amendment (GMP Amendment) and the draft environmental impact statement (EIS).

The Interagency Visitor Use Management Council (IVUMC), a collaborative council comprising six federal agencies, provides a consistent approach to visitor use management. The National Park Service (NPS) is a leading member of the IVUMC. A full description of the IVUMC Framework and additional resources related to visitor carrying capacity can be found at http://visitorusemanagement.nps.gov/.

Consistent with the IVUMC framework, the desired conditions for preservation of area resources and visitor experiences were used to guide the development of capacity for the planning area. Visitor caused-issues in the planning area, such as parking, crowding and congestion, and trash and waste, were identified. The discussion of issues helped inform the development of indicators (measurable attributes that can be tracked over time); thresholds (minimal acceptable condition for each indicator); and monitoring protocols, management strategies, and actions that can be taken to help maintain desired conditions. Visitor capacities and strategies to implement visitor capacity were then identified using IVUMC guidance, best practices, and examples from other plans and projects across the national park system.

Desired Conditions

Desired conditions describe resource conditions, visitor experiences and opportunities, and facilities and services that an agency strives to achieve and maintain in a particular area. Desired conditions describe what conditions, outcomes, and opportunities are to be achieved and maintained in the future, not necessarily what exists today. Desired conditions paint a picture of what the particular area will look like, feel like, sound like, and function like in the future. They do not answer the questions of how conditions will be maintained or achieved. The desired conditions for the planning area are found in chapter 1 of the EIS.

Visitor-Caused Issues

The planning issues summarized below describe the visitor-caused issues in the planning area. The discussion informed the development of indicators and thresholds as well as identifying visitor capacity.

Crowding and Congestion

Crowding has become an issue in the planning area, and typically occurs during nice weather, weekends, and holidays. Sir Francis Drake Boulevard provides access to the beach and can become very congested during whale watching and elephant seal viewing seasons. The park operates a winter seasonal shuttle between the end of December and mid-April annually but has observed similar congestion conditions outside this season. After the Federal Highways project on Sir Francis Drake Boulevard is paved, bicycle use is expected to increase as well.

Parking

The availability of formal parking and the existence of visitor-created parking sites are concerns in several sites in the planning area. Social media sharing has encouraged use at the Cypress Tree Tunnel and has led to increased visitor parking along the tree roots and at the pullout past the tunnel, resulting in damage to the tree tunnel. Parking lots at Pierce Point Ranch, Marshall Beach Trailhead, and the Estero Trail often fill up, especially during good weather and on weekends. Informal parking has been observed at those locations, as well as at Kehoe Beach Trailhead, and to a lesser extent around trailheads in the north district of Golden Gate, including Bolinas Ridge Trailhead. Informal roadside parking results in an increased threat to visitor safety, especially during times of peak congestion and when motorists do not practice safe traveling speeds.

Ranches

Many visitors are unaware that they are allowed to visit the ranchlands. More education is needed about access and appropriate visitor behavior in this area. Improvements to access and wayfinding could make these allowed uses more apparent. However, NPS is also concerned that visitor use will increasingly conflict with ranch operations and that both visitors and ranchers understand what constitutes appropriate access. Increased use of ranchlands may also pose safety concerns related both to visitors' interaction with livestock and to ranch operations such as silage and manure spreading.

Trails

The current trail system is not well connected, and the creation of informal trails has been observed. Informal trails have the potential to damage natural and cultural resources and may also pose public safety risks as visitors may create unstable trails or may unknowingly travel into unsafe areas. Lack of connectivity among trails may be contributing to crowded parking areas and road congestion, as visitors who would otherwise hike to a destination drive there instead. There are also opportunities to improve communication about designated trails through wayfinding, particularly at the trailheads in the north district of Golden Gate.

Trash/Waste

Increased usage has resulted in an increase in staff reports and visitor complaints related to inappropriate waste disposal, including litter, illegal dumping, human waste, and toilet paper. Pierce Point Road and L Ranch Road have been the focus of a number of these incidents. The lack of restrooms at the Cypress Tree Tunnel and Marshall Beach Trailhead may also be contributing to the inappropriate disposal of human waste.

Indicators and Thresholds

Indicators

Indicators translate goals and objectives into measurable attributes (e.g., lineal extent of visitor-created trails) that when tracked over time, evaluate change in resource or experiential conditions. Indicators are critical components of monitoring the success of the plan and are considered common to all action alternatives. The interdisciplinary planning team considered the central issues and developed related indicators that would help identify when the level of impact becomes cause for concern and management action may be needed. The indicators described below were considered the most critical, given the importance and vulnerability of the resource or visitor experience affected by types of visitor use. The planning team also reviewed the experiences of other park units with similar issues to identify meaningful indicators.

Thresholds

Thresholds represent the minimum acceptable condition for each indicator and were established by considering qualitative descriptions of the goals and objectives, data on existing conditions, relevant research studies, professional judgement of staff based on management experience, and public preferences. Although defined as "minimally acceptable," thresholds still represent acceptable conditions. Establishing thresholds does not imply that no action would be taken prior to reaching the threshold. Thresholds identify when conditions approach unacceptable levels and serve as mechanisms to alert managers and the public that corrective action must be taken to keep conditions acceptable. Indicators and thresholds can be tracked over time and ultimately form the foundation of good monitoring protocols that will allow managers to maintain and achieve desired conditions for resources and visitor experiences.

Indicators, thresholds, monitoring protocols, management strategies, and mitigation measures that would be implemented as a result of this planning effort and are described below. The planning team identified the following indicators that can be tracked over time:

- Number of incidents of informal parking at key destinations
- Number of documented incidents and visitor complaints related to visitor use
- Number of new and existing dumping sites encountered, and incidences recorded
- Documented condition assessment changes to cultural resources
- Number of visitors per year

Informal Parking

Indicator

Number of incidents of informal parking.

Threshold

No more than 10% increase in extent of informal parking at key destinations, per day.

Rationale for Indicator and Threshold

High levels of visitation will result in continuing and increasing vehicular congestion levels in the planning area. Whenever parking demand is substantially higher than supply, informal parking in illegal and unsafe locations will increase, with visitors walking longer distances in unsafe conditions and creating informal trails in the park that damage resources. Informal parking also affects the quality of the visitor experience, as it can block viewsheds and interfere with scenery-viewing opportunities.

Monitoring Method

Data would be collected periodically to confirm that the thresholds are not being exceeded and that use levels are not being overly restricted beyond what is necessary to achieve the desired visitor experience. Once a schedule is implemented, monitoring would occur multiple times per season for this indicator, both remotely (e.g., using a global positioning system on vehicles and traffic counters) and directly (e.g., periodic staff monitoring along the road and at viewsheds). If trends indicate the standards for these indicators are or could be exceeded, NPS could respond with a decrease in traffic levels as necessary.

- Management Strategies and Actions: The following adaptive management strategies represent the suite of actions that NPS could implement if the informal parking threshold is approached or exceeded. Increase education about the potential impacts of parking along the sides of the road
- Encourage visitor use during non-peak times
- Redirect visitors to other, less crowded areas
- Evaluate alternative modes of transportation access
- Redesign or increase the number of formal parking areas
- Formalize informal parking areas

Incidents and Visitor Complaints

Indicator

Number of documented incidents and visitor complaints related to visitor use, per month, at key sites.

Threshold

No more than five documented incidents and visitor complaints related to visitor use at key sites within the project planning area per month.

Rationale for Indicator and Threshold

Unendorsed behaviors have become a primary safety concern for visitors and NPS staff and pose noteworthy risks to park resources and visitor safety. Inappropriate use can also diminish the quality of the visitor experience from the effects of disruptive or destructive behavior that interferes with others' enjoyment of park resources. Curtailing unendorsed behaviors would reduce the need for enforcement, allowing park staff to be reallocated to handle higher-priority safety situations, such as search and rescue.

Monitoring use-related complaints allows the park to proactively and preemptively investigate possible related changes in the condition of natural and cultural resources that may not only compromise those resources, but also the visitor experience.

Monitoring Method

Monitoring for this indicator would occur through a variety of methods and may include data from the following sources: law enforcement incidents, visitor complaints in writing or the visitor center comment forms, webmaster comments, comments the park responds to on social media, rancher-related complaints and other mechanisms.

Management Strategies and Actions

The following adaptive management strategies represent the suite of actions that NPS could implement if the incidents and visitor complaints threshold is approached or exceeded.

- As the threshold is approached (five incidents per month), additional assessments of key sites will be conducted.
- Targeted law enforcement efforts will be implemented with the goal of educating the visiting public about appropriate behaviors.
- Area closures will only be considered after a range of management strategies have been implemented and found not to have been effective and will initially be piloted on a temporary basis.
- Use volunteers to staff closures and educate visitors about the closure.

Waste

Indicator

Number of new and existing dumping sites encountered, and incidences recorded in areas currently patrolled.

Threshold

No more than six incidents (which are defined as one or more large items, one or more deposits of human waste, or multiple bags of trash) of dumping per area (which are defined as locations geographically close together, e.g., XX parking lot and day use area) annually.

Rationale for Indicator and Threshold

Excessive litter, waste, and dumping is a prominent problem at some locations in the park and not only affects the quality of visitor experience, but also natural resources through trampling, the leaching of contaminants into the soil and water, and the degradation of wildlife habitat.

Monitoring Method

Monitoring for this indicator would occur through a variety of methods and may include data from the following sources: law enforcement incidents, visitor complaints in writing or the visitor center comment forms, webmaster comments, comments the park responds to on social media, rancher-related complaints and other mechanisms.

Management Strategies and Actions

The following adaptive management strategies represent the suite of actions that NPS could implement if the waste threshold is approached or exceeded.

- Increase targeted enforcement
- Increase education and information distribution
- Manage site with placement of physical barriers and improved boundary marking
- Develop partnerships and community involvement

- Change visitor use hours
- Increase ongoing cleanup response

Cultural Resource Impacts

Indicator

Documented condition assessment changes to cultural resources from visitor caused actions and disturbances, as defined in NPS Archeological Site Management Information System (ASMIS). Negative changes in the condition of a cultural resource due to visitor caused actions and disturbances, as defined in NPS cultural resource databases (i.e., ASMIS, Cultural Landscape Inventory [CLI], and the List of Classified Structures [LCS]).

Threshold

No more than one documented incident to a single resource resulting in a downgrade in its condition due to visitor use impacts in a one-year period.

Rationale for Indicator and Threshold

Visitor damage to cultural resources can occur through both intentional and unintentional means. Both types can cause impacts that influence the integrity of these resources. Continued and increasing visitor use and the resulting deterioration of resource condition and deliberate efforts of theft and vandalism could cause negative impacts on cultural resources. This indicator measures damage to park cultural resources, including archeological resources, historic structures, cultural landscapes, museum objects, and ethnographic resources.

Cultural resources are non-renewable resources and as a result, the threshold is low. By the nature of cultural resources, impacts are typically permanent and irreversible. Considering the level of damage attributed to intentional and unintentional visitor impacts, even slight changes in the indicator (resource condition) make a reasonable visitor use threshold to evaluate how the park can continue to preserve cultural resources.

Archeological sites are non-renewable resources and as a result, the threshold for this indicator is low. By the nature of archeological resources, all impacts on archeological sites and artifacts are permanent. Considering the level of damage attributed to intentional and unintentional visitor impacts, even slight changes in the indicator (archeological site condition) make a reasonable visitor use threshold to evaluate how the park can continue to preserve the archeological resources.

Some historic structures contribute to the integrity of historic districts, and, consequently, they are unique and non-renewable resources. For example, the Radio Compass Station was part of the San Francisco Bay entrance group, a group of three radio compass stations that worked together to determine the locations of ships traveling in the area. The establishment of this navigational aid significantly reduced the number of shipwrecks that occurred along this section of California’s rocky coast, even in low-visibility conditions.

Cultural landscapes also contribute to the integrity of historic districts. Planted around 1930, the Monterey cypress tree tunnel at the Point Reyes station is a signature landscape feature that evokes some of the prestige that RCA American electronics company, placed in this profitable, historic operation.

Monitoring Method

The planning area contains more than 200 documented historic buildings, structures, and archeological sites that are documented and tracked in NPS cultural resource databases, such as ASMIS, CLI, and LCS. For each of these resources, NPS conducts condition assessments, which are typically scheduled at a regular interval between one and ten years. Condition is determined based on a rating system of *good*, *fair*, *poor*, and *destroyed*. The monitoring is intensive and includes photo documentation to measure change over time resulting from various natural and use-related causes such as vandalism, erosion, and others. Ideally, the park would update the monitoring schedule to a shorter period, such as every five years. The park would continue to explore photogrammetry and other technologies as a monitoring technique and would continue to explore the change in condition over time for Facility Management

Software System (FMSS)-maintained assets or change in deferred maintenance as a monitoring mechanism. As a part of monitoring for this indicator, the park will record events of disturbance. Cultural Landscapes Inventory and the US Geological Survey Land Change Science National Land Cover dataset will also aid in the monitoring method.

Management Strategies and Actions

The following adaptive management strategies represent the suite of actions that NPS could implement if the cultural resources impact threshold is approached or exceeded.

- Educate visitors through interpretive panels, interpretive programming, and visitor outreach on the sensitivity of cultural resources and the need to protect historic sites
- Increase park presence or patrol of visible front-country cultural resources during times of high visitor use
- Continue monitoring of cultural resources by park staff and/or park-trained site stewards
- Document changing site conditions and analyze impacts
- Prioritize cultural resource documentation and evaluation in high visitor use areas and front-country sites
- Conduct evaluations of previously unevaluated cultural resources and provide recommendations for management strategies
- As appropriate, add resources to park FMSS database to allow for facilities-based projects and additional staff support for the preservation and care
- Increase enforcement for vandalism and looting
- Erect physical barriers and/or reroute trails to protect exposed and highly visible archeological sites from visitor impacts
- Consider piloting temporary area or trail closures if management strategies and mitigation measures prove ineffective in addressing visitor impacts on archeological sites and other cultural resource types

Visitation

Indicator

Number of visits per year.

Threshold

The number of visits to the park year. Table G-1 infers a variety of conditions as inferred by the indicator. These conditions were calculated by examining visits in 2017 and increasing that baseline use by 25% (threshold) and finding a middle ground between the two conditions (trigger).

TABLE G-1: MONITORING ANNUAL PARK-WIDE VISITATION

Indicator	2017	Trigger	Threshold
Number of visitors per year	<2,456,669	2,763,752	>3,070,836

Rationale for Indicator and Threshold

Monitoring and managing visitor use according to this indicator helps ensure that visitors have safe and stress-free access to popular destinations at key areas and along key corridors by reducing vehicle congestion. Vehicles at one time is a measure commonly used by park managers and researchers to quantify vehicle congestion in parking lots (Lawson and Kiser 2013a; Lawson and Kiser 2013b; Manning et al. 2014). Monitoring the numbers of vehicles travelling along certain roads and stopping at key sites will also help management understand how visitors are circulating in the park and will provide a better understanding of the factors that drive crowding in particular locations.

Monitoring Method

Automatic traffic recorders will measure the number of vehicles, which will be tallied monthly.

Management Strategies and Actions

The following adaptive management strategies represent the suite of actions that NPS could implement if the visitation threshold is approached or exceeded.

- Implement an education program about the effects of traffic on the visitor experience
- Increase law enforcement presence
- Develop alternate bike/pedestrian opportunities
- Implement more management controls by site area
- Limit party size
- Explore a pilot permit/reservation system for key destinations during peak times or on peak weekends

Visitor Capacity

Overview

This section provides additional information about the visitor capacity identification as it relates to the visitor use management framework for the GMP Amendment. For a full description of the IVUMC framework and additional resources, please visit the following web address: http://visitorusemanagement.nps.gov/. The IVUMC defines visitor capacity as the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining the desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established. NPS identified visitor capacities using best practices and examples from other plans and projects across the agency. Based on these best practices, the planning team describes the process for identifying capacity following guidelines: (1) determining the analysis area, (2) reviewing existing direction and knowledge, (3) identifying the limiting attribute, and (4) identifying visitor capacity and strategies to implement visitor capacity.

Visitor Capacity Analysis Areas

Key areas were selected as destinations where high levels of use are currently or are projected to affect natural and cultural resources and visitor experiences related directly to desired conditions. For these key areas, a detailed analysis has been conducted to identify the visitor capacities. The visitor capacities will be used to implement management strategies for these sites as part of the plan. Three key areas were identified:

1. Key visitor destinations along Pierce Point Road and L Ranch Road
2. North district of Golden Gate
3. Key visitor destinations along Sir Francis Drake Boulevard from Pierce Point Road through to the end of the planning area (A Ranch)

NPS also discussed the Commonweal area, which is adjacent to the Palomarin area, a popular destination at Point Reyes. This area has also experienced increased visitation and congestion on weekends. However, because most of the visitation and impacts in this area fall outside the planning area, Commonweal was not included as key area for analysis in this plan.

To fulfill the requirements of the 1978 National Parks and Recreation Act (54 U.S.C. 100502), visitor capacity identifications are required for all destinations and areas that this planning effort addresses. Together, the three key areas listed above compose the majority of the visitor use areas in the planning area. Future monitoring of use levels and indicators will inform NPS if use levels are at or near visitor capacities. If so, adaptive management strategies as outlined in this plan would be taken (see the "Indicators and Thresholds" section).

Review of Existing Direction and Knowledge

Context for Point Reyes. During this step, the planning team developed desired conditions, indicators and thresholds, paying particular attention to conditions and values that must be protected and are most related to visitor use levels. For each key area, relevant indicators are listed. The associated thresholds can be found in the full description of the indicators and thresholds. An overview of visitor use issues and current use levels for each key area are presented below under each analysis area.

The amount, timing, and distribution of visitor use outside the planning area for the park influences resource conditions and visitor experiences. During the process of identifying visitor capacity, the park clearly noted a need to maintain current visitor use levels park-wide. For the most part, the planning area receives less visitation than other areas of the park and provides unique opportunities to redistribute use. Although many of the park's key visitor destinations are outside the planning area, many of the roads that provide access to some of the unit's key visitor destinations are within the planning area. Consideration was given to the levels and patterns of visitor use that cause negative impacts on the visitor experiences and more evident negative impacts on cultural and natural resources. Therefore, the relationship between the planning area and key visitor destinations outside the planning area was also a consideration when identifying visitor capacity. These impacts influence NPS's ability to maintain desired conditions. Appropriate adaptive management strategies can then be selected and implemented to maintain desired resource conditions and visitor experiences consistent with the purposes for which the park was established.

In addition, the action alternatives were assessed for the primary differences related to the amounts, timing, distribution, and types of use. The differences in the alternatives do not suggest the need for a visitor capacity that varies but, rather, suggest the opportunity to identify a visitor capacity that would be common to all action alternatives. If alternative F, which calls for the elimination of ranching and limited management of tule elk, were to be selected, an implementation plan would be developed to provide additional detail about expanded visitor opportunities. At that time, the visitor capacity would also be updated.

Identify the Limiting Attribute. This step requires the identification of the limiting attribute(s) that most constrain the analysis area's ability to accommodate visitor use. The limiting or constraining attribute(s) may vary across the analysis area and is described under each key area. This is an important step given that a key area could experience a variety of challenges and opportunities regarding visitor use issues.

Identify Visitor Capacity and Implementation Strategies. To identify the appropriate amount of use at key areas, outputs from previous steps were reviewed to understand current conditions compared to desired conditions for the area. Visitation data collected annually by NPS staff to track levels of visitor use park-wide and by area were used as a data source. NPS also collects annual data including counts of fees, parking availability, trail counts, and other data.

Analysis Area 1: Key Visitor Destinations along Pierce Point Road and L Ranch Road

This analysis area includes key visitor destinations along Pierce Point Road and L Ranch Road. Tomales Bay State Park is located in this analysis area that the NPS does not manage. Therefore, for the purposes of visitor capacity, visitation to the state park is considered to be outside this analysis. These roads are primary transits that provide visitors access to key experiences outside the planning area. Key destinations in the planning area include Marshall Beach and Kehoe Beach Trailheads and Abbotts Lagoon parking area. This analysis area is also mostly ranching land; therefore, the amount of visitor use that can be accommodated is directly proportional to the types of opportunities provided on the ranching lands.

These areas fill with parked vehicles during weekends with nice weather, resulting in visitors parking along the side of the road. Off-leash dogs, litter, and trash are also visitor-caused issues in this area. Throughout the park, crowding is occurring at key locations. As a result of this crowding, visitors seek alternative locations for recreation in the unit. The most relevant desired condition for this area is that visitors would have opportunities to enjoy expanded connections and greater access to diverse recreation including but not limited to, hiking, wildlife viewing (note: many of those options could originate off of L Ranch Road).

The highest visitor use levels to this area of the park in the last five years occurred in July 2017 when traffic counts reported 15,600 vehicles. The person per vehicle multiplier for the Pierce Point Road traffic counter is four people per vehicle. A standard assumption is that 70% of visitor use occurs on the weekends while 30% occurs during the week, where weekends are defined as Saturdays and Sundays and weekdays are Monday through Friday. Of the weekend days in July 2017, the average use per day included 3,500 (~875 vehicles) visitors and during weekdays was about 700 visitors.

The most limiting attribute constraining visitor use throughout Pierce Point Road and L Ranch Road is the quality of the visitor experience. Currently, a lack of infrastructure to support diversification of recreation opportunities and/or expansion of visitors to the area affects the visitor experience. The character of the L Ranch Road is gravel rather than paved and the trailhead lacks restroom facilities, except for is a restroom facility at the bottom of the trail. Roadside parking occurs frequently given the small nature of existing parking lots and inability to expand onto ranching lands. Most beach access requires moderate to strenuous hiking. The most relevant indicators to monitor changes in these conditions are the number of new and existing dumping sites encountered and incidences recorded in areas currently patrolled, number of visitors per year, and number of incidents of informal parking.

Visitor Capacity and Implementation Strategies. The park identified the need to maintain current visitor use levels, as measured by vehicle counts, in the analysis area to maintain and achieve desired conditions. Given the review of existing visitor use levels, the visitor capacity for the area will be 3,500 visitors on a weekend day (~875 vehicles) and 700 visitors during a weekday (~175 vehicles). However, the park also identified the need to increase other types of use such as biking and trail-based recreation experiences. This decision was based on the importance of redistributing visitors temporally and spatially because the visitor experience is a limiting attribute for visitation to Point Reyes, park-wide.

Strategies to Implement Visitor Capacity.

- Increase park-wide wayfinding
- Increase education by providing more information about Pierce Point Road, Pierce Point Historic Ranch, and additional lesser known visitor opportunities
- Explore vehicle shuttles and other mechanisms of transporting bikes to trailheads and other starting locations
- Provide trip planning tools to diversify the intensity of visitation in some of the primary areas
- Identify measures to formalize and more efficiently use existing parking
- Explore a pilot program that evaluates implementation of parking fees or expanded amenity fee areas during peak times
- Require vehicle shuttles
- Expand recreation opportunities, evaluate trail connections that can create loops from L Ranch Road to Pierce Point Ranch, and evaluate Marshall Beach Trail loop connection
- Work with ranchers to provide new opportunities that connect trail-based recreation with ranch interpretation and education

Analysis Area 2: North District of Golden Gate

This analysis area includes the north district of Golden Gate managed as a part of Point Reyes. This analysis area is also mostly ranching land; therefore, the amount of visitor use that can be accommodated is directly proportional to the types of visitor access that can be provided on ranching lands. Visitor activities in this area include hiking, biking, dog walking, equestrian use, swimming, some fishing, and wildlife viewing. Occasional special events occur in this area (e.g., filming). The trails in this area represent the kinds of trail experiences visitors are looking for, which are connected loop experiences. However, the trails in this area currently provide limited connected loop experiences. The trails, which traverse through ranch lands with gates that facilitate access, were mostly formalized from access roads that existed prior to the park formation and follow ridges away from sensitive areas. A moderate amount of visitor use occurs in this portion of the park; however, some trailheads receive high levels of use. Informal parking areas are full during busy times, except for Tomales Bay Trail, which has a designated parking lot where parking is rarely full because it is on the north end of town with limited destinations. The amount of use on the trails is often limited by the ability to find parking at the trailheads. See Analysis Area 1 for more description of similar types of activities occurring in this analysis area.

Visitor use occurs mostly on the first few miles of trails, and the remainder of the trail network has the opportunity to accommodate increased levels of visitor use. These areas fill with parked vehicles during weekends with nice weather, resulting in visitors parking along the side of the road. Off-leash dogs, litter, and trash are also visitor-caused issues in this area. Roadside parking occurs frequently in many areas including trailheads along State Route 1. Throughout the park, crowding is occurring at some key locations. As a result of this crowding, visitors seek alternative locations for recreation in the unit. Both desired conditions for public use and enjoyment/visitor experience are relevant to this area of the park; visitors would have opportunities for expanded educational and learning experiences and visitors would have opportunities to enjoy expanded connections and greater access to diverse recreation including, but not limited to, hiking, wildlife viewing.

Several primary parking lots are available in this area to accommodate visitor use. Five Brooks Trailhead is an information parking lot that can accommodate about 40 cars, but it is often filled with truck/horse trailers. The other parking lot options include Bolinas Ridge Trail, Olema Valley Trail, Cross Marin Trail at Platform Bridge, and Randall Trail, which are all just pullouts on State Route 1. Each of these four roadside pulloffs can likely accommodate a maximum of 10 to 15 vehicles at one time for 45 to 55 vehicles. Bicyclists who would stay longer often use Bolinas Ridge. Using the person per vehicle multiplier for the Hagmaier Trailhead and Bolinas Ridge/Tocaloma traffic counter for 2 people per vehicle, the total available parking is 100 vehicles, so current use levels would contribute 200 people at one time to this analysis area. Over the course of a month, the visitor use data report that during August, vehicle counts reached 500.

The most limiting attributes constraining visitor use throughout the north district of Golden Gate are the topography, parking, and information about these opportunities and the quality of the visitor experience. Current infrastructure is unable to support diversification and/or expansion of visitors to the area. The size of the informal parking bordered by private and ranch lands restrains the park’s ability to modify the infrastructure footprint. Further, trailheads are lacking restroom facilities. Geography is also a limiting attribute for some types of uses because of the steep terrain, presence of poison oak, and hotter and drier temperatures compared with the peninsula. The most relevant indicators to monitor changes in these conditions are the number of new and existing dumping sites encountered and incidences recorded in areas currently patrolled, number of visitors per year, and number of incidents of informal parking.

Visitor Capacity and Implementation Strategies. The park identified the opportunity to increase visitor use levels in this analysis area and would redistribute use from other areas of the park. Increasing visitor use in the north district of Golden Gate could alleviate pressure on the peninsula at some of the high visitor use areas. This decision was based on the importance of redistributing visitors temporally and spatially because crowding is a limiting attribute for visitation to Point Reyes, park-wide. By formalizing some of the parking spaces and improving wayfinding at trailheads, the number of people at one time that can be accommodated could increase by 20%. The visitor capacity for this analysis area would be 250 people at one time.

Strategies to Implement Visitor Capacity.

- Improve wayfinding at trailheads
- Identify measures to formalize and more efficiently use existing parking
- Provide information about connections along Bolinas Ridge Trail
- Explore creating trail loops to add to the diversification of trail experiences and connect ranch roads to trails

- Formalize trailheads and trailhead parking—locations could include Bolinas Ridge, Randall Trail, Platform Bridge, and Olema
- Produce bike maps highlighting specific opportunities and include level of difficulty
- Expand hiking opportunities out of Cheda Ranch and consider using existing/old ranch roads and redeveloping Cheda Ranch as a trailhead
- Explore opportunities for the Cross Marin Trail through NPS lands connecting and converting trails into multiple-use trails (i.e., where biking and equestrian use would be allowed)
- Explore partnership trail opportunities
- Manage large-scale, trail-based event requests to 1 to 2 per year to avoid conflicts with general visitor use

Analysis Area 3: Key Visitor Destinations along Sir Francis Drake Boulevard and the Cypress Tree Tunnel

This analysis area includes key visitor destinations along Sir Francis Drake Boulevard southwest of Pierce Point Road and a specific visitor capacity for the Cypress Tree Tunnel. Visitor use in these areas includes road biking, scenic driving, bird watching, elk/wildlife viewing, and photography. Sir Francis Drake Boulevard provides visitors with access to key destinations along the road specifically to many of the park's popular beaches during whale watching and elephant seal viewing. The volume and amount of visitor use on Sir Francis Drake Boulevard traveling to other areas outside the planning area were considerations. During this type of seasonal visitation, the road and areas outside the planning area become very congested, most notably on weekends. Specifically, congestion occurs in surges when visitors are leaving the park and most often on the weekends. The Lighthouse Visitor Center, also outside the planning area, is now open four days a week to address increasing visitation. In contrast, on weekdays and rainy weather days the park can seem quiet and empty. Unique to the planning area and this analysis area is the visitor experience of driving through A, B, and C Ranches because it provides unique possibilities to expand visitor opportunities. Visitors often encounter ranching traffic that includes hay, milk, and cattle trucks. Visitor safety can be a concern when multiple users share the road, for example, bicyclists and pedestrians with vehicular traffic.

Both desired conditions for public use and enjoyment/visitor experience are relevant to this area of the park and include the fact that visitors would have opportunities for expanded educational and learning experiences and visitors would have opportunities to enjoy expanded connections and greater access to diverse recreation including, but not limited to, hiking, wildlife viewing. Also relevant to this area are the desired conditions related to preservation strategies for cultural resources and include National Register Historic Districts, including contributing landscapes and structures, would be preserved in a manner that maintains their integrity and historic and prehistoric archaeological sites, and ethnographic resources related to historic land uses and Coast Miwok traditional associations would be preserved and maintained.

The Cypress Tree Tunnel is also in this analysis area, and likely as a product of being a social media sensation, visitation has dramatically increased. Much of the visitor use around the Cypress Tree Tunnel focuses on photography; however, some of this use is drone photography, which is prohibited in the park. The length of visitor stay is short with high turnover rates and high volume of visitor use, and results in impacts from human use such as litter and human waste because of the lack of restroom facilities. Visitors park on the tree roots that are a cultural resource. A small parking lot past the tree tunnel gets visitor use. However, beyond those few spots relatively few parking stalls are available to accommodate the large volume of visitor use. In addition, visitor conflicts are occurring between different user groups as visitors seek to take the perfect picture.

The highest visitor use levels to this area of the park in the last five years occurred in May 2014 when traffic counts reported 25,500 vehicles. The person per vehicle multiplier for the Sir Francis Drake Blvd traffic counter is 4 people per vehicle. A standard assumption is that 70% of visitor use occurs on the weekends while 30% occurs during the week, where weekends are defined as Saturdays and Sundays and weekdays are Monday through Friday. Of the weekend days in May 2014, the average use per day was 8,000 visitors and during weekdays was about 1,400 visitors.

The most limiting attributes constraining visitor use are the visitor capacity of the destinations outside the planning area, the resulting road capacity, and visitor safety. While this visitor capacity process did not address some of the most popular visitor destinations at the park, it was important to consider those areas when identifying capacity within the planning area. Further, shuttle operations result in a road closure from South Beach down to the lighthouse during the operating season, presenting a managerial limiting attribute. The limiting attribute for the Cypress Tree Tunnel is the tunnel itself because the trees are a cultural resource. The most relevant indicators to monitor changes in these conditions are the documented incidents of visitor complaints related to visitor use, number of visitors per year, documented condition assessment changes to cultural resources, and number of incidents of informal parking.

Visitor Capacity and Implementation Strategies. The park identified the need to maintain visitor use levels by distributing use to other areas of the park to maintain and achieve desired conditions. Given the review of existing visitor use levels, the visitor capacity for the area will be 8,000 (~2,000 vehicles) visitors per weekend day and 1,400 (~350 vehicles) visitors per weekday. This decision was based on the importance of redistributing visitors temporally and spatially, given that crowding is a limiting attribute for visitation to Point Reyes, park-wide.

Strategies to Implement Visitor Capacity.

- Expand use of intelligent transportation systems such as distributing information about crowded and/or closed areas
- Expand wayfinding to include alternative locations for visitor activities
- Develop a beach viewing area adjacent to the Naval Compass Station
- Expand the range of visitor opportunities to facilitate new and unique places to see and experience at Point Reyes
    - Consider the use of commercial use authorizations to distribute visitor use
    - Develop loop trails and opportunities to connect the Cypress Tree Tunnel to H Ranch
    - Explore trail potentials near Creamery Bay and Drake's east; if the park develops additional trails/trailheads, visitor use could be distributed better along the road corridor (with new trailheads/parking)
    - Complete Estero Trail with a loop through Home Ranch and connect to other sites
    - Develop and assess the appropriateness of additional parking locations
- Partner with the county to expand bus service
- Partner with the county to improve multi-use road to provide enhanced safety for bicycles
- Consider temporary road closures when visitor safety is compromised
- Explore a pilot permit/reservation system for key destinations during peak times or on peak weekends
- Increase the shuttle season but include the development of a new staging area before the Y at Sir Francis Drake and Pierce Point Road in the expansive flat area
- Cypress Tree Tunnel
    - Develop strategies to increase pedestrian use at the Cypress Tree Tunnel
    - Develop and assess the appropriateness of new facilities
    - Expand/improve parking at the pullout
    - Consider restrooms
    - Lock gate at the Cypress Tree Tunnel entrance
    - Leverage the radio site at the end of the road to be an attraction that is open most Saturdays and staffed by a volunteer group.

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APPENDIX H—DRAFT GENERAL MANAGEMENT PLAN AMENDMENT SUBZONE DEFINITIONS AND SELECTION CRITERIA

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APPENDIX H: DRAFT GENERAL MANAGEMENT PLAN AMENDMENT SUBZONE DEFINITIONS AND SELECTION CRITERIA

Range Subzone

The Range subzone is identified as areas where cattle grazing would be authorized by the National Park Service (NPS) under lease/permit, but other and more intensive ranch management activities would generally not be allowed because of the documented presence of sensitive resources. Activities that work toward attainment of NPS resource management goals and objectives could be included in this subzone based on evaluation by NPS.

The extent of the Range subzone was determined by combining existing geographic information system (GIS) coverages of known sensitive resources and buffering them by 35 feet (coverages from NPS, the US Geological Survey, US Fish and Wildlife Service, National Marine Fisheries Service, and the US Department of Agriculture [USDA]). These resources include threatened and endangered species or critical components of their life cycle (e.g., California red-legged frog; mountain beaver; and occurrences of *Viola adunca*, the host plant for Myrtle's silverspot butterfly), rare plants, native grasslands, forests, ponds, streams and wetlands, and archeological sites. Slopes greater than 20% were also generally included in this subzone, based on a digital elevation model derived from USDA LIDAR surveys. Range subzone areas would be updated based on monitoring and surveys for the above sensitive resources. NPS would make on-the-ground field verification and determinations based on activity regarding slope to further delineate the Range subzone.

Resource Protection Subzone

The Resource Protection subzone is identified as lands where NPS does not generally authorize livestock grazing in order to protect park resources, including surface waters, threatened and endangered species habitat, and cultural resource sites. Limited prescribed grazing may be authorized to meet NPS resource management goals and objectives.

Existing Grazing Exclusion

These are lands where cattle grazing has been excluded with fencing, which may or may not be formally excluded in the grazing lease/permit. A Ranch Operating Agreement would determine if these areas are included in the lease/permit and what intensity and duration of grazing, if any, is authorized. Most existing grazing exclusions protect sensitive resources; however, some exclusion areas also contain ranch or park infrastructure.

Proposed Grazing Exclusion

NPS would implement proposed grazing exclusion areas over time as funding, permits, and priorities dictate and would select areas for grazing exclusion based on:

- already funded current projects (e.g., NPS resource protection or rancher Natural Resources Conservation Service, Environmental Quality Incentives Program contracts)
- protection of water quality in areas regulated by the San Francisco Bay Regional Water Quality Control Board under Waivers of Discharge Requirements or total maximum daily load, threatened and endangered salmon/steelhead species habitat, or other NPS resource priority areas
- protection of degraded sensitive habitats with a history of heavy use
- continuity with existing protected areas
- protection of habitat with low forage value and high sensitivity (e.g., forested riparian)
- establishment of formal ranch boundaries where no boundary fencing exists and is needed to limit cattle access to unauthorized areas
- limitation of heavy use in low slope access to highly productive transitional marsh systems

- advancement toward desired conditions, based on NPS goals and objectives and monitoring data

Pasture Subzone

The Pasture subzone is identified as lands where no sensitive resources are known to occur that are generally dominated by introduced or domestic species of vegetation. A suite of ranch management activities in addition to grazing may be conducted in this subzone to facilitate the production of livestock, as defined in this environmental impact statement. For the Pasture subzone, some additional steps were taken to refine the GIS coverage:

NPS conducted a desktop review was conducted using the following decision matrix to determine inclusion in the Pasture subzone:

- Is the proposed contiguous non-resource polygon area >10 acres? (Yes = Pasture subzone)
- Is the slope >20% but the polygon is <10 contiguous acres? (Yes = Pasture subzone)
- Are patchy areas of slope and forest fingers less than roughly 300 feet across? (Yes = Pasture subzone)
- Is the polygon <10 acres with high uncertainty regarding the validity of either a single 1994 vegetation map native grassland polygon or a large, hand-digitized rare plant polygon with no additional data? (Yes = Pasture subzone but survey may be needed). However, if two or more of these polygons are overlapping, do not include in Pasture subzone.

Additionally, the boundaries of the Pasture subzone GIS coverage were adjusted where explicit field knowledge of the site and surrounding vicinity could be applied, including:

- a known wetland or other sensitive resource not in the existing GIS coverage
- an area with a history of disturbance or heavy land use
- feasibility of equipment access to perform management activities
- ability to influence areas outside the proposed activity (e.g., Is the slope adjacent sensitive areas?)
- consideration of existing infrastructure (e.g., fence lines and roads)
- stand-alone ponds with a 35-foot buffer not adjacent to other sensitive resources were “punched out” of the Pasture subzone

These criteria define the GIS coverage for the Pasture subzone and would require site-specific field verification by NPS prior to implementing practices to determine on-the-ground status of undetected sensitive resources, practical feasibility, and other site considerations for proposed activities.

Ranch Core Subzone

The Ranch Core subzone is identified as the developed complex of structures and buildings on most ranches. This subzone would also include up to 2.5 acres of disturbed lands located immediately adjacent to the developed complex that do not contain or have the potential to affect sensitive resources. Ranches without a developed complex or buildings that are not occupied by individuals associated with ranch operations would not have a Ranch Core subzone. The exact location of the Ranch Core subzone would be defined in each individual Ranch Operating Agreement.

Draft Criteria for NPS Field Surveys to Use to Refine Subzones

- Resource survey required if one has not been conducted in last five years
- Vegetation surveys would follow 0.25-hectare plot grassland methodology developed with University of California, Berkeley, and note that it is Range subzone if plots return:
  - Rare or sensitive species
  - Obligate wetland indicator species
  - Native grasses as dominant species

- NPS would evaluate the location of a proposed activity to determine the activity’s ability to influence areas outside the proposed footprint (e.g., % slope and seed dispersal)
- NPS would consider restoration suitability to determine the most appropriate subzone designation:
  - Adjacent to high quality resource area?
  - Same soil?
  - Similar slope?
  - If yes, do not include in Pasture subzone.

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APPENDIX I—FORAGE MODEL

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APPENDIX I: RATIONALE, WORKFLOW, AND EXAMPLES USING THE R PACKAGE FORAGE() TO PREDICT RANGELAND RESIDUAL DRY MATTER[1]

Ben Becker, Dave Press, Samuel Kraft, Roxanne Foss and Dylan Voeller[2]

June 25, 2019

Introduction

The Forage() R package implements Monte Carlo simulations of rangeland forage production and consumption by cattle (and, if desired, elk) with the goal of predicting the residual dry matter (RDM) on a specified rangeland at the end of the season. The primary output consists of a series of plots showing production (lbs. of forage grown in a season), consumption, and probability that the RDM is above a set threshold at the end of the season. The output provides a probability of meeting RDM thresholds over the long-term given natural variation in rainfall. Because forage production varies mainly with rainfall (but also with temperature, nutrients, inedible plants, etc.), results should not be interpreted as the likelihood for any given year, but rather the probability over many years of varying rainfall similar to the rainfall patterns observed from 1987–2018.

The package is not designed to be a standalone solution, but rather a supplementary tool combined with range manager and rancher expertise, historical information, USDA estimates of production and demand, and variation in on the ground conditions and weather/climate. Nonetheless, this tool provides a rapid estimation tool for managers assessing the ability of a land parcel to support variation in stocking rates, forage decomposition, etc. The simulations can also be scaled by less than a full year if desired.

The simulations rely on a variety of estimated and empirical parameters, including:

- Natural Resource Conservation Service (NRCS) forage production estimates by soil type summed for the entire ranch (estimated and corrected with empirical ungrazed plot data)
- USDA estimates of dry matter demand for cattle (estimated, given specific stocking rates and cattle size and class)
- Current permitted number of cattle on the Ranch (empirical)
- Forage consumption rates of elk (estimated with empirical mass input)
- Elk population and residence time (# days per year) (empirical)

At the most basic level, the simulations calculate:

$$(RemainingRDMfrompreviousyear(lbs) - MonthlyDecompositionRate) +$$

$$(USDARanchForageProduction(lbs) * ControlPlotCorrection * SeasonalCorrection) -$$

$$(MonthlyForageDecayRate - SummerMonthlyDecompositionRate) -$$

$$(CattleIntakeperDay * DaysonRanch * ProportionNonsupplementalFeed) -$$

$$(ElkIntakeperDay(lbs/lbs) * ElkDaysonRanch)$$

with random variation around each variable that is detailed below.

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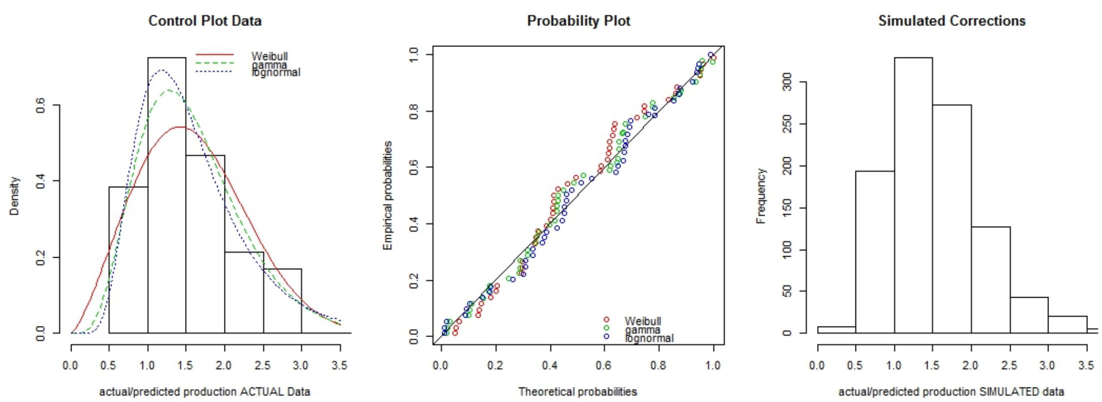
[1] The case study portion (section 4) of this document was added post-peer review. However, it is an application of the peer-reviewed model, and thus follows the same methodologies.

[2] Point Reyes National Seashore, ben_becker@nps.gov

Data for the Simulations

- A forage production estimate at the ranch scale. We generated forage production using a soils map for ranches using data available from the USDA NRCS (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).
- The number of acres of each soil type on a ranch was calculated in GIS.
- Acres not suitable for grazing (e.g., dune habitats, forest, and dense coastal scrub) were excluded from the forage production estimate. The data set is currently based on the 1994 NPS vegetation map with known updates to shrub and weed areas. However, this may be updated in the future to more realistically reflect current conditions and identify and misclassifications.
- The available forage (lbs.) for each ranch was determined by multiplying the USDA NRCS estimates of forage production (lbs./acre, normal year) for each soil type by the total numbers of acres of each soil type found within the grazeable acres of the ranch.
- The total forage production on a ranch was then scaled by a single correction factor derived from the ratio of dry matter produced on ungrazed (i.e., control) plots (N = 59 samples from 6 different plots between 1987 and 2018) to the USDA soil prediction for forage under a normal year. These samples represent a wide range of rainfall and production and ratios ranged from about 0.5 to 3.0 (one outlier of 4.5 was removed) (Figure 2). The distribution of corrections (actual production - predicted production) best fit a gamma distribution (shape = 6.13, rate = 4.01) determined using the fitdistrplus R package (Delignette-Muller and Dutang 2015).



Distribution fitting for ratio of ungrazed control plots to NRCS soil production predictions. The best fit (by AIC) gamma distribution is used to scale soil production in ranch.forage() *and other functions. Left plot shows empirical ratio of end of year forage to NRCS predicted forage with best fits of Weibull, Gamma, and Lognormal distributions (all non-negative distributions). Center plot shows fits to theoretical probabilities, and right plot shows simulated values based on the best fit gamma distribution.*

Additional Simulation Inputs Related to Ranch Production and Consumption to Arrive at a Final Estimate of RDM

- Remaining dry matter from the previous year is also included in the beginning of year forage availability. Both past year and present year forage decomposed at a rate of 0.07 ± 0.02 percent per month (Frost et al. 2005) with previous year's RDM decomposing immediately and current year forage decay beginning in the dry season (July, but this can be edited).
- The average daily dry matter demand for cattle (dairy and beef) were obtained from USDA tables (see references). Simulations include Gaussian variation around the mean.
- The number of permitted cattle on each ranch was obtained from the Special Use Permit signed between the NPS and the ranch. This has a default small Gaussian error.

- The total forage demand (lbs./day) with Gaussian error was calculated by multiplying the daily dry matter demand for cows by the number of permitted cows on the ranch.
- For Dairy ranches, the amount of dry matter (lbs.) required annually for each ranch to meet its organic certification was calculated by multiplying the total forage demand by 120 days by 30% (7 CFR Subtitle B, Chapter I, Subchapter M, Part 205). For Beef ranches, the days and percentages were generally 365 and 80-95%.
- The forage remaining after organic certification (Dairy) or other DMI (Beef) has been met is calculated by subtracting the total amount of dry matter required to meet the certification from the total estimated forage available on the ranch.
- The default values for **beef** cow-calf pairs was 26 ± 2 lbs. (USDA 2010a) and these values can be adjusted for any model as needed. The default values for **dairy** cattle forage needs were taken from USDA tables on organic dry matter demand for milk cows, dry cows, and heifers from a range of sizes organic dry matter demand tables 1-5, 1-7, 1-9, and 1-10 (USDA 2010b). Bulls were considered equivalent to a milk cow. These values can be changed for any model as desired. Here we show the raw values used for the dairy demand values.

Here we show the daily intake values for Dairy Cattle and print out the means and standard deviations of daily forage required (lbs.) by dairy cow type.

```
## these are required daily forage in lbs. used for different cow classes.
## We used the values for a range of cow sizes that are generally on Point
Reyes ranches.

## Milk cow daily forage requirement from USDA organic Dry Matter Demand
Table 1-5
milkcow.mean.lb <- mean(c(50, 52, 54, 56.6, 62, 63, 66, 70))
milkcow.sd.lb <- sd(c(50, 52, 54, 57, 62, 63, 66, 70))

## Dry Cow daily USDA organic Dry Matter Demand Table 1-7
drycow.mean.lb <- mean(c(32, 30, 22))
drycow.sd.lb <- sd(c(32, 30, 22))

## Heifer daily USDA Organic Dry Matter Demand Table 1-9 & 1-10
heifer.mean.lb <- mean(c(9.2, 11.4, 13.5, 15.5, 17.3, 19.1, 23, 25, 26.8,
28.6, 30.3))
heifer.sd.lb <- sd(c(9.2, 11.4, 13.5, 15.5, 17.3, 19.1, 23, 25, 26.8, 28.6,
30.3))

## Put all values in a table and Check that numbers look reasonable
print(as.data.frame(cbind(milkcow.mean.lb, milkcow.sd.lb, drycow.mean.lb,
drycow.sd.lb,
                          heifer.mean.lb, heifer.sd.lb)), digits = 3)

##   milkcow.mean.lb milkcow.sd.lb drycow.mean.lb drycow.sd.lb heifer.mean.lb
## 1            59.2          7.11             28         5.29             20
##   heifer.sd.lb
## 1         7.22
```

Additional Inputs when Estimating the Forage Consumption and Subsequent RDM Effects of Elk on a Ranch

- Actual female and male elk masses from Tule Elk at Point Reyes.
- Daily elk forage consumption rate is between 20-25 grams of forage per kilogram of body weight.
- Number of days elk are resident on a ranch unit (max 365 d) and the number of elk (with Poisson variance).

We then estimate the remaining forage on a ranch at the end of the season. In some cases, we may want to know the RDM values or other parameters prior to the traditional end of the season (October), thus the simulations can be scaled using a seasonal correction factor based on Becchetti et al. (2016) that simulates RDM at the end of the Winter (November-January) period or Spring (February - May) period. Care must be taken to also adjust number of days that cattle (or elk) are foraging as well. Especially considering that when specifying a simulation for the February - May period, growth and consumption inputs must include the prior November - January, or the results will be incorrect.

Function Overviews

All functions were programmed in R 3.5.1 (R Project Team (2015) using the R Studio Integrated Development Environment (RStudio Team 2016) and functions from the tidyverse R package (Wickam et al. 2018). Each function shares many parameter inputs that can be found in the help files for each function and was designed for a different but related simulation. The output of all the simulations should be interpreted as “given the known variability (wet/dry/etc.) in forage production conditions, what is the distribution of RDM we are likely to see in any given random year?” Of course, wet years will be at the higher end of the results and dry years at the lower end, but the goal is to produce a long-term expected probability of end of season RDM conditions under specified stocking rates. The functions in the package are as follows:

- ranch.forage() simulates 1000 realizations of forage production and consumption under specified parameters such as cattle numbers, days on ranch, etc. This function is usually called within the ranch.forage.mc() and elk.forage.mc() functions, but can be used alone if there is not a need to vary cattle or elk numbers.
- ranch.forage.mc() loops the ranch.forage() function through a range of specified cattle stocking rates.
- dairy.forage() is similar to ranch.forage() except it can incorporate additional information on cattle ages/types. This function is not designed to loop through varying cattle stocking rates.
- elk.forage.mc() loops through the ranch.forage() function while keeping cattle numbers constant and varying elk numbers.
- forage.stats() is used internally by the two “.mc” (for monte carlo) functions to produce RDM plots under varying levels of cattle or elk.

Examples

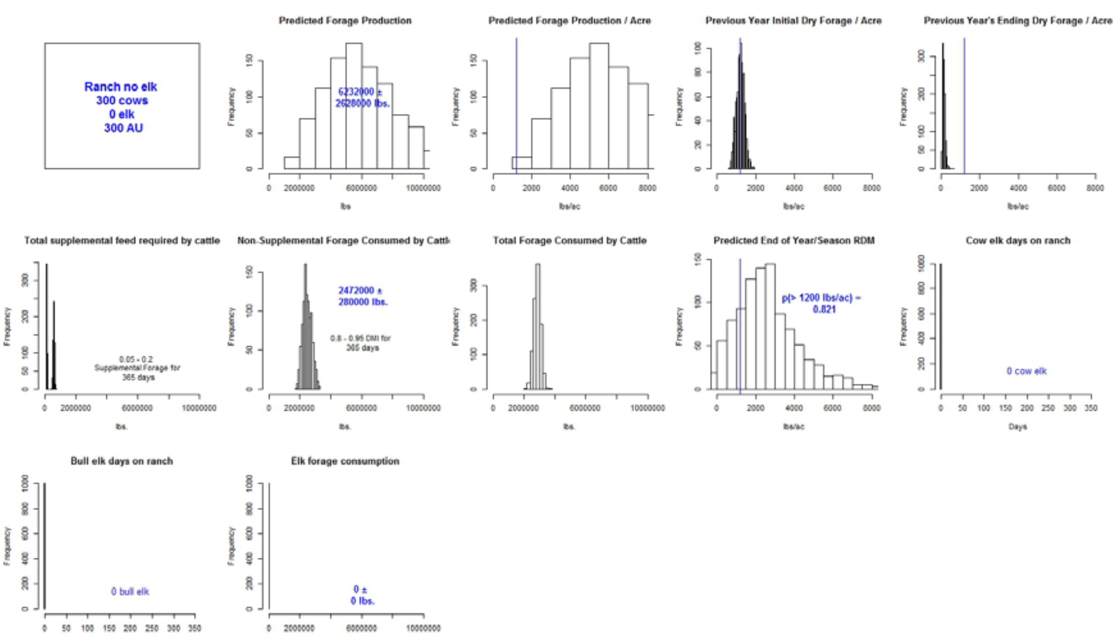
For all the examples below, we need to load the following packages:

```
require(plyr)
require(reshape2)
require(ggplot2)
require(Forage)
library(fitdistrplus)
require(roxygen2)
library(Forage)
library(tidyverse)
require(reshape2)
```

Example 1: Simulating Beef Operation Single Stocking Rate on a Ranch with No Elk Using Ranch.Forage()

Here, we are using the basic function with most of the default values, only specifying the number of cattle, the size of the ranch, and the pasture production for the year derived from USDA soil production values. To see all of the options, type ?ranch.forage to access the help page. Results are presented in Fig. 3.

```
ranch.no.elk <-
  ranch.forage(
    number.bovines.x = 300,
    pasture.name = "Ranch no elk",
    pasture.acres = 1000,
    pasture.prod.lb.x =  4000000
  )
```



Output from Example 1. A `ranch.forage()` simulation for a fictitious ranch with 300 cattle (The 100 AU are simply a potential authorized lease number not included in calculations). Histograms represent realizations of each of 1000 simulations. Moving from left to right and down these are: total forage produced on ranch; forage produced per acre; forage remaining from previous season; previous season forage remaining at end of current season; supplemental forage required by cattle; forage from range required by cattle; total forage required by cattle; end of season RDM per acre; days (and number) of female elk; days (and number) of male elk.

Further analyses and calculations can be performed with the model outputs. Try summary(ranch.no.elk) and you will see the model outputs that can be used to generate custom statistics or plots. For example, if you wanted to know the mean and make a histogram of the simulated forage production, type:

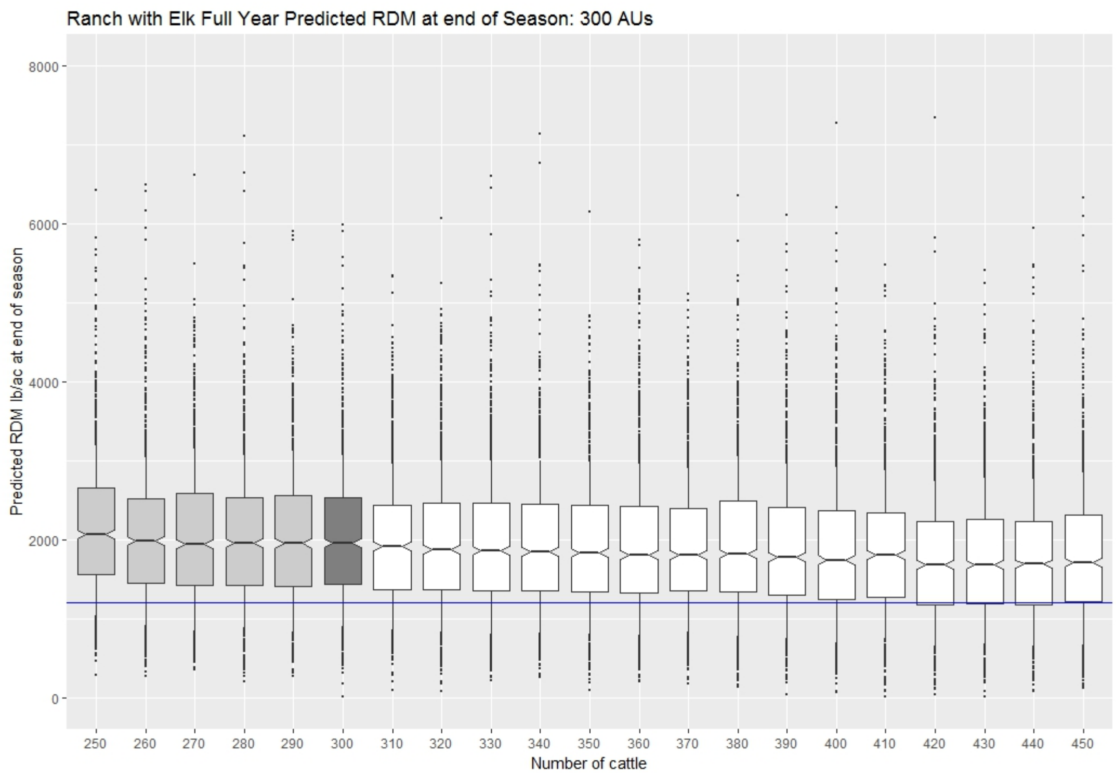
```
mean(ranch.no.elk$pasture.prod.lb)
> 6149859
hist(ranch.no.elk$pasture.prod.lb)  ## not run
```

Example 2: Simulating Multiple Stocking Rates on a Beef Ranch with Elk Using `Ranch.Forage.Mc()`

Next, we add some complexity by varying the number of cattle by looping through the ranch.forage() function using ranch.forage.mc(). We will also specify that elk are on the ranch for some period of time. This example covers only the winter (Nov - Jan) and spring (Feb - May) growing seasons which totals 7 months. The production, decay, and consumption will all be scaled to reflect the shorter time period. Note that seasonal correction values are derived from Frost et al. 2005 who measured the percentage of annual production by month for California grasslands. Results are presented in Fig. 4.

```
Ranch_Elk_Winter_Spring.mc <-
  ranch.forage.mc(
    number.bovines.x <- seq(250, 450, by = 10), ## Loop through 250 - 450
cattle in steps of 10
    pasture.name = "Ranch with Elk Full Year",
    pasture.acres = 2110,
    pasture.prod.lb.x = 4500000,
    rdm_start_dry_decay_mos = 7,               ## last years RDM decays for
7 months
    current.au = 300,                        ## this authorized # cattle and
is used only for plotting
    elk.cows.x = 5,
    elk.bulls.x = 25,
    elk.cow.days.on.pasture.x = 75,
    elk.bull.days.on.pasture.x = 75,
    seasonal_correction = 0.16 + 0.81,         ## 0.16 for winter growth and
0.81 for spring
    DMI.req.wet = 0.95,
    DMI.req.norm = 0.85,
    DMI.req.dry = 0.80,
    loss_mean = 0.07,                          ## 7 % loss per month per
Frost et al 2005
    loss_sd = 0.02,                            ## Not much data for this
estimate
    loss_mos = 0,                              ## set to zero if not
```

```
including summer-fall
    rdm.ac.req = 1200,                              ## target RDM at end of
season
    bovine.daily.dry.matter.lb.x = 26,              ## lbs of daily intake for a
beef cow/calf
    bovine.daily.dry.matter.lb.sd = 2,
    bovine.days.on.pasture = 91 + 121               ## Days cattle on pasture
(winter + spring = 7 mos)
  )
Ranch_Elk_Winter_Spring.mc                          ## show the plot
```



Boxplot output from Example 2. `ranch.forage.mc()` will automatically include a series of panels like Fig. 3 for each stocking rate. Calling the object after running the model will produce this plot showing simulated RDM at the end of the season for the range of stocking rates. The horizontal blue line shows the designated RDM target. The middle 50% of the simulations are represented within the boxes, with lines going out to 2.5% and 97.5%, Thus, when the "bottom" of a box touches the desired RDM line, that can be interpreted as ~75% of the simulations were greater than the specified RDM. In this example, this is the case for the stocking rates between ~400 - 450. Boxplots are automatically colored light grey when below the selected stocking rate, dark grey at the authorized stocking rate, and white when above the authorized stocking rate. In this example, the simulations end in May (end of growing season) so these are expected RDM values 4-5 months before the end of the summer when RDM is traditionally recorded. Adding the extra 5 months of grazing and natural decomposition will result in lower RDM values.

We can also display a table of the specific probabilities of meeting the specified RDM at various cattle stocking rates using the RDM.Probabilities.cattle() function.

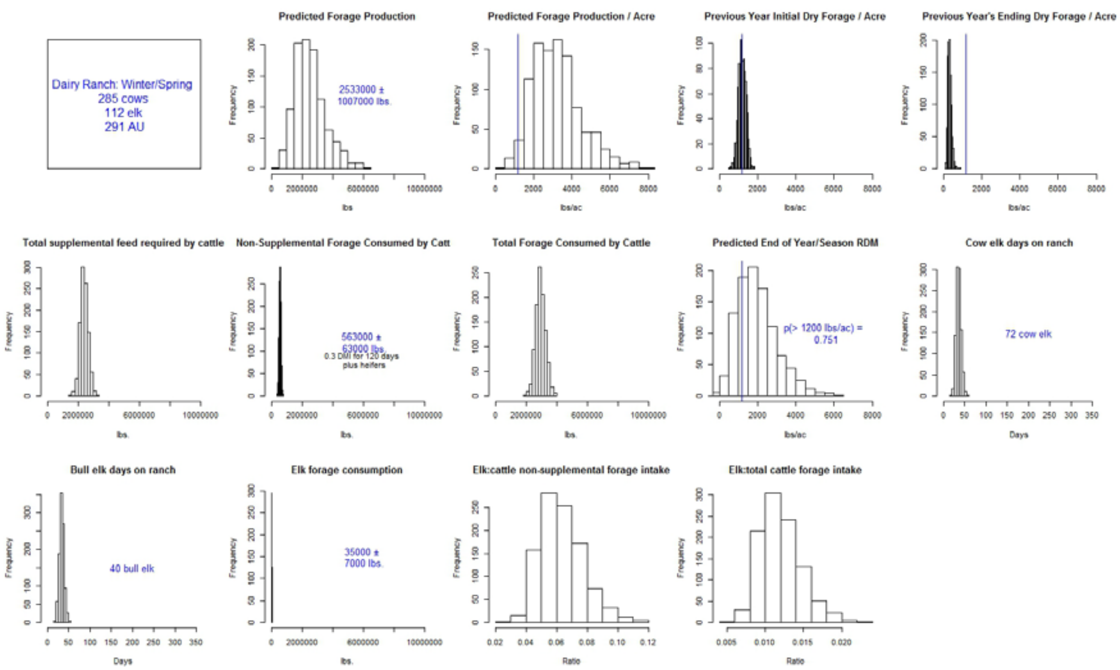
```
## Not run, default RDM is 1200
RDM.Probabilities.cattle(Ranch_Elk_Winter_Spring.mc$data, rdm.ac.req = 1200)
```

Example 3: Simulating Dairy Operation Stocking Rate for only the Winter and Spring Seasons with Elk Using Dairy.Forage()

Dairy ranches have milk cows, dry cows and heifers which all may have different numbers of days on pasture and daily forage requirements. Bulls are assumed to have similar energy requirements as milk cows. Results are presented in Figure 5.

```
Dairy.Ranch.Elk.Winter.Spring <- dairy.forage(
  pasture.name = "Dairy.Ranch: Winter/Spring (November - May)",
  pasture.acres = 785.106173,
  pasture.prod.lb.x = 1722319.616,
  seasonal_correction = 0.16 + 0.81,
  rdm_start_dry_mean = 1200,          ## presumed RDM leftover from last
season
  rdm_start_dry_decay_mos = 3 + 4,    ## months are for winter and spring
  number.milkcow.x = 200,
  number.drycow.x = 40,
  number.heifer.x = 45,
  elk.cows.x = 72,
  elk.bulls.x = 40,
  elk.cow.days.on.pasture.x = 21  + 15,
  elk.bull.days.on.pasture.x = 19 + 3 + 12,
  current.au = 291,                   ## Authorized number of cattle on ranch
  bovine.days.on.pasture = 120,       ## USDA Organic Requirement
  DMI.req = 0.30,                     ## for milk cows, USDA Organic
Requirement
  heifer.days.on.pasture = 90 + 120,
  heifer.DMI.req = 0.50               ## assume derive 50% of forage from
pasture
)

## get the mean and sd of remaining forage per acre (RDM) at the end of the 7
month simulation
mean(Dairy.Ranch.Elk.Winter.Spring$remaining.forage.lb /
Dairy.Ranch.Elk.Winter.Spring$pasture.acres)
sd(Dairy.Ranch.Elk.Winter.Spring$remaining.forage.lb /
Dairy.Ranch.Elk.Winter.Spring$pasture.acres)
```



Output from Example 3. Summary of simulations for November - May on a dairy ranch with 285 cattle and 112 elk (and an AU of 291). This output is identical to Figure 3, however, because there were elk in this model, two additional panels are included: ratio of elk/cattle total non-supplemental forage consumption; and ratio of elk/cattle total consumption.

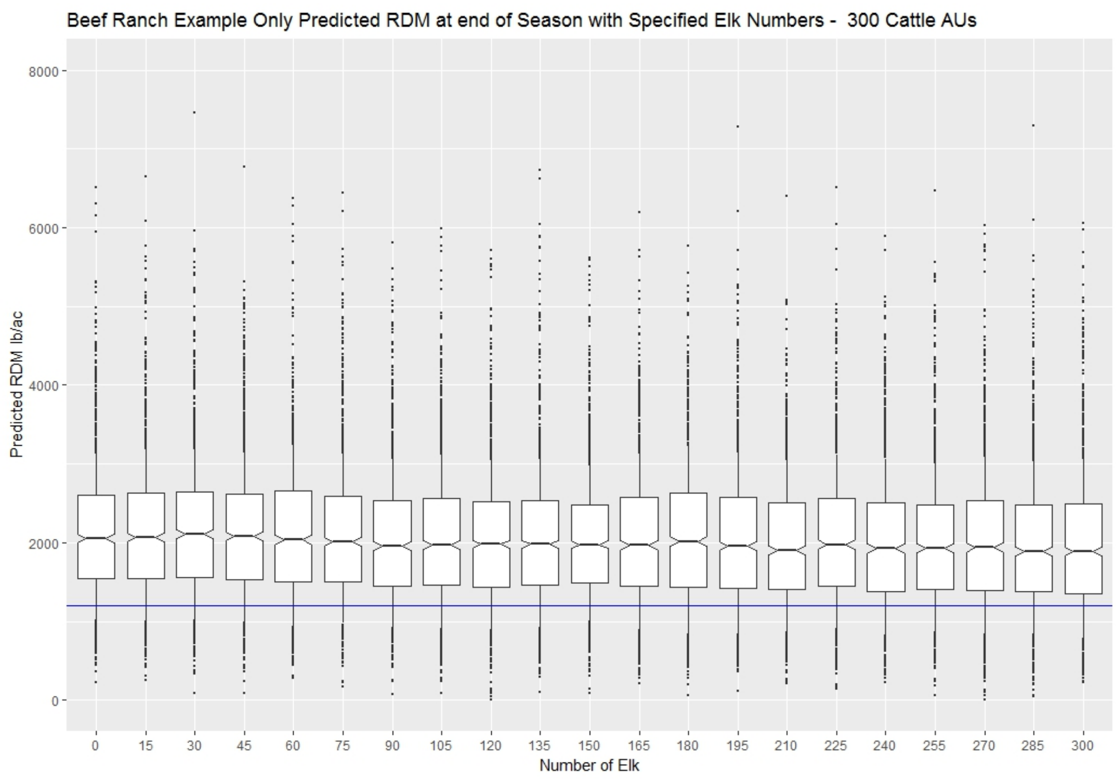
Example 4: Simulating Varying Elk Numbers on a Beef Ranch Using ELK.FORAGE.MC()

In our last example, we vary the number of elk on a ranch while holding the number of cattle steady. The simulation encompasses the full year (Nov - October). Results are presented in Figure 6.

```
vary.elk.Beef_ranch_example <- elk.forage.mc(
  number.bovines.x = 300,
  elk.cows.x = seq(0, 200, by = 10),       ## sequence of cow elk numbers
  elk.bulls.x = seq(0, 100, by = 5),       ## sequence of bull elk numbers
  elk.bull.days.on.pasture.x = 300,
  elk.cow.days.on.pasture.x = 100,
  rdm_start_dry_mean = 1200,
  pasture.name = "Beef Ranch Example Only",
  pasture.acres = 2110,
  pasture.prod.lb.x = 4552656,
  bovine.days.on.pasture = 365,            ## need 120 days/yr on pasture per
org cert.
                                           ## Make sure to correct for
shorter seasons.
  DMI.req.wet = 0.95,
  DMI.req.norm = 0.90,
  DMI.req.dry = 0.80,
  bovine.daily.dry.matter.lb.x = 26,       ## beef
  current.au = 300,
  seasonal_correction = 0.16 + 0.81 + 0.03,  ## make cumulative for full year
  rdm_start_dry_decay_mos = 3,
```

```
  loss_mean = 0.07,                         ## 7 % loss per month per Frost et
al 2005
  loss_sd = 0.02,                           ## need better SD
  loss_mos = 3                              ## set to zero if not including
summer-fall
)

vary.elk.Beef_ranch_example                 ## calls the plot
```



Output from Example 4. This plot can be read similarly to Figure 5, except that cattle numbers are kept constant and elk numbers vary. This simulation shows minimal RDM decline with increases in elk in part because it is a large ranch with mostly female elk that are only present for 100 days of the year.

Similar to when we varied cattle, we can also display a table of the specific probabilities of meeting the specified RDM at various elk counts using the RDM.Probabilities.elk() function.

```
## Not run, default RDM is 1200
RDM.Probabilities.elk(vary.elk.Beef_ranch_example.mc$data, rdm.ac.req = 1200)
```

C Ranch Case Study

Introduction

Here, we perform preliminary simulations of expected residual dry matter (RDM) on C Ranch (including D West Pasture) at Point Reyes National Seashore with current information on numbers of elk, sex of elk, and time spent on C Ranch derived from observational and telemetry studies over the past several years. We use the dairy.forage() function in the Forage() package (Becker et al., 2019) which simulates the probability of meeting a specific RDM value (in this case 1200 lbs/ac) being satisfied at the end of the season under specific numbers of dairy cattle (including dry cows, bulls, heifers) and elk. Computationally, the simulations are similar to traditional methods developed by USDA to estimate stocking rates for cattle (CITE) based on forage requirements and soil productivity. However, to assist managers with assessing the probability of meeting a specific RDM threshold, we have have incorporated random annual variation around all parameters (forage growth, cattle intake, elk intake, etc.) and empirical correction factors derived from ungrazed field plots (Becker et al., 2019). Documentation and help files for the Forage() package includes details for all models, calculations, code, assumptions, and inputs (Becker et al., 2019).

The output from these simulations represents the expected (mean) over a large number of years given historic variation in rainfall. The scale of the RDM estimates are at the entire ranch level. Subunits within the ranch should vary based on specific spatial use by cattle and elk. Finer sub-ranch estimates would require more detailed information on cattle and elk locations through the year. Thus, the goals of these simulations are broad scale, ranch level estimates of expected long-term RDM conditions.

C Ranch Methods and Results

C Ranch Model Assumptions. We built a simulation from available information that C Ranch/D West currently has:

- Average annual forage production of 1,722,320 lbs. on 785 acres derived from USDA soil production tables (USDA 2019).
- Each rainy season begins with 1,200 lbs. of RDM/ac remaining from the previous year.
- 200 milk cows (which includes a few bulls with similar intake requirements) and 40 dry cows which require 120 days of pasture feeding at 30% of the DMI.
- 45 Heifers that derive 50% of their DMI from the range year round.
- 73 Female (cows + juveniles) elk that spend 76 days per year on C Ranch.
- 51 Male (all age classes) elk that spend 103 days per year on C Ranch.

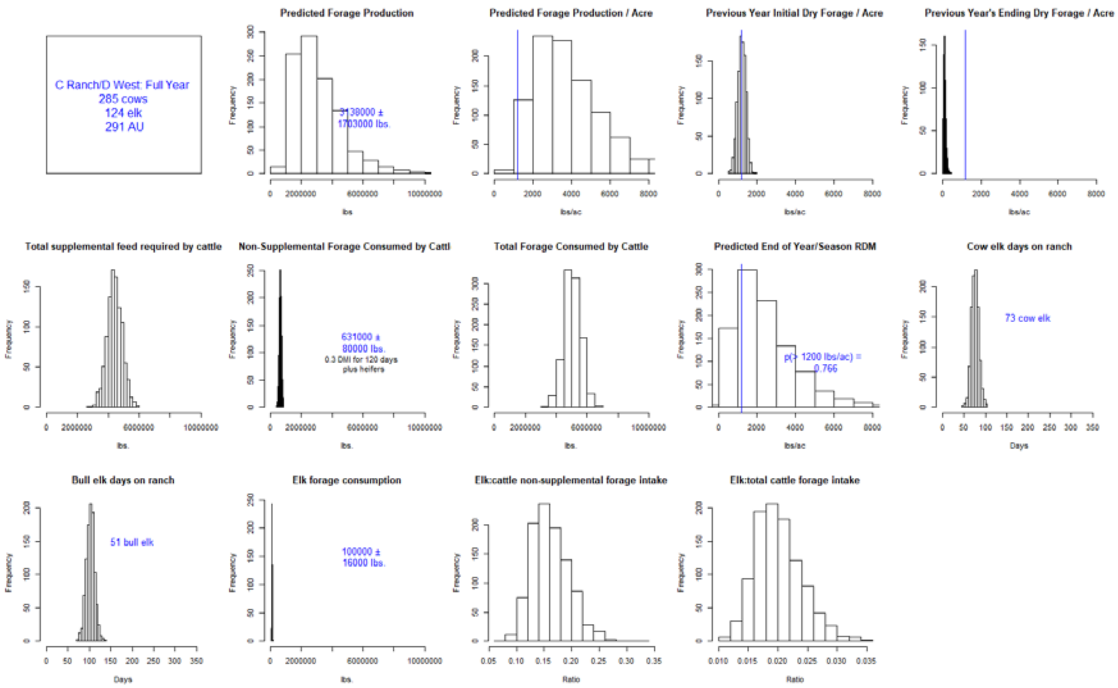
Any of these parameters can be modified as more detailed information becomes available.

Perform C Ranch Simulations and View Results

C Ranch Current Elk Numbers and Residence Time. Here we show the input parameters for the dairy.forage() function to perform the simulations and produce graphical output. The text following the “#” on each line indicates the source or additional details of the data.

```
set.seed(123)                                # make simulations repeatable
Spaletta.Elk.Full.Year<- dairy.forage(
  pasture.name = "C Ranch/D West: Full Year",
  pasture.acres = 785.1,                     # per GIS
  pasture.prod.lb.x = 1722319.6,             # from GIS and NRCS
  seasonal_correction = 0.16 + 0.81 + 0.03, # full year
  rdm_start_dry_mean = 1200,                 # Beginning of year RDM
  rdm_start_dry_decay_mos = 12,              # Initial RDM decays all year
  number.milkcow.x = 200,                    # from Voeller
  number.drycow.x = 40,                      # from Voeller
  number.heifer.x = 45,                      # from Voeller
  elk.cows.x = 73,                           # per 2019 data
  elk.bulls.x = 51,                          # per 2019 data
  elk.cow.days.on.pasture.x = 76,            # per 2019 data
  elk.bull.days.on.pasture.x = 103,          # per 2019 data
  current.au = 291,                          # per lease
```

```
  bovine.days.on.pasture = 120,             # USDA Organic Req
  DMI.req = 0.30,                           # USDA Organic Req
  heifer.days.on.pasture = 90 + 120 + 155,  # assume year round
  heifer.DMI.req = 0.50                     # Assume 50% from pasture
)
```



The model output panels from left to right and down show for any given year the predicted values for C Ranch and D West:

1. Distribution and mean total forage production: 3,138,000 ± 1,703,000 lbs.
2. Distribution and mean forage production per acre (blue line at 1200 lbs/ac).
3. Beginning of year RDM (mean set at 1200 lbs/ac = blue line).
4. Amount of beginning year RDM remaining at end of year (blue line = 1200 lbs/ac).
5. Supplemental feed required by cattle: 631,000 ± 80,000 lbs.
6. Non-supplemental forage required by cattle (from range).
7. Total supplemental and non-supplemental feed and forage consumed by cattle.
8. Predicted end of year RDM and probability that it exceeds 1200 lbs/ac. For this simulation we expect to satisfy an RDM of 1200 lbs/ac about 77% of the time.
9. Number of days female elk are on C Ranch.
10. Number of days male elk are on C Ranch.
11. Total elk forage consumption from C Ranch: 100,000 ± 16,000 lbs.
12. Elk:Cattle ratio of range forage consumption. Elk are consuming about 10-20% of what cattle consume from the range. The functions in the Forage() package assume that daily elk forage consumption rate is 20-25 g/kg of body weight (Holechek 1988, Thomas & Toweill 1982).
13. Elk:Cattle ratio of total forage consumption.

The expected mean RDM over the long term with these inputs is 2475 lbs/ac. Mean annual expected forage production is ~3,100,000 lbs. with elk consuming ~100,000 lbs. over the year (~3%).

Varying Elk Numbers and Residence Time on C Ranch. Next, we simulate varying levels of elk numbers using a similar male:female ratio (51:73) which is approximately 0.7:1, and similar numbers of days present on C Ranch.

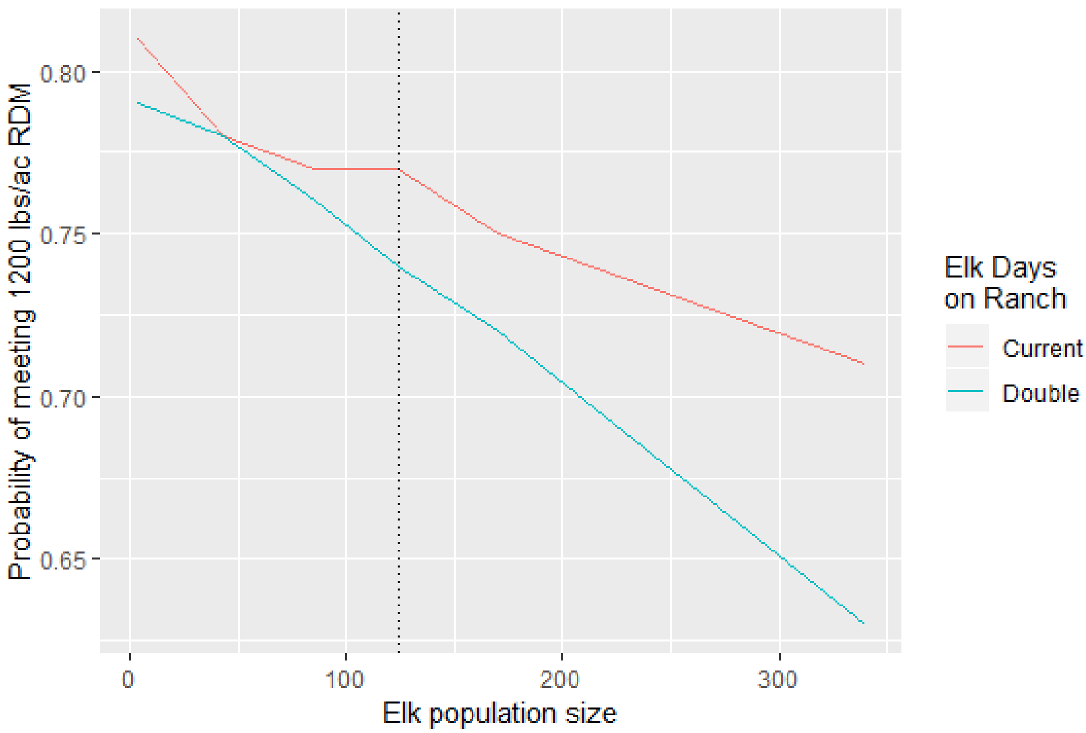
Probability of achieving RDM >1200 lbs/ac and forage consumed by elk with varying numbers of elk and 2019 use patterns on C Ranch.

Males	Females	p(RDM>1200)	Forage consumed (lbs)	Mean percent of available forage consumed
1	2	0.81	2,000	0
18	25	0.78	35,000	1
35	50	0.77	69,000	2
51	73	0.77	100,000	3
70	100	0.75	138,000	4
140	200	0.71	275,000	9

Due to the amount of time that elk currently are present on the ranch, elk numbers must nearly triple from the 2019 elk numbers to reduce probability of meeting RDM by ~10% (from 0.80 to 0.71). We also see that the differences between 3 and 124 elk have a negligible effects on the probability of meeting RDM requirements. Doubling the number of days elk spend on the ranch at varying elk numbers has a predictable decrease in meeting RDM targets (Table 2, Figure 1).

Probability of achieving RDM >1200 lbs/ac and forage consumed by elk with varying numbers of elk using C Ranch and double the current residence time on the ranch (males: 206 days, females: 152 days).

Males	Females	p(RDM>1200)	Forage consumed (lbs)	Mean percent of available forage consumed
1	2	0.79	5,000	0
18	25	0.78	70,000	2
35	50	0.76	138,000	4
51	73	0.74	201,000	6
70	100	0.72	276,000	9
140	200	0.63	551,000	18



Probability of meeting 1200 lbs/ac at C Ranch with variation in elk population size at current (M:103 d; F:76 d) and doubled (M:206 d; F:152 d) use level. Current population size is shown with a vertical dashed line. Data from Tables 1 and 2.

C Ranch Case Study Discussion

These simulations predict that under this scenario of 285 cattle satisfying minimum organic forage requirements and 124 elk on the ranch for either 76 (females) or 103 (males) days would satisfy an RDM threshold of 1200 lbs/ac about 79% of years. These simulations can be extended to scenarios varying cattle numbers and forage requirements (DMI, days on range, etc.) to compare differing management scenarios.

Simulation results from the Forage() package are dependent upon correction factors derived from ungrazed RDM plots at Point Reyes National Seashore and Golden Gate National Recreation Area. Forage() had reasonable ability to predict RDM ($r = 0.58$, $P < 0.01$) at 17 representative grazed beef cattle RDM study sites (Becker and Voeller, 2019). This prediction generally had a slight positive bias, overestimating actual RDM by about 8% (50th percentiles -2% to 0.16%). These simplified estimates assume that both cattle and elk have equal access and an equal probability of consuming forage over the entire Ranch area. In reality, grazing is less likely to be equal or random on dairy ranches such as C Ranch, since dairy cattle must frequently travel to a central location for milking. So while these estimates predict a ranch level mean RDM based on gross forage production and consumption, smaller scale local RDM would likely vary.

Discussion

This group of functions should be viewed as general simulations to approximate on the ground conditions for planning cattle stocking rates. The outputs can be used in conjunction with on the ground observations and data to provide a foundation to predict long term patterns of RDM under various cattle (and elk) stocking rates. Additional information from expanded control plots and comparing the model to on the ground conditions should be used to improve, calibrate, and validate the simulations. Additional areas that could be improved and may yield more realistic estimates include incorporating information on:

- Dietary overlap between elk and cattle (currently assumes 100%).
- Other wildlife present on the ranch which may affect forage availability, such as black-tailed deer.
- Whether grazing stimulates current growth or alters subsequent plant growth.
- Spatial patterns of use exhibited by the cattle or tule elk on a ranch. The cows (and elk) generally do not utilize all areas of the ranch equally. This model is non-spatial, if spatial information were desired and cattle stocking rates were known, the functions can accommodate simulations at the pasture or paddock scale by simply changing the inputs (production, cattle, days on pasture, etc.) to the proper scale.
- Updated mapping of available cattle forage areas on ranches and impacts from weeds/inedibles.
- Estimates of forage loss due to trampling and defecation. These are likely to be small in our study system but could also be included for other areas.
- Gathering additional data within soil types could allow testing the current assumption of similar corrections between soils, or if separate corrections are more appropriate.

Despite these limitations, the methods developed provide a foundation that can be used to generalize long term patterns of RDM under various cattle (and elk) stocking rates.

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APPENDIX J—THREATENED AND ENDANGERED SPECIES TABLES

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APPENDIX J: THREATENED AND ENDANGERED AND SPECIAL-STATUS SPECIES TABLES

TABLE J-1: STATE-LISTED/STATE RARE PLANTS

Common Name	Scientific Name	State Status[a]/ CRPR[b]	Habitat
Pink sand-verbena	*Abronia umbellata ssp. breviflora*	NA/1B.1	Coastal dune
Blasdale's bent grass	*Agrostis blasdalei*	NA/1B.2	Coastal prairie; coastal dune; coastal scrub; chaparral
Coast rock cress	*Arabis blepharophylla*	NA/4.3	Hardwood forest; coastal scrub; coastal prairie
Coastal marsh milkvetch	*Astragalus pycnostachyus var. pycnostachyus*	NA/1B.2	Wetland; riparian; along estuary margins
Point Reyes blemnosperma	*Blennosperma nanum var. robustum*	CR/1B.2	Coastal prairie; grazed and ungrazed areas
Thurber's reed grass	*Calamagrostis stricta ssp. inexpansa*	NA/2B.1	Freshwater marsh; northern coastal scrub
Coastal bluff morning-glory	*Calystegia purpurata ssp. saxicola*	NA/1B.2	Coastal scrub; coastal dunes; grazed and ungrazed areas
Swamp harebell	*Campanula californica*	NA/1B.2	Bogs and fens; coniferous forest; coastal prairie and meadows; freshwater marshes and swamps
Buxbaum's sedge	*Carex buxbaumii*	NA/4.2	Bogs and fens; meadows and seeps; marshes and swamps
Johnny-nip	*Castilleja ambigua ssp. ambigua*	NA/4.2	Coastal scrub; coastal prairie; marshes and swamps; valley and foothill grassland
Glory bush	*Ceanothus gloriosus var. exaltatus*	NA/4.3	Chaparral
Point Reyes ceanothus	*Ceanothus gloriosus var. gloriosus*	NA/4	Coastal scrub; coniferous forest; coastal dunes
Mount Vision ceanothus	*Ceanothus gloriosus var. porrectus*	NA/1B	Coniferous forest; coastal scrub; coastal prairie; valley foothill and grassland
Mason's ceanothus	*Ceanothus masonii*	NA/1B.2	Chaparral (openings, rocky, serpentine)
Point Reyes bird's beak	*Chloropyron maritimum spp. palustre*	NA/1B.2	Coastal salt marshes
San Francisco bay spineflower	*Chorizanthe cuspidata var. cuspidata*	NA/1B.2	Coastal bluff scrub; coastal dune; coastal prairie; coastal scrub
Wooly-headed Spineflower	*Chorizanthe cuspidata var. villosa*	NA/1B.2	Coastal dunes; coastal prairie; coastal scrub
Bolander's water hemlock	*Cicuta maculate var. bolanderi*	NA/2B.1	Marshes and swamps; coastal, fresh or brackish water; wetlands in pastureland
Franciscan thistle	*Cirsium andrewsii*	NA/1B.2	Coastal prairie; coastal scrub; mixed coniferous forest
San Francisco wallflower	*Erysimum franciscanum*	NA/4.2	Often serpentine or granite, sometimes roadsides; chaparral; coastal dunes; coastal scrub; valley and foothill grasslands

Common Name	Scientific Name	State Status[a]/ CRPR[b]	Habitat
Marin checker lily	*Fritillaria lanceolata var. tristulis*	NA/1B.1	Coastal scrub; coastal prairie
Fragrant fritillary	*Fritillaria liliacea*	NA/1B.2	Coastal prairie; valley grassland; coastal scrub; woodland
Blue coast gilia	*Gilia capitata ssp. chamissonis*	NA/1B.1	Coastal dunes; coastal scrub; areas of open sand
Manyleaf gilia	*Gilia millefoliata*	NA/1B.2	Coastal dune
Short-leaved evax	*Hesperevax sparsiflora var. brevifolia*	NA/1B.2	Coastal scrub; coastal dunes; coastal prairie
Harlequin's lotus	*Hosackia gracilis*	NA/4.2	Hardwood forest/woodland; coastal scrub; coniferous forest; coastal prairie; meadows and seeps; marshes and swamps; valley and foothill grassland. Found in cattle grazed areas and near trails.
Perennial goldfields	*Lasthenia californica ssp. macrantha*	NA/1B.2	Coastal scrub; coastal dunes
Large-flower leptosiphon	*Leptosiphon grandiflorus*	NA/4.2	Coastal scrub; coniferous forest; woodland; coastal dunes; coastal prairie; valley and foothill grassland
Rose leptosiphon	*Leptosiphon rosaceus*	NA/1B.1	Coastal scrub; coastal prairie
Coast lily	*Lilium maritimum*	NA/1B.1	Coastal prairie; coastal scrub; forest/woodland
Point Reyes meadowfoam	*Limnanthes douglasii* ssp. *sulphurea*	CE/1B.2	Coastal prairie; mesic areas in meadows; freshwater marsh; and vernal pools.
Marsh microseris	*Microseris paludosa*	NA/1B.2	Forest/woodland; grassland; coastal dune; coastal scrub; chaparral
Curly-leaved monardella	*Monardella undulata*	NA/4.2	Coastal dune; coastal scrub
Gairdner's yampah	*Perideridia gairdneri ssp. gairdneri*	NA/4.2	Hardwood forest; chaparral; coastal prairie; valley and foothill grassland; vernal pools
North coast phacelia	*Phacelia insularis var. continentis*	NA/1B.2	Coastal scrub; coastal dune
Michael's piperia	*Piperia michaelii*	NA/4.2	Coastal prairie
Lobb's aquatic buttercup	*Ranunculus lobbii*	NA/4.2	Shallow pools near sea level
Point Reyes checkerbloom	*Sidalcea calycosa ssp. rhizomata*	NA/1B.2	Marshes and wet places
Beach starwort	*Stellaria littoralis*	NA/4.2	Marshes; bogs; coastal bluffs; seasonal wetlands in coastal prairie
Mt. Tamalpais jewel-flower	*Streptanthus glandulosus ssp. pulchellus*	NA/1B.2	Chaparral; valley and foothill grassland
Two-fork clover	*Trifolium amoenum*	NA/1B.1	Coastal bluff scrub; valley and foothill grassland
San Francisco owl's clover	*Triphysaria floribunda*	NA/1B.2	Coastal prairie
Western dog violet	*Viola adunca*	NA/NA	Coastal prairie; forest; wetland and riparian

Sources: CDFW (2019a); CNPS (2019); NPS (2017)

[a] NA – Not state listed; CR – State listed as Rare; CE – Listed as Endangered under CESA.

[b] California rare plant ranking; listing significance: List 1B – Plants rare, threatened, or endangered in California and elsewhere; List 2 – Plants rare, threatened, or endangered in California, but more common elsewhere; List 3 – Plants about which additional Information is needed – A review list; List 4 – Plants of limited distribution – A watch list.

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TABLE J-2: FEDERALLY LISTED THREATENED AND ENDANGERED PLANTS

Common and Scientific Name	ESA Status	CESA Status	Habitat	Analyzed Further?
Beach layia *Layia carnosa*	Endangered	Endangered	Coastal dune[a]	Yes. Known to occur on the AT&T, Davis, and B Ranches.
Marin dwarf flax *Hesperolinon congestum*	Threatened	Threatened	Serpentine grassland[b]	Yes. Known to occur on the Cheda, McIssac, and Zanardi Ranches
Showy Indian clover *Trifolium amoenum*	Endangered	None	Barrens; cliffs; grassland; coastal scrub; chaparral[c]	No. Species is believed to be extirpated.
Sonoma alopecurus *Alopecurus aequalis var. sonomensis*	Endangered	None	Moist soils in freshwater marshes[a]	Yes. Known to occur on the G, F, and H Ranches.
Sonoma spineflower *Chorizanthe valida*	Endangered	Endangered	Coastal prairie[b]	Yes. Known to occur on the G, F, and AT&T Ranches.
Tiburon paintbrush *Castilleja affinis* ssp. *neglecta*	Endangered	Threatened	Serpentine grassland[b]	Yes. Known to occur on the McIssac Ranch.
Tidestrom's lupine *Lupinus tidestromii*	Endangered	Endangered	Coastal dune[a]	Yes. Known to occur on the A, B, Davis, F, and AT&T Ranches.
Baker's larkspur *Delphinium bakeri*	Endangered	Endangered	Decomposed shale in mixed woodland plant communities[d]	No. Species does not occur in the park.
Yellow larkspur *Delphinium luteum*	Endangered	None	North-facing rocky slopes within coastal scrub communities, including areas with active rock slides, in Sonoma County[e]	No. Species is believed to be extirpated from Marin County.

Sources: USFWS (2018); CNDDB (2018); CNPS (2019)

[a] USFWS (2011a)

[b] USFWS (1998)

[c] USFWS (2012)

[d] USFWS (2014)

[e] USFWS (2011b)

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TABLE J-3: SPECIAL-STATUS WILDLIFE OCCURRING IN THE PLANNING AREA

Common Name	Scientific Name	State Status (CESA or CDFW Designation), or USFWS Bird of Conservation Concern (BOCC)	Habitat in the Planning Area
Mammals			
American badger	*Taxidea taxus*	CDFW Species of Special Concern	Open areas with friable soils, including grasslands, shrublands, woodlands, and coastal dunes
Point Reyes mountain beaver	*Aplodontia rufa phaea*	CDFW Species of Special Concern	Dense, shrublands on cool, moist, north-facing slopes with easily excavated, humus-rich soils with extensive and continuous heavy chaparral
Point Reyes jumping mouse	*Zapus trinotatus orarius*	CDFW Species of Special Concern	Wet, marshy coastal meadows with dark soils associated with coast redwood forests and riparian areas[a]
Pallid bat	*Antrozous pallidus*	CDFW Species of Special Concern	Open dry habitats with rocky areas
Townsend's big-eared bat	*Corynorhinus townsendii*	CDFW Species of Special Concern	Diverse habitats, but particularly mesic habitats, and natural (caves) or man-made (mines, tunnels, buildings) roosting sites
Western red bat	*Lasiurus blossevillii*	CDFW Species of Special Concern	Various habitats, from grasslands, shrublands, open woodlands, forests, and croplands
Birds			
Raptors			
American peregrine falcon	*Falco peregrinus anatum*	CDFW Fully Protected animal; USFWS BOCC	Mountains, cliffs, ledges, trees, or man-made structures near wetlands, rivers, and lakes
Bald eagle	*Haliaeetus leucocephalus*	CESA Endangered; CDFW Fully Protected animal	Large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches.
Burrowing owl	*Athene cunicularia*	CDFW Species of Special Concern; USFWS BOCC	Grassland and desert open areas with old small mammal burrows
Cooper's hawk	*Accipiter cooperii*	CDFW Watch List species	Dense stands of live oak, deciduous riparian or forest habitats near water
Ferruginous hawk	*Buteo regalis*	CDFW Watch List species	Open grasslands, agricultural areas, and shrublands
Merlin	*Falco columbarius*	CDFW Watch List species	Coastlines, open grasslands, shrublands, riparian areas, and forests
Northern harrier	*Circus cyaneus*	CDFW Species of Special Concern	Meadows, grasslands, open ranges, wetlands, and other open areas
Osprey	*Pandion haliaetus*	CDFW Watch List species	Inland lakes and reservoirs and some river systems with ponderosa pine and mixed conifer forests

Common Name	Scientific Name	State Status (CESA or CDFW Designation), or USFWS Bird of Conservation Concern (BOCC)	Habitat in the Planning Area
Sharp-shinned hawk	*Accipiter striatus*	CDFW Watch List species	Forests and riparian habitats
White-tailed kite	*Elanus leucurus*	CDFW Fully Protected animal	Open areas along the coast and valley lowlands
Passerines			
California black rail	*Laterallus jamaicensis coturniculus*	CESA Endangered; CDFW Fully Protected animal	Saline, brackish, and fresh emergent wetlands.
Grasshopper sparrow	*Ammodramus savannarum*	CDFW Species of Special Concern	Dry, dense grasslands with a diversity of grasses and tall forbs, with occasional shrubs for singing
Nuttall's woodpecker	*Picoides nuttallii*	USFWS BOCC	Low elevation riparian deciduous and oak habitats
Oak titmouse	*Baeolophus inornatus*	USFWS BOCC	Oak, montane hardwood-conifer forest, and riparian areas
Olive-sided flycatcher	*Contopus cooperi*	CDFW Species of Special Concern; USFWS BOCC	Forest and woodlands
Purple martin	*Progne subis*	CDFW Species of Special Concern	Wooded and riparian habitats[b]
Rufous hummingbird	*Selasphorus rufus*	USFWS BOCC	Forests that provide nectar-producing flowers
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	CDFW Species of Special Concern; USFWS BOCC	Woody swamps, brackish marshes, and freshwater marshes[b]
Tricolored blackbird	*Agelaius tricolor*	CESA Threatened; CDFW Species of Special Concern; USFWS BOCC	Emergent wetlands with tall, dense cattails or tules, or thickets of willow, blackberry, wild rose, and tall herbs near grasslands and croplands
Yellow warbler	*Setophaga petechia*	CDFW Species of Special Concern; USFWS BOCC	Riparian woodlands, woodlands and forests (ponderosa pine and mixed conifer)
Fishes			
Pacific lamprey	*Entosphenus tridentatus*	CDFW Species of Special Concern	Cold, clear water with soft sediments and woody or herbaceous debris[c]
Riffle sculpin	*Cottus gulosus*	CDFW Species of Special Concern	Permanent cold-water headwater streams with abundant riffles and rocky substrates[c]
Western river lamprey	*Lampetra ayresii*	CDFW Species of Special Concern	Limited studies on habitat requirements, but likely clean, gravelly riffles in permanent streams with backwater silty backwaters[d]
Reptiles			
Western pond turtle	*Clemmys marmorata*	CDFW Species of Special Concern	Aquatic habitats, particularly large, slow-moving streams, with basking sites (partially submerged logs, floating vegetation, or open mud banks

Common Name	Scientific Name	State Status (CESA or CDFW Designation), or USFWS Bird of Conservation Concern (BOCC)	Habitat in the Planning Area
Amphibians			
Coast Range Newt	*Taricha torosa*	CDFW Species of Special Concern	Forests (hardwood and mixed-conifer) and shrublands, but also in annual grasslands

Sources: CDFW (2018a, 2019a); CNDDB (2018); USFWS (2018)

[a] Collins (1998)

[b] Shuford and Gardali (2008)

[c] CDFW (2018a)

[d] CDFW (2018b)

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TABLE J-4. FEDERALLY LISTED THREATENED AND ENDANGERED WILDLIFE

Common and Scientific Name	ESA Status	CESA Status	Habitat[a]	Analyzed Further?
Amphibians				
California red-legged frog *Rana draytonii*	Threatened	None	Quiet pools of streams, marshes and occasionally ponds Critical habitat located in the planning area	Yes. Some of the largest remaining populations of the species are found in the planning area, where there are more than 120 breeding sites with a total adult population of perhaps a thousand frogs
Birds				
Western snowy plover *Charadrius alexandrines nivosus*	Threatened	None	Sandy marine and estuarine shores Critical habitat located in the planning area	Yes. Known to nest on beaches adjacent to ranches from North Beach to Kehoe Creek, and can be affected by ravens attracted by certain ranch practices (e.g., livestock feeding).
Ridgway's rail (California clapper rail) *Rallus longirostris obsoletus*	Endangered	Endangered	Salty and brackish water marshes and emergent wetlands	No. Habitat not present in the planning area.
California least tern *Sternula antillarum browni*	Endangered	Endangered	Marine and estuarine shores, and nearby shallow, estuarine waters	No. Habitat not present in the planning area.
Northern spotted owl *Strix occidentalis caurina*	Threatened	Threatened	Dense, old-growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats	No. Habitat is present in the planning area but ranch activities do not occur within its habitat and potential effects would not occur or are avoidable.
Short-tailed albatross *Phoebastria albatrus*	Endangered	None	Oceanic waters of the Pacific Ocean, nesting on two rugged, isolated, islands in Japan[b]	No. Habitat not present in the planning area.
Yellow-billed cuckoo *Coccyzus americnus*	Threatened	Endangered	Valley foothill and desert floodplain forest habitats, especially cottonwood-willow riparian areas	No. Habitat not present in the planning area.

Common and Scientific Name	ESA Status	CESA Status	Habitat[a]	Analyzed Further?
Marbled murrelet *Brachyramphus marmoratus*	Threatened	Endangered	Mature redwood and Douglas-fir forests for nesting and shallow, coastal waters for feeding	No. Habitat is present in the planning area but no nesting occurs. Ranch activities do not occur within its habitat and potential effects would not occur.
Invertebrates				
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	Endangered	None	Coastal areas (dunes, scrublands and grasslands) with species of violets (preferably *Viola adunca*)	Yes. Known to occur on some Point Reyes ranches. Most occurrences in the planning area have been found in areas that are grazed by either cattle or tule elk.
California freshwater shrimp *Syncaris pacifica*	Endangered	Endangered	Small, perennial, low-gradient coastal streams[c]	Yes. Known to occur in the lower reaches of Lagunitas and Olema Creeks
San Bruno elfin butterfly *Callophrys mossii bayensis*	Endangered	None	Rocky outcrops and cliffs in coastal scrub on the San Francisco peninsula	No. The planning area is beyond the known range of this subspecies.
Fishes				
California Coastal Chinook salmon *Oncorhynchus tshawytscha*	Threatened	None	Ocean and freshwater streams[c]	Yes. Known to occur in Lagunitas Creek.
Central California Coast steelhead *Oncorhynchus mykiss*	Threatened	None	Ocean and freshwater streams[c] Critical habitat is located in the planning area	Yes. Known to occur in Lagunitas, Olema, and Home Creeks and other creeks
Central California Coast Coho salmon *Oncorhynchus kisutch*	Threatened	Threatened	Coastal, low gradient streams with abundant pools formed by large woody debris[c] Critical habitat located in the planning area	Yes. Known to occur in Lagunitas and Olema Creeks
Longfin smelt *Spirinchus thaleichthys*	Candidate	Threatened	Bays, estuaries, and nearshore coastal areas, and migrate into freshwater rivers to spawn[d]	No. Habitat not present in the planning area.
Delta smelt *Hypomesus transpacificus*	Threatened	None	Bays, estuaries, and nearshore coastal areas, and migrate into freshwater rivers to spawn[e]	No. Habitat not present in the planning area.

Common and Scientific Name	ESA Status	CESA Status	Habitat[a]	Analyzed Further?
Tidewater goby *Eucyclogobius newberryi*	Endangered	None	Brackish water in lagoons created by coastal streams, preferring shallow open water with emergent or submerged vegetation	No. Habitat not present in the planning area.

Sources: CDFW (2019b, 2019c); CNDDB (2018); USFWS (2018); NMFS (2018)

Note: Table does not include marine or delisted species.

[a] CDFW (2014, 2018c), unless otherwise indicated.

[b] USFWS (2001)

[c] NMFS (2004)

[d] CDFW (2009)

[e] CDFW (2018d)

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APPENDIX K—BIOLOGICAL ASSESSMENT – US FISH AND WILDLIFE SERVICE

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National Park Service
U.S. Department of the Interior

POINT REYES NATIONAL SEASHORE

GENERAL MANAGEMENT PLAN AMENDMENT ENVIRONMENTAL IMPACT STATEMENT

BIOLOGICAL ASSESSMENT

Prepared for:
US Fish and Wildlife Service

August 2019

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ATTACHMENTS

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ACRONYMS AND ABBREVIATIONS

AU	animal unit
BA	biological assessment
BMP	best management practice
BO	biological opinion
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNPS	California Native Plant Society
DPS	Designated Population Segment
EIS	environmental impact statement
ESA	Endangered Species Act
FR	Federal Register
GMP	general management plan
IPaC	Information for Planning and Conservation
IPM	integrated pest management
MMWD	Marin Municipal Water District
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
north district of Golden Gate	North District of Golden Gate National Recreation Area
NPS	National Park Service
NRCA	National Resources Condition Assessment
NRCS	US Department of Agriculture, Natural Resources Conservation Service
park	Point Reyes National Seashore and North District of Golden Gate National Recreation Area
PCE	primary constituent element
Point Reyes	Point Reyes National Seashore
RDM	residual dry matter
ROA	Ranch Operating Agreement
RWQCB	Regional Water Quality Control Board
SFAN	San Francisco Area Network
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
U.S.C.	United States Code

USDA	US Department of Agriculture
USFWS	US Department of the Interior, Fish and Wildlife Service
USGS	US Geological Survey

1.0 INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] 153 *et seq*.), as amended in section 7(a)(1) directs federal agencies to conserve and recover listed species and use their authorities in the furtherance of the purposes of the act by carrying out programs for the conservation of endangered and threatened species so that listing is no longer necessary (50 Code of Federal Regulations [CFR] § 402). Furthermore, in section 7(a)(2), the ESA directs federal agencies to consult (referred to as section 7 consultation) with the US Fish and Wildlife Service (USFWS) when their activities "may affect" a listed species under the jurisdiction of USFWS. Additionally, the 2006 *National Park Service (NPS) Management Policies* directs NPS to "inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006).

1.1 Purpose of this Biological Assessment

This biological assessment (BA) has been prepared to complete consultation with the USFWS under section 7 of the ESA for the environmental impact statement (EIS) for a General Management Plan amendment (GMP Amendment) for Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively the park). This BA analyzes the potential effects of the proposed action in sufficient detail to determine to what extent the proposed activities may affect species listed under the ESA as threatened, endangered, or proposed species, and their critical habitat. This BA addresses the federally listed plant and animal taxa and their critical habitat under the jurisdiction of USFWS, meeting the following criteria:

1. taxa is known to occur in the park based on confirmed sightings;
2. taxa may occur in the park based on unconfirmed sightings;
3. potential habitat exists for the taxa in the park; or
4. potential effects may occur to the taxa from the proposed action.

This BA is prepared in accordance with legal requirements set forth under regulations implementing section 7 of the ESA (50 CFR 402; 16 U.S.C. § 1536(c)) and section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act. If any changes to the proposed action could affect listed species in a manner beyond that analyzed herein, 50 CFR 402.16(b) would require NPS to reinitiate section 7 consultation with USFWS. Species under the jurisdiction of National Marine Fisheries Service are being addressed under a separate BA.

1.2 Current Management Direction

The *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980) designates a "Pastoral Lands" zone "to permit the continued use of existing ranchlands for ranching and dairying purposes." In 1990, NPS adopted the *Range Management Guidelines* (NPS 1990a) in response to countywide concerns about flooding and large-scale erosion control in the early 1980s. NPS has updated and adapted authorizations based on this guidance and other best available science. Recently, NPS contracted with the UC Berkeley Range Ecology Lab to review existing ranch management practices and make recommendations that NPS could consider and incorporate as part of this planning process. Collectively, these guidelines set forth standards and best management practices (BMPs) for ranching operations with the overall goal of administering the grazed rangelands in the park in a manner that provides for environmental protection and restoration, public recreation opportunities, and a visually aesthetic pastoral scene, while simultaneously permitting ranchers to continue traditional and viable agricultural operations.

The *Range Monitoring Handbook* (NPS 1990b) outlines monitoring methods to ensure that the standards as set forth in the 1990 *Range Management Guidelines* are met and incorporated into ranch lease/permits. Specifically, it outlines the methodologies used to assess rangeland vegetation species composition (condition and trend) and conduct residual dry matter (RDM) monitoring. Monitoring is designed to determine range carrying capacities, evaluate the effectiveness of current grazing management in maintaining or improving range resources, and provide baseline data on range plant community successional dynamics. NPS established RDM and vegetation species composition monitoring locations in each ranch or pasture unit between 1986 and 1990, based on the concept of key areas, a widely used rangeland monitoring concept.

The 1990 guidelines establish a minimum RDM level of 1,200 pounds/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. Park RDM monitoring has been updated to reflect recommendations by the UC Berkeley Range Ecology Lab: Bartolome et al. (2015) analyzed 25 years of park RDM monitoring data and concludes that the minimum 1,200 pounds/acre standard is appropriate based on the RDM guidelines developed by UC researchers for coastal prairie (Bartolome et al. 2006), noting that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. RDM monitoring is conducted annually.

In addition, NPS previously conducted spring species composition monitoring at key area monitoring locations during multiple, but typically, nonconsecutive years from 1987 to 2011. The coastal grassland section of the *Point Reyes Natural Resource Condition Assessment* (NPS 2019a) evaluates this data set. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review.

The 1990 guidelines identify a number of management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of permitted livestock, deferring grazing on seasonally vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive non-native plant species. The park has implemented these techniques to address livestock-related resource degradation on particular ranches. The terms and conditions of grazing permits have been made more rigorous since adoption of the 1990 guidelines to reflect the goals stated in it. The 1990 guidelines also set forth standards for cultivation of park lands for forage production, including providing a 200-foot buffer zone between cultivation and any natural bodies of water, marshes, to sand dunes, and a prohibition against cultivating within significant wildlife or plant areas. Use of biocides on cultivated or rangeland areas is strictly limited and must comply with NPS integrated pest management (IPM) regulations and procedures. These guidelines continue to be revised and updated based on new science and adaptive management of ranching activities.

Current management direction for federally threatened and endangered species under USFWS jurisdiction in the action area can be found in the following statutes and associated documents:

- ESA of 1973, as amended
- 1916 NPS Organic Act
- NPS General Authorities Act of 1978
- *NPS Management Policies 2006* (NPS 2006)
- Migratory Bird Treaty Act (MBTA)
- National Environmental Policy Act (NEPA)
- Taylor Grazing Act of 1934

- *1980 Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980)
- *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998a)
- *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b)
- *Recovery Plan for California Freshwater Shrimp* (*Syncaris pacifica* Holmes 1895) (USFWS 1998c)
- *Recovery Plan for the California Red-legged Frog* (USFWS 2002a)
- *Western Snowy Plover* (*Charadrius alexandrinus nivosus*) *Pacific Coast Population Recovery Plan* (USFWS 2007a)

2.0 CONSULTATION HISTORY

February 20, 2018	Dave Press, NPS Wildlife Biologist, and Dylan Voeller, NPS Range Program Manager/Ecologist, had a phone conversation with Ryan Olah, USFWS Coast Bay Division Chief, to discuss potential issues with threatened and endangered species in the park.
April 30, 2019	Dave Press, NPS Wildlife Biologist, emailed Ryan Olah, USFWS Coast Bay Division Chief, to inquire about the USFWS' preference for displaying species occurrence data on figures in this BA.
May 2, 2019	Ryan Olah, USFWS Coast Bay Division Chief, replied via email to Dave Press, NPS Wildlife Biologist, that maps of occurrence data should be presented as an attachment, with summaries of monitoring data in text.

3.0 DESCRIPTION OF THE PROPOSED ACTION

3.1 Location and Background

Beef and dairy ranching began in the Point Reyes area in in the mid-19th century and continues today. At the time Point Reyes was established, Congress allowed ranching and dairying operations to continue by limiting NPS's ability to acquire private ranch lands in an area Congress identified as the "pastoral zone." In 1970, with the support of the area's ranchers, Congress repealed the limitation on eminent domain and allowed NPS to acquire ranch lands from willing sellers. NPS began acquiring ranch lands in Point Reyes' pastoral zone soon thereafter.

The detailed history of agricultural land in the park is described in chapter 1 of the EIS. Currently, approximately 18,000 acres (20%) of Point Reyes and 10,000 acres (60%) of the north district of Golden Gate are used for beef and dairy ranching under agricultural lease/permits. Twenty-four families hold lease/permits for beef cattle and dairy operations, and approximately 2,400 animal units (AUs) of livestock on beef ranches and 3,315 dairy animals are authorized on a year-round basis (attachment A, figure K-1). Eighteen lease/permits include residential uses specific to on-site ranch operations. NPS has worked to maintain a direct relationship with the ranchers.

In spring 2014, NPS initiated development of a ranch comprehensive management plan to address high-priority management needs associated with the approximately 28,000 acres of active beef and dairy ranching on park lands. The planning effort also addressed the expansion of free-range tule elk on lands leased for ranching and other issues, including lease duration, succession, and ranch operational flexibility and diversification.

In February 2016, three environmental groups brought litigation against the ranch planning process, arguing that NPS was required to prepare an updated GMP for Point Reyes and determine whether ranching remained an appropriate use of park lands. The plaintiffs and NPS, together with most ranchers individually, the Point Reyes Seashore Ranchers Association, and Marin County, reached a court-approved multi-party Settlement Agreement on July 14, 2017. Per the settlement, NPS agreed to prepare an EIS for a GMP Amendment addressing the management of the lands currently leased for ranching in the park. The Settlement Agreement requires NPS to evaluate three alternatives in the EIS—no ranching, no dairy ranching, and reduced ranching. These alternatives must not be conditioned on the discretionary termination of lease/permits by ranchers. In addition to addressing elk management and the statutorily required elements of a GMP (see below), the Settlement Agreement preserves NPS's right to give full consideration to other potential action alternatives. It also allows NPS to consider agricultural diversification, increased operational flexibility, promotion of sustainable operational practices, succession planning, and similar ranch management practices as part of any action alternative except the no ranching alternative.

NPS prepared an EIS for the GMP Amendment that evaluates the potential impacts of agricultural diversification, increased operational flexibility, ranch and dairy succession planning, and similar ranch management practices as part of several action alternatives. The purpose of the EIS is to establish guidance for the preservation of natural and cultural resources and the management of infrastructure and visitor use in the action area. In this context, the EIS addresses the future management of tule elk and leased ranch lands in the action area. Under the proposed action, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the action area. NPS would allow for continued ranching with terms of up to 20 years and would set a population threshold for the Drakes Beach herd.

3.2 Proposed Action—Continued Ranching and Management of the Drakes Beach Tule Elk Herd

The following text provides an overview of the proposed action. However, not all elements are described. See chapter 2 of the EIS for a complete description of every element.

3.2.1 Zoning Framework

NPS would apply a new management zone, the Ranchland zone, to the action area. This 28,700-acre zone would be managed to support the desired conditions for the action area defined in chapter 1 of the EIS. Six organic dairy operations and 18 beef operations would continue to operate in the park. Beef cattle would generally be allowed to graze on open grassland year-round; dairy cows would be milked twice a day, kept near the ranch complex, and fed high-nutrition feeds. NPS would issue lease/permits with up to 20-year terms to the existing ranch families to continue beef and dairy operations on approximately 26,100 acres. Current permitted use on ranches is summarized in table 3-1 below.

To ensure protection of natural and cultural resources, streamline the permitting process for typical ranch activities, and provide consistent guidance to ranchers, a subzoning framework would be implemented for the Ranchland zone to define the Resource Protection, Range, Pasture, and Ranch Core subzones. This subzoning framework is based on resource sensitivity. The subzones were developed based on analysis of topography, existing sensitive resource information, and ranch management activities. By implementing a subzoning framework, NPS can better ensure resource protection by directing where more intensive activities are conducted. Because certain practices or activities would be authorized for specific subzones, the subzoning framework accommodates greater operational flexibility for ranchers while protecting park resources. Different diversification activities, which would be authorized in each subzone, are described below in section 3.2.10, "Diversification."

The EIS for the GMP Amendment provides general percentages under each subzone. The percentage of Range and Pasture subzones would differ by ranch, based on the site topography and presence of wetlands, rare plants, and other sensitive resources. Draft maps of the zoning for each ranch operation are provided in appendix A of the EIS. These maps would continue to be refined in collaboration with ranchers.

3.2.1.1 Resource Protection Subzone

The Resource Protection subzone includes lands where no grazing would be authorized to protect park resources, including surface waters, threatened and endangered species habitat, and cultural resource locations. Limited prescribed grazing may be authorized to meet NPS resource management goals and objectives. Under the proposed action, the Resource Protection subzone would encompass approximately 2,600 acres comprising the following lands: approximately 800 acres within current lease/permit boundaries but already excluded from ranching; an additional 1,200 acres that would be excluded from ranching; and approximately 600 acres in the action area but not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd.

In this BA, areas composing the Resource Protection subzone are referred to as “resource protection exclusion areas.”

3.2.1.2 Range Subzone

The Range subzone is identified as lands where grazing would be authorized, but more intensive activities would not be allowed because of the documented presence of sensitive resources, including rare plants, wetlands, riparian/stream/pond habitats, forested areas, and critical habitat for threatened and endangered species. Additionally, this subzone includes nearly all areas with slopes greater than 20%. The authorized activities in this subzone would be limited to cattle grazing; generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. Based on analysis of existing sensitive resource data, approximately 16,900 acres (nearly 65%) of the lands under lease/permit is identified as Range subzone.

3.2.1.3 Pasture Subzone

The Pasture subzone is identified as lands where no sensitive resources are known to occur; therefore, a suite of vegetation management activities, including seeding and mowing, may be conducted in addition to grazing. The Pasture subzone includes grazed lands that are outside the Range subzone where introduced or domesticated native forage species exist and would be used primarily for the production of livestock. Approximately 9,000 acres (nearly 34%) of the area under lease/permit is identified as Pasture subzone. Nutrient management on dairies would be authorized in the Pasture subzone. Under the proposed action, some diversification activities would be authorized in the Pasture subzone as described in the “Diversification” section, below. Forage production would be authorized for several ranches; however, areas of forage production already occur in the proposed Pasture subzone. See the “Ranch Operating Agreements” and “Diversification” sections for details. Generally, construction of permanent buildings would not be authorized in the Pasture subzone.

3.2.1.4 Ranch Core Subzone

The Ranch Core subzone is identified as the developed complex of buildings and structures on most ranches. Ranches without a developed complex or buildings that are not occupied by individuals associated with ranch operations would not have a Ranch Core subzone. Approximately 180 acres (less than 1%) of the area under lease/permit is identified as Ranch Core subzone. The Ranch Core subzone would also include disturbed lands located immediately adjacent to the developed complex that do not contain or have the potential to affect sensitive resources. These disturbed lands, not to exceed 2.5 acres, would be available for diversification activities (e.g., small-scale, on-site processing of ranch products, row crops not requiring irrigation) or high intensity operations (e.g., building new infrastructure). Geographic constraints could limit Ranch Core subzone options on individual ranches. The exact location of the Ranch Core subzone would be defined in each ranch operating agreement (ROA).

3.2.2 Agricultural Lease/Special Use Permits

Under the proposed action, NPS would issue lease/permits with 20-year terms to continue beef and dairy operations on approximately 26,100 acres (attachment A, figure K-1). The lease/permits would constitute the overall authorization for the ranch families to operate on park lands, including general terms and conditions, commitments, and standards for the operations. The lease/permit would include all the standard clauses necessary for the ranches to operate in the park. The lease/permit would also establish the process by which the ranchers would work with NPS to identify priority projects and would establish the requirement for a maintenance reserve as part of the agreement. Ranch-specific details for operations and infrastructure investment would be identified through the ROA that would be an exhibit to the lease/permit.

3.2.3 Succession

In the event an existing lessee decides to discontinue ranching, NPS would implement succession planning that is consistent with maintaining multi-generational ranching in the action area.

3.2.4 Ranch Operating Agreements

Each rancher would be required to enter into a ROA as part of the lease/permit. In addition to identifying authorized activities (e.g., beef ranching, dairy ranching, diversification activities), the ROA would identify the site-specific management and mitigation measures that apply to each ranch as well as resource and ranch operational goals and objectives, descriptions of existing and desired conditions, grazing capacity analysis, grazing management specifications, and adaptive monitoring plans. A list of management practice standards and mitigation measures for potential ranching activities are contained in appendix D of the EIS. The ROA would specify the subzones where specific activities could occur. Authorized activities identified in the ROA would be consistent with the activities and approaches analyzed in the EIS. The ROAs would be developed with each rancher and reviewed as part of the 20-year lease issuance process. Thereafter, NPS and each rancher would meet annually to discuss the ROA and ranch operations. The ROA would be updated or reauthorized following the annual meeting. Modifications to ranching operations either at the rancher’s request or to address resource issues would be reviewed for consistency with the EIS to determine whether additional environmental review is necessary. If proposed activities are not consistent with the location, intensity, and scale of what is analyzed in the EIS, additional environmental review would be necessary. If authorized by NPS, the proposed activities would be incorporated into the ROA.

3.2.5 Animal Units

Each ranch would continue to have a maximum number of AUs that are allowed to graze at one time. AUs allowed under a lease/permit would continue to be managed to meet the 1,200 pounds per year RDM standard. NPS would determine the annual adjustments to AUs based on the use of a rangeland forage production model (see appendix I of the EIS), monitoring data, NPS range program manager and rancher expertise, historical information, US Department of Agriculture (USDA) guidelines, and variation in ground conditions and weather/climate. All dairy ranch lease/permits would be permitted based on the number of dairy animals. Annually, NPS and ranchers would review performance measures, including RDM, to identify grazing levels that would ensure site conditions are maintained to meet the minimum RDM standard.

For purposes of this analysis, NPS estimates authorizations would be similar to existing lease/permits, and approximately 2,400 AUs of beef cattle and 3,130 dairy animals would be authorized.

NPS would not authorize any additional AUs for personal, noncommercial livestock. Allowances for livestock other than beef and dairy cattle would be considered and would be managed as described below in the "Diversification" section.

3.2.6 Beef Operations

Management of the 18 beef operations in the park varies. Some of these operations include use of the residential complex and other infrastructure such as barns for hay and storage, while others are grazing only leases with limited to no use of infrastructure. Beef cattle are generally allowed to graze on open grassland year-round. Ranches in the park typically provide fall/winter feed to cattle in upland areas because of winter access constraints and limited forage species growth during those seasons. Mineral supplements such as salt licks or molasses barrels are also placed in certain pastures. Holding paddocks and areas such as those surrounding water troughs and feeding areas are considered heavy use or high-impact areas and are often devoid of vegetation.

3.2.7 Dairy Operations

The six organic dairies manage their beef grazing operations differently from the ranches. In general, they have more cattle than the beef grazing operations (table 3-1). Dairies are high intensity operations that require extensive milking, feeding, and waste management infrastructure to meet current production and water quality management standards. A typical dairy includes milking, loafing, and feed barns; structures for milk storage and processing; and often a hospital barn. Dairy operations in the park provide housing for some workers and their families. Between one and eight families are housed at each of the dairy operations.

Dairy cows are milked twice a day, kept near the ranch complex, and fed high-nutrition feeds. Roughly 10%–15% of dairy cows are either dry or non-lactating cows that are not in the milking string. Another roughly 20%–40% are heifers that are raised to eventually replace current milk cows. The dry cows are typically kept and fed in outdoor paddocks and small pastures. Heifers are fed regularly and generally graze in pastures similar to beef cattle. Current minimum organic production standards require dairy cattle to remain on pasture for a minimum of 120 days per year, and animals older than 6 months of age must get at least 30% of their dry matter intake from pasture during the grazing season (USDA-AMS 2013). Dairy cattle consume between 15 to 25 gallons of water per day (Rayburn 2007). Dairy operations have additional water needs for the management of the dairy complex, cleaning, and other tasks.

Compared to beef cattle operations, dairies produce large quantities of concentrated manure waste because of the need to keep dairy cows close to dairy headquarters for milking twice a day. Waste management is required for manure produced in the heavy-use, high-impact areas of cattle concentration, including feeding and loafing areas, the milking parlor, and corrals. Many dairy operations include loafing barns that allow the operator to keep the milking string indoors through much of the winter, which is important for both manure management and cow health. Loafing barns are covered areas where cows can shelter, particularly during inclement weather. The barns have concrete floors and drainage systems that ensure appropriate containment and management of liquid manure. These barns also make it easier for dairy ranchers to manage manure in these confined areas. Regular manure management includes scraping and storing manure in a manure management system. These quantities are managed to avoid pollution of nearby streams. The barns, milking parlors, and travel lanes between the structures are cleaned by scraping or washing manure into ponds, where the manure slurry is stored. Small pastures

TABLE 3-1: PERMITTED ACREAGE AND LIVESTOCK USE ON RANCHES IN THE ACTION AREA UNDER THE PROPOSED ACTION

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
1	A Ranch	838	496	**Dairy:** 350 milk cows, 50 dry cows, 90 heifers, 6 bulls Max. 135 AU of dry cows and heifers at one time	**2019:** 200 milk cows, 45 dry cows, 35 heifers	Interim Lease 1715 Nunes/Hemelt	Point Reyes
2	B Ranch	1,257	516	**Dairy:** 475 milk cows, 40 dry cows, 1 bull Max. 120 AU of dry cows and heifers at one time	**2019:** 220 milk cows, 40 dry cows, 220 heifers, 4 bulls	Interim Lease 1713 Mendoza	Point Reyes
3	C Ranch	718	255	**Dairy:** 255 AUs per year including the milking string, dry cows, and heifers Max. 100 AU dry cows at one time	**2019:** 200 milk cows, 40 dry cows, 100 heifers, 2 bulls	Interim Lease 1717 Spaletta	Point Reyes
3	D Ranch Pasture A	132	36	Heifers rotated as part of overall operation		Interim Lease 1717 Spaletta	Point Reyes
4	D Ranch Pastures B and C	581	123	Beef, dairy heifers		Interim Lease 1715 Nunes/ Hemelt	Point Reyes
5	E Ranch	1,372	201	Beef, dairy heifers		Interim Lease 1715 Nunes/ Hemelt	Point Reyes
6	F Ranch	1,510	175	Beef		Interim Lease 1703 Gallagher	Point Reyes

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
7	ATT	481	35	Beef		Interim Lease 1702 D. Evans	Point Reyes
8	G Ranch	1,151	90	Beef No-till silage: 190 acres		Interim Lease 1709 Lunny	Point Reyes
9	D. Rogers Ranch	382	55	Beef, chickens		10 Year Lease AGRI-8530-1000-1001 D. Evans	Point Reyes
10	M Ranch	1,178	175	Beef		Interim Lease 1707 Grossi/ Arndt	Point Reyes
11	H Ranch	1,099	285	Beef Silage: 96 acres		Interim Lease 1701 Evans/ Rossotti	Point Reyes
12	I Ranch	1,076	856	**Dairy:** 500–510 milk cows, 70-80 dry cows, 270 heifers, 6 bulls Max. 325 AU of dry cows and heifers at one time Silage: 552 acres	**2019:** **500** milk cows, 65 dry cows, 270 heifers, 6 bulls	Interim Lease 1710 McClure	Point Reyes
13	L Ranch	1,126	400	**Dairy:** 350–360 milk cows, 40–50 dry cows and/or heifers Max. 70 AU of dry cows and heifers at one time	**2019:** 250 milk cows, 40 dry cows, 150 heifers, 3 bulls	Interim Lease 1714 McClelland/ Mendoza	Point Reyes
14	K Ranch (portion)	566	72	Beef		Interim Lease 1701 Evans/ Rossotti	Point Reyes

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
15	J Ranch	648	756	**Dairy:** 420–450 milk cows, 50–80 dry cows, 250 heifers, 6 bulls Max. 310 AU of dry cows and heifers at one time Silage: 163 acres	**2019:** 400 milk cows, 60 dry cows, 260 heifers, 6 bulls	Interim Lease 1708 Kehoe	Point Reyes
15	K Ranch (portion)	486	37	Heifers rotated as part of overall operation	Same operation as J Ranch, above	Interim Lease 1708 Kehoe	Point Reyes
16	N Ranch	924	90	Beef		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
17	Home Ranch Developed Complex	20	0	N/A		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
18	Home Ranch	2,660	300	Beef		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
19	Martinelli Ranch	259	36	Beef			Golden Gate
20	Genazzi Ranch	436	55	Beef		1 Year Letter of Authorization Genazzi	Golden Gate
21	E. Gallagher Ranch	320	35	Dairy heifers		Interim Lease 1705 B. Giacomini/ Stray /Hagan/ Basch	Golden Gate
22	McFadden Ranch	335	35	Beef		Interim Permit 1706 Giammona	Golden Gate

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
23	C. Rogers Ranch	229	39	Beef		10 Year Lease AGRI-8530-2600-1203 Rogers	Golden Gate
24	Zanardi Ranch	404	45	Beef		10 Year Lease AGRI-8530-1000-1201 Zanardi	Golden Gate
25	McIssac Ranch	1,403	135	Beef		Interim Permit 1712 McIsaac	Golden Gate
26	Cheda Ranch	808	60	Beef		Interim Permit 1712 McIsaac	Golden Gate
27	Percy Ranch ROP[a]	240	10	Beef	No stocking rate specified in ROP[a] **2019:** 10 AU	Life Estate Percy	Golden Gate
27	Percy Ranch	447	25	Beef		Interim Permit 1716 Percy	Golden Gate
28	Stewart Ranch Lupton Ranch Truttman Ranch	2,188	189	Beef		10 Year Lease AGRI-8530-1000-1006 Wisby	Golden Gate
29	Stewart Ranch Developed Complex	18	0	N/A		10 Year Lease AGRI-8530-1000-1006 Wisby	Golden Gate
30	R. Giacomini Ranch	1,858	95	Beef		Interim Permit 1704 Giacomini	Golden Gate

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
31	Niman Ranch ROP[a]	206	45	Beef	No stocking rate specified in ROP[a] **2019:** 45 AU	Life Estate Niman	Point Reyes
31	Commonweal	575	66	Beef		10 Year Lease AGRI-8530-2600-1202 Niman	Point Reyes

[a] ROP – Reservation of Possession. Contain life estates—the number of cattle is not specified on the RUO. Numbers in the table are combined based on self-reporting by ranchers.

where cows are held between milking are typically scraped by a tractor, and the manure is stockpiled. Generally, liquid manure is sprayed or spread on pastures through a pump and irrigation system. Large trucks also spread slurry and solids by driving over pasture lands and distributing manure. These activities are conducted outside the rainy season or during dry periods.

Two Point Reyes dairies and two beef cattle operations are authorized for forage production. Table 3-1 lists acreages.

3.2.8 Range Management and Monitoring

The guidelines and monitoring protocols for range management would be the same as those described under "Section 1.2, Current Management Direction." The expectations and requirements contained in these guidelines would be incorporated into each ROA and updated and revised as new information becomes available.

3.2.9 Ranch Infrastructure

Under the proposed action, the following types of ranch infrastructure activities would be authorized following NPS review and approval:

- road upgrade and decommissioning
- stream crossings
- infrastructure management
- fencing
- livestock water supply
- pond restoration
- waterway stabilization

A general description of these activities can be found in chapter 2 of the EIS, and additional detail is provided in appendix D of the EIS. As part of this planning effort, size limitations and mitigation measures have been adapted from the Marin County Resource Conservation District's Permit Coordination Program, other permitting agencies, previous ranching projects, and USFWS. These mitigation measures have been incorporated into appendix D to streamline the approval process for these activities. NPS would work with ranchers and relevant external agencies to review proposed ranch infrastructure projects on an annual basis. Projects that are within the size and location limitations identified in the EIS and are approved by NPS would be incorporated into the ROA along with all applicable mitigation measures from table D-2 in appendix D.

Activities associated with road upgrades and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as existing conditions. Fence repair and maintenance of existing fences in-place for ranch operations would continue to be the responsibility of the rancher and would follow NPS-defined wildlife-friendly fencing design. NPS would require the removal of abandoned fence on ranch lands to meet wildlife and visitor goals. Construction of temporary fencing (i.e., electric fencing) would be authorized following NPS approval. Ranch water development systems (i.e., springs, wells, storage tanks, and troughs) would continue to be used for cattle consumption, and repair and maintenance in-place would continue to be the responsibility of the rancher. Troughs would require wildlife escape ramps. Redevelopment of existing water sources and associated distribution infrastructure would be authorized following NPS review and approval. Stream crossings would generally be limited, and other activities to prevent the need for stream crossing would be evaluated first.

Establishing new water sources (e.g., new wells) would require separate environmental review and are not being analyzed in this EIS.

3.2.10 Vegetation Management

The following types of vegetation management activities would be authorized following NPS review and approval:

- upland and riparian vegetation management and planting
- mowing and IPM
- prescribed grazing

A general description of these activities can be found in the EIS under alternative A, and additional detail is provided in the management activity standards in appendix D of the EIS. The size limitations and mitigation measures for these activities have been adapted from the Marin County Resource Conservation District's Permit Coordination Program, other permitting agencies, previous ranching projects, and USFWS. These mitigation measures are intended to streamline the approval process for these activities. NPS would work with ranchers and relevant external agencies to review proposed vegetation management activities on an annual basis. Projects that are within the size and location limitations identified in this EIS and are approved by NPS would be incorporated into the ROA along with all applicable mitigation measures from table D-2 in appendix D of the EIS.

Seeding would be limited to hand broadcast and no-till seed drill using an NPS-approved seed mix only in the Pasture and Ranch Core subzones. Seedbed preparation would be conducted in the fall, before October 15. Seeding would also be authorized where forage production is permitted. Requests for aeration would only be allowed if a need is demonstrated (e.g., via soil test).

Shrub control and weed management are conducted to maintain or increase areas of grassland habitat available for grazing activities. Coastal California grasslands are disturbance dependent, and even with grazing, some can slowly convert from grassland to shrubland (Ford and Hayes 2007). Mowing involves the timely cutting, and in some cases removal of, herbaceous vegetation for forage, control of herbaceous weeds, and woody (non-herbaceous) plants, including those that are invasive and noxious. NPS and ranchers use IPM to treat weed problems using the least toxic, effective methods of controlling weeds. Using biocides on cultivated or rangeland areas is strictly limited and must comply with NPS IPM regulations and procedures. All lease/permits require herbicides to be handled and disposed of in accordance with applicable laws, including reporting requirements. Mowing and IPM would be allowed in the Pasture and Ranch Core subzones. Site-specific management would be allowed in the Range subzone, depending on rancher requests, park vegetation management goals, and extent of infestation.

3.2.11 Other Activities (Applicable Only on Ranches Where Currently Authorized)

3.2.11.1 Forage Production

The purpose of forage production is to optimize yield and quality of forage for livestock and promote vigorous plant regrowth. These activities involve seedbed preparation, manure spreading, seeding and harvest mowing of herbaceous vegetation to provide feed for on-site consumption by livestock. Non-native grasses, such as ryegrass (*Lolium* spp.), oat grass (*Avena* spp.), and vetch (*Vicia* spp.), are typically planted. Silage is cut earlier in the season than haylage and is wetter; hay is drier and cut latest in the season. Once silage is harvested, it is stored in covered piles or bunkers; haylage is baled within several days and wrapped in plastic. Both are allowed to ferment prior to feeding to livestock. Hay is cut and dried on the ground prior to being baled and preserved without fermentation.

NPS would continue to set the standards for cultivation of ranch lands for forage production following NRCS's cultivation practice recommendations. These standards would continue to prohibit plowing land with slopes greater than 20%; require a 200-foot buffer between cultivation and any natural bodies of water, marshes, or sand dunes, or on land classified by the NRCS as highly erodible; and prohibit cultivating significant wildlife or plant areas, endangered plant habitat, high visitor use areas, and archeological sites. Ranchers who produce forage would continue to be required to cultivate and plant during a period that allows a cover crop to establish prior to the fall rains and to have adequate crop residues (at least 20%) after cutting to protect the soil from erosion.

Approximately 1,000 acres on four ranches (two beef and two dairy) are currently authorized for forage production under lease/permits (see table 3-1). Forage production would continue, consistent with lease/permit language updated as necessary to reflect current NRCS conservation standards or other site-specific considerations under an approved plan. If ranchers want to discontinue forage production in permitted areas, those acres would be retired and the total acreage of forage production in the action area would be reduced. One operation has specific language authorizing no-till haylage practices and generally does not conduct activities on the total authorized area every year. One life estate also contains authorization for silage, but the activity, other than occasional seeding and manure spreading, has not been practiced in recent years. Based on a current site-specific rancher request and subsequent NPS approval, at least 38 acres are expected to be converted to permanent pasture and no longer authorized for silage production.

3.2.11.2 Manure and Nutrient Management

Dairies would continue to produce large quantities of manure waste that ranchers would be required to manage to avoid impacts on sensitive resources. Application of animal manure and compost generated in the action area would be allowed with an approved nutrient management plan and would remain at a level consistent with existing conditions (approximately 2,500 acres, with some pastures not treated every year). Approved methods for nutrient management (e.g., storing, composting, and spreading) would be consistent with the management activity standards and mitigation measures in appendix D of the EIS. The requirements for park dairies to comply with animal waste discharge standards found at sections 22560 and 22565 of Title 27 of the California Code of Regulations would continue. Application of commercially produced compost and fertilizer would not be authorized.

3.2.12 Diversification

Diversification of ranching activities allows ranchers to react to poor forage production years, as well as and fluctuations in the economic market (e.g., the price of cattle, grain, hay). A limited number of livestock species other than beef and dairy cattle are currently authorized under personal use, including poultry, pigs, sheep, and horses. Horse boarding for approximately 15 to 20 horses currently occurs on two ranches.

New diversification activities could be allowed in the Pasture and Ranch Core subzones, as defined below with the use of management activity standards and mitigation measures specific to each activity (see appendix D of the EIS). Diversification of ranching activities could include new types of livestock, row crops, stabling horses, paid ranch tours and farm stays, small-scale processing of dairy products, (e.g. cheese), and sale of local agricultural products. Existing diversification activities authorized on ranches include one commercial free-range chicken egg and meat production operation, which is subject to NPS discretion, lease terms, and in accordance with overall resource goals. Diversification would be expanded under the proposed action. All authorized activities and associated management needs (e.g., temporary fencing and guard animals) would be required to be incorporated into the individual ROA prior to implementation. Diversification activities authorized in the Ranch Core and Pasture subzones are:

- Ranch Core subzone
    - Livestock species (pigs, chickens, sheep, and goats)
    - Horse boarding activities
    - Row crops

    - Public-serving ranch activities that support park goals for interpretation and education (i.e., farm stays, ranch tours)
    - Small scale processing of dairy products
- Pasture subzone
    - Livestock species (sheep, goats, chickens)

NPS would evaluate individual proposals for diversification activities; these activities may be subject to additional compliance.

3.2.12.1 Ranch Core Subzone

In addition to cattle, livestock species that could be allowed in the Ranch Core subzone include pigs, chickens, sheep, and goats. Any confinement of these species would be required to meet the State Water Resources Control Board (SWRCB) regulations for waste management.

Horse boarding activities could be allowed on additional ranches in the Ranch Core subzone. The scale of these activities would be determined on a case-by-case basis for an individual ranch and would consider existing infrastructure.

Up to 2.5 acres of row crops not requiring irrigation would be allowed in previously disturbed areas in the Ranch Core subzone. Tilling and seeding would be limited to hand broadcast and no-till seed drill and would follow established mitigation measures (see appendix D of the EIS). Management of any wildlife associated with protection of row crops would not be allowed in the action area; however, ranchers would be allowed to fence row crops to exclude wildlife.

NPS would allow public serving ranch diversification activities that support park goals for interpretation and education (e.g., farm tours in the ranch core) that do not create new problems (i.e., traffic congestion) and use existing infrastructure (i.e., no new permanent infrastructure). NPS would also authorize adaptive re-use of existing infrastructure (i.e., no new permanent infrastructure) to produce value added products, including cheese. NPS would collaborate with ranchers to develop interpretive materials for visitors.

3.2.12.2 Pasture Subzone

Sheep, goats, and chickens would also be allowed in the Pasture subzone. For grazing purposes, sheep and goats have AU equivalents of 0.15 and 0.2 AU, respectively, and for individual ranches grazing by sheep and goats in the Pasture subzone would not be allowed to exceed 10% of their authorized AU or 10 AU equivalents if the authorized AU is greater than 100 (whichever is less). The proposed action would also authorize each residentially occupied ranch to request up to 500 chickens with up to 3 associated mobile huts in the Pasture subzone. Construction of permanent infrastructure associated with new livestock species would generally not be allowed in the Pasture subzone; however, temporary fencing may be approved on a case-by-case basis. Management of any predators associated with new livestock species would not be allowed. The use of guard animals (i.e., dogs, llamas, donkeys) would be allowed with the adherence to management activity standards and mitigation measures (see appendix D of the EIS).

3.2.13 Elk Management

The management of free-range elk would allow elk in the portion of the action area within Point Reyes, but with limited geographic distribution and controls on herd size on areas under lease/permit. No new elk herds would be allowed to establish on areas under lease/permit outside the defined range of the existing herds. However, in the event of an unforeseen circumstance that causes the herds to completely move, NPS would reevaluate the impacts and management approaches as needed to ensure maintenance of a free-ranging herd in Point Reyes.

NPS would continue to work with the California Department of Fish and Wildlife (CDFW) and would continue to take actions to prevent or mitigate elk damage to ranches. To date, most actions have been taken in the Drakes Beach area. Actions could include:

- Fence repair and construction of elk crossings, including repairing fences damaged by elk and building elk crossings to allow elk to cross fences without damaging them
  - Fencing materials would be provided to ranchers for repairs, assuming materials are accepted by the rancher.
  - Alternative fence designs could be installed, particularly around seasonal pastures that would better allow elk movement across fence lines without damage to the fences.
- Habitat enhancements, including water enhancements, weed control, or pasture mowing, and prescribed grazing to increase herbaceous habitat
- Pasture offsets, including identifying access to additional pasture for ranchers to offset forage lost to grazing elk
- Hazing, including using park staff on foot to push elk in the main herd from active pastures to areas not leased for grazing

3.2.13.1 Population Level Management and Geographic Extent

NPS would actively manage the free-range elk herds within the Point Reyes portion of the action area. At Tomales Point, NPS would continue to maintain the elk fence that serves as the northern boundary to the action area, and the elk at Tomales Point would continue to be managed as a captive population. NPS would manage the herds to remain within Point Reyes, in coordination with CDFW.

3.2.13.2 Drakes Beach Herd

NPS would actively manage the Drakes Beach herd to keep it in its existing core area (i.e., between Barries Bay and the C Ranch and B Ranch boundary) at a level compatible with authorized ranching operations. NPS has determined a population target of 120 adult elk based on estimated forage consumption by elk, forage productivity on ranches, and time that elk spend on ranches, as well as NPS capacity to manage elk. While the elk population may experience a slight increase each year due to spring calving, a population count would be conducted in each fall and if necessary, elk would be removed to reach the target population size. Any removals would occur outside the calving and rut seasons. The population management goal is not anticipated to change unless there were long-term or permanent changes to existing conditions. Male elk would be allowed to wander.

NPS would manage the Drakes Beach herd to the target population size using lethal removal methods or, if practicable, translocation outside the park. Currently, the state does not allow the translocation of elk outside the park because of concerns about spreading Johne’s disease. Previous efforts to move elk in or out of the park have been halted because of Johne’s disease and/or chronic wasting disease policies. For translocation outside the park to be practicable, NPS would need to document that the elk are free of Johne’s disease and chronic wasting disease, and the state would need to approve the move and have capacity to accept additional elk in state-managed herds. If translocation becomes a practicable option in the future, additional compliance would be completed at that time to address potential impacts on elk and other resources. Removals would consider the desired sex ratio needed to maintain the herd at a reduced number and would be consistent with natural conditions of the herd. Between 10 to 15 elk are anticipated to be removed annually using existing NPS staff, qualified volunteers or other authorized agents to maintain the herd at its target population size. Elk would be removed using methods that would result in minimal interruptions to park operations, ranchers, and park visitors.

NPS would evaluate options to donate meat to the extent possible. Options could include donation of meat to local charitable organizations, the California condor program, or tribal groups, or for the purposes of disease testing. Meat donation would occur in collaboration with the NPS Office of Public Health and CDFW. Elk carcasses that are difficult to retrieve would be left in place.

3.2.13.3 Limantour Herd

Management of the Limantour herd would be based on the concept of not allowing new herds to establish in the Point Reyes portion of the action area. Elk from the Limantour herd would be allowed to wander outside a core area, if they do not establish new herds, and they would be monitored closely and managed in consideration of ranch operations. Hazing, including lethal removal, may be used to manage the geographic extent if individuals establish outside the core use areas or to address localized impacts from the presence of elk.

No population-level management would be taken that would threaten the future existence or viability of the Limantour herd, consistent with the goals of the 1998 *Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment* to maintain viable populations of a free-range elk herd in Point Reyes and to manage with minimal intrusion to regulate population size, where possible, as part of natural ecosystem processes.

3.2.13.4 New Herds

No new herds would be allowed to establish in the action area. Hazing techniques would be used to prevent the establishment of new herds. More direct (lethal) action would be a method of last resort.

3.2.14 Pest Control

In-residence pest control management for rodents would continue to be allowed using traps. The use of poison or bait is not allowed on park lands.

3.2.15 Visitor Use on Ranchlands

Under the proposed action, NPS would identify broad management strategies to preserve park resources as well as indicators and standards to guide visitor carrying capacities. Recreation and other visitor activities compatible with ranching would be identified to improve visitor experience and recreational access in the action area (e.g., enhanced trail connections, improved signage, and new interpretive waysides). Additional information about visitor use under the proposed action can be found in chapter 2 of the EIS, under “Public Use and Enjoyment” for alternative B.

3.3 Avoidance, Minimization, and Mitigation Measures

The 1990 *Range Management Guidelines* identify several management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of livestock permitted, deferring grazing on seasonal vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive plants. The terms and conditions of grazing permits have been made more rigorous since adoption of the guidelines to reflect the goals stated there. Under the proposed action, NPS would implement management activity standards and mitigation measures to protect and restore resources on ranches based on results of monitoring and other site-specific factors (see appendix D of the EIS). BMPs identified in the 1990 *Range Management Guidelines* would continue to be applicable under the proposed action. NPS has also developed additional avoidance, minimization, and mitigation measures to provide for the protection of natural resources in the action area (see section 3.3). Under the proposed action, programmatic approaches would be established for streamlined implementation of these measures under ROAs for each ranch.

Table 3-2 summarizes the avoidance, minimization, and mitigation measures that would be implemented to ensure the protection of federally listed species under the jurisdiction of USFWS. These measures are discussed further as they pertain to specific threatened and endangered species in section 8.0, "Effects to Evaluated Species and Determinations."

TABLE 3-2: AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES TO BE IMPLEMENTED UNDER THE PROPOSED ACTION THAT WOULD AVOID OR MINIMIZE PROJECT EFFECTS ON THREATENED AND ENDANGERED SPECIES, AND THEIR CRITICAL HABITAT, IN THE ACTION AREA

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Ensure use of heavy machinery is performed by experienced operators and ensure heavy machinery: ▪ avoids steep slopes (20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ is kept at least 10 feet from any cliffs or steep banks ▪ is only allowed based on daily fire danger rating ▪ avoids woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ is cleaned before arrival at the park; upon arrival; is inspected to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; is removed from NPS property if deficient and properly clean it at the expense of the contractor before returning to NPS property; and is cleaned before moving between sites and before storing to control the spread of plant diseases, insects, and weeds ▪ avoids significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoids waterbodies and riparian zones ▪ avoids lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	All	California red-legged frog, California freshwater shrimp, all federally listed plants	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Prepare and implement a spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas ▪ prohibit petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life from passing into, or being placed where it can pass into the waters of the state ▪ require operators to have emergency spill clean-up gear (spill containment and absorption materials) and fire equipment available on site at all times ▪ use or store petroleum-powered equipment in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: – ensure that all vehicles and equipment on the site do not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel – perform – fueling outside the riparian corridor ▪ If needed ,design a contained area located at least 100 feet from a watercourse for equipment storage, short-term maintenance, and refueling; if possible, prohibit these activities from taking place on the project site ▪ immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence ▪ ensure that all spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries are collected, stored, and recycled as hazardous waste off site ▪ ensue that dry cleanup methods (i.e., absorbent materials, and/or rags) are available on site ▪ inspect vehicles each day for leaks and repair immediately ▪ conduct major vehicle maintenance and washing off site	All	California red-legged frog, California freshwater shrimp	All
Restrict vehicles and equipment to one principal access route, preferably one that has been used for past activities Stage all vehicles and equipment on roads, in specified staging areas, or on existing disturbed ranch operation sites	All	Restrict vehicles and equipment	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
If access through a wetland is necessary, determine the timing of access to minimize disturbance (typically later summer is the dry time) Use low ground pressure, rubber-tired equipment	All	California red-legged frog, California freshwater shrimp	All
Ensure erosion control and sediment detention measures are available on site at all times and are in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway When requested by project regulators, inspect (NPS staff or a qualified designee) in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly	All	California red-legged frog, California freshwater shrimp	All
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits If rain occurs while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind Install silt fencing or wattles on contour around all stockpile locations	All	California red-legged frog, California freshwater shrimp	Pasture and Ranch Core
Permanent fill of wetlands is not authorized without consultation and issuance of regulatory permits from the US Army Corps of Engineers and/or Regional Water Quality Control Board.	All	California red-legged frog, California freshwater shrimp	All
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities during the dry season, generally June 1 through October 31; exceptions may be made in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species Note that (1) work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by project regulators	All	California red-legged frog, California freshwater shrimp	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter Ensure that exclusion fencing is highly visible and its installation is overseen by the project biologist Restrict openings to areas of construction site access Note that the purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats	All	All federally listed species	All
Design projects in potential CRLF habitat to minimize disturbance to vegetation near or in permanent and seasonal pools of streams, marshes, ponds, or shorelines with extensive emergent or weedy vegetation	All	California red-legged frog	All
If a project site occurs in potential CRLF habitat, conduct (project biologist) a preconstruction survey of potential CRLF habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for the CRLF no more than 48 hours before the start of construction activities Look (project biologist) for individual frogs, evaluate the likelihood of usage, and determine whether additional biological monitoring is needed during construction to ensure that individuals present are be removed or avoided	All	California red-legged frog	All
Monitor (project biologist) initial ground-disturbing activities within 300 feet of CRLF habitat and halt work activities that may adversely affect the CRLF until it no longer occupies the project area Note that relocation of CRLF can performed only by individuals, who are approved in advance by CDFW and USFWS	All	California red-legged frog	All
If suitable CRLF breeding habitat is present, only conduct project activities between July 1 and October 15 to avoid impacts on breeding CRLF or egg masses	All	California red-legged frog	All
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until July 1 and complete work by October 15 Note that (1) work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from project regulators	All	California freshwater shrimp	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Ensure reconnaissance-level surveys are performed by project biologist to determine whether suitable habitat for Myrtle's silverspot butterflies are present in the project area If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, ensure the project biologist performs a survey to determine presence or absence using widely accepted scientific protocols if suitable habitat for listed butterflies is present, make sure to: – conduct project work with minimum soil compaction and disturbance – wherever possible, conduct work with hand tools	All	Myrtle's silverspot butterfly	All
Protect host plants for listed butterflies, including *Sedum spathulifolium* and *Viola adunca*, with a clearly demarcated 20-foot buffer zone	All	Myrtle's silverspot butterfly	All
Closely monitor treated areas for pest plant invasion after construction, mechanical and burn treatments, aeration, and seeding Establish a monitoring plan to detect and eradicate any weeds including: ▪ employing an early detection, rapid response approach to any previously undetected aggressive weedy species observed, once the plant's species identification and non-native status have been confirmed ▪ following best available weed-specific technical guidance current at the time of implementation	All	All federally listed species	All
To the extent feasible, replace all plants disturbed project activities with a species palette similar to that of the removed vegetation or with species that are appropriate to the site conditions and are native to the project watershed Otherwise, obtain source plants from Marin County or southern Sonoma County; for plants from more distant sources, obtain NPS's preapproval Use native plant species with high wildlife and/or pollinator values to the extent feasible	All	All federally listed species	All
Complete revegetation as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain When timing does not coincide with suitable planting windows for permanent vegetation, use a temporary cover (e.g., weed-free mulch or weed-free straw) to protect soil until permanent vegetation can be established Use non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) in limited instances in conjunction with native species to provide fast-establishing, temporary cover for erosion control	All	All federally listed species	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Soil amendments are typically not needed for establishment of native vegetation in intact native soils, so if soils have been disturbed and require additional organic matter or nutrients to support native plants, use limited organic, weed-free amendments to help establish restoration vegetation Organic fertilizers may be used only above the normal high water mark of any adjacent waterways, so if fertilizers are to be used around a listed plant, consult (project manager) with a qualified biologist or range scientists to establish a buffer zone Do not allow the use of chemical fertilizers	All	California red-legged frog, California freshwater shrimp, all federally listed plants	All
Revegetate soil exposed during construction and soil above rock riprap using native seed casting In general, plant interstitial spaces between rocks riparian vegetation such as willows Use hydromulching (NO SEED INCLUDED) as a soil stabilization technique as allowed	All	California red-legged frog, California freshwater shrimp	All
Design culverts to minimize habitat fragmentation and barriers to aquatic movement Note that channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible	Road Upgrade and Decommissioning Stream Crossing Infrastructure Management Waterway Stabilization	California red-legged frog, California freshwater shrimp	All
Ensure livestock water supply activities include: ▪ using buried pipelines to minimize ground disturbance ▪ installing buried pipe at minimum sufficient depth (typically 18” or less) below the ground surface to provide protection from hazards imposed by traffic loads, farming operations, freezing temperatures, or soil cracking, as applicable ▪ using pipelines of sufficient strength to withstand all external loads on the pipe for the given installation conditions. ▪ if the action includes installing a trench, placing the top 6 inches of excavated soil to one side and the remaining soil to the other side of the trench; when refilling the trench, placing the top 6 inches of soil back on top of the final fill to retain the existing native seed bank and to return the surface to existing condition and grade ▪ keeping trench width to the minimum necessary to allow for pipeline installation ▪ equipping the pipe leading from the spring to a tank or trough with a valve or overflow to allow water to return to the spring when the tank or trough is full ▪ conducting work during driest time of the year (August to first fall rains)	Livestock Water Supply	California red-legged frog	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
▪ placing any material excavated from springs or ponds during development on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less ▪ conducting spring maintenance activities with hand tools whenever possible			
For pond restoration activities: ▪ ensure that maintenance activities are conducted either when a pond has dried out completely, or during the driest period of the year in September or October (late August is an option if necessary, but not preferred) ▪ ensure that no mowing occurs around ponds unless pre-approved by NPS ▪ avoid excavation below original pond depth ▪ provide sloping or benched sides with shallow areas and keeping deep areas at least a yard deep ▪ use spoils from the ponds to buttress the berm; otherwise, place excess soils in an NPS-identified area for stockpiling or spreading ▪ place excavated material on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less ▪ install a staff gage in the pond before construction begins to monitor water level ▪ if the pond has existing emergent vegetation, maintain 10% to 35% cover	Pond Restoration	California red-legged frog	All
Unless otherwise stated on the Practice Requirement sheet or seeding plan, ensure the timing of seeding is in the fall before October 15 Only use local (collected in Marin County) genotypes of native species seed certified to be free of noxious weed seeds or with species on the park's approved seed species list (based on information provided by the USDA, NRCS Plant Materials Program, unless otherwise approved by NPS Adjust seeding rates for soil textural differences and the pure live seed rating Only conduct seeding using no-till drill or broadcast methods and using only broadcast methods on sites with a high risk of soil erosion	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	All federally listed species	Pasture
Restrict or reduce grazing in the two years of establishment at least until the seedlings have completed their growth for the first growing season	Upland and Riparian Vegetation Management and Planting Forage Production, including Silage, Haylage and Hay	California red-legged frog, California freshwater shrimp	Resource Protection

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
With the exception of silage harvest and management of certain weed species as approved by NPS, time mowing to minimize resource impacts: ▪ August 1–October 15 (or first autumn rains, whichever comes first) is preferred to avoid impacts to ground nesting birds and California red-legged frog (CRLF) ▪ March 15–July 31 (bird nesting season) is limited to removal of vegetation less than 8 inches in height or can take place only if bird nesting surveys are completed	Mowing Forage Production, including Silage, Haylage and Hay	California red-legged frog, Western snowy plover	All
As appropriate, attach flushing bars to the mower to help to flush birds and mammals (especially deer and rabbit) before the mower reaches them and mow from the middle to the outside to minimize impacts	Mowing Forage Production, including Silage, Haylage and Hay	California red-legged frog, Western snowy plover	Pasture
Use rotational mowing practices (i.e., early, late, or rested), which can maintain grassland communities in various stages of growth and vegetative diversity, thus potentially providing more nesting habitat for grassland birds Do not mow at night due to the risk of higher wildlife mortality	Mowing Forage Production, including Silage, Haylage and Hay	California red-legged frog, Western snowy plover	Pasture
Limit shrub management efforts to areas previously occupied by grassland, as shown by historical photographs, or to soil types appropriate to support grassland, according to the USDA, NRCS, soil survey and associated ecological site descriptions	Mowing Upland and Riparian Vegetation Management and Planting	Myrtle's silverspot butterfly	Pasture, Range upon site specific approval
Limit shrub treatment areas to those identified by NPS biologists as acceptable based on: ▪ the absence of endangered species and significant wildlife and plant communities, including areas with high concentrations of nesting birds ▪ appropriate ratio and spatial arrangement of grassland and woody vegetation at the site and landscape scale to provide food, shelter, and cover to shrub-dependent wildlife and appropriate structure for wildlife that benefit from edge habitat or structural diversity ▪ appropriate size and shape of treated acreage and of any shrubland acreage left untreated ▪ desired age or successional status of remaining shrubland	Mowing Upland and Riparian Vegetation Management and Planting	All federally listed species	Range upon site specific approval

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Use operational techniques to prevent livestock predation before it starts and to minimize livestock predation when it does occur by taking into account the surrounding environment, including the native wildlife within it. Husbandry practices include the following: ▪ keep recently castrated/branded/docked animals in an area close to the ranch core for a time to allow healing before putting them out to pasture/rangeland because wounds create odors that attract wildlife ▪ where possible, remove all wastes such as afterbirths and stillborn animals that attract wildlife including ravens ▪ confine young livestock (e.g., calves, lambs, and kids) for approximately two weeks following birth ▪ feed livestock in a manner that discourages or precludes raven access to feed (e.g., use covered feed bunks) ▪ control access to carcasses, grain, and ranch-related and household trash/waste to reduce attracting wildlife, including ravens ▪ promptly remove dead livestock from the park Structural measures include the following: ▪ build wildlife-proof structures for poultry using strong wire metal mesh that is firmly secured ▪ enclose poultry in night houses or shelters for species on pasture Electric fencing includes the following: ▪ in smaller areas only, where animals are penned within the Ranch Core subzones, use multiple strands (7 to 9) of high-tensile, smooth wire with alternating charged and grounded wires (beginning with a charged wire on the bottom) ▪ place the bottom wire about 6 inches off the ground to help prevent wildlife from digging under the fence ▪ for best results, install fencing before the wildlife has established a pattern of movement Repellants and frightening devices are designed to discourage or reduce the attractiveness of specific areas to wildlife. They work best for short durations because wildlife can quickly become accustomed to them, and they are best used in combination with other techniques, such as: ▪ putting bells on livestock ▪ parking a vehicle in area of loss by predation, which may temporarily deter predators and is most effective if vehicle is moved often	Integrated Pest Management	California red-legged frog, Western snowy plover	Pasture and Ranch Core

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Use the following grazing methods to control weeds to the degree feasible, especially as a follow-up method that minimizes the need for repeated mechanical or chemical applications: ▪ use targeted grazing to impact weedy species when they are vulnerable, using species-specific technical guidance available from sources such as NPS; University of California, Cooperative Extension and Weed Research and Information Center; USDA, NRCS; and DiTomaso et al. (2013) ▪ avoid heavy grazing of infested areas at stages of the weedy species' phenology when herbivory favors increased tillering ▪ encourage vigorous growth of desirable grass species in infested or recently treated areas by maintaining sufficient residual dry matter in fall and winter and by allowing thick grass growth throughout winter	Integrated Pest Management Forage Production, including Silage, Haylage and Hay Upland and Riparian Vegetation Management and Planting	All federally listed species	All
Consider the use of multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment	Integrated Pest Management	All federally listed species	
Ensure that any use of herbicides conforms to relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates. Consult with a PCA and/or NPS and: ▪ address measures to minimize the use of high-persistence herbicides and the potential for leaching to surface and groundwater, especially in soil types with high leaching potential ▪ for application of herbicides to uplands that may have CRLFs or other rare amphibians present, consider the use of herbicides specifically formulated and approved for use in water ▪ consider the use of pollinator-protective strategies as described in USDA-NRCS (2014), especially when considering broadcast applications and applications when pollinator host plants are flowering. ▪ minimize the use herbicides or fertilizers in habitat that supports special-status butterflies and do not use herbicides in this habitat during Myrtle's silverspot butterfly flight season (June 15-early September)	Integrated Pest Management	California red-legged frog, California freshwater shrimp, Myrtle's silverspot butterfly	
Ensure that in-stream crossings are not designed for placement within 300 feet of known spawning or breeding areas of listed species	Stream Crossing	California red-legged frog, California freshwater shrimp	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
For pasture and crop fertilization, comply with Nutrient Management Plans and USDA, NRCS, guidelines for nutrient management, including but not limited to: ▪ Develop a nutrient budget that considers all sources of nutrients ▪ evaluate the risks of nitrogen and phosphorus transport using methods cited by USDA, NRCS ▪ conduct pertinent soil analyses to determine the appropriate (and maximum) level of nutrient addition, such as nutrient and pH levels and electrical conductivity, and ensure that the total nutrient loading does not exceed the amount needed to meet crop demand ▪ for cropland applications, maintain soil pH in a range that favors nutrient uptake by crops ▪ do not exceed the University of California guidelines (or industry practice when recognized by the university) for nitrogen, phosphorus, and potassium application rates and noting that lower rates are acceptable ▪ ensure application timing corresponds as closely as practicable with the timing of plant uptake by crops or pasture grasses ▪ Apply solid or liquid waste discharges to land at rates that are reasonable for crop, soil, climate, special local situations, management system, and type of manure ▪ Apply manure and wastewater discharges to land during non-rainy or non-saturated conditions, ensuring that discharges do not result in runoff to surface waters and that discharges infiltrate completely within 72 hours after application ▪ do not spread compost, manure, or fertilizer when the top 2 inches of soil are saturated or when enough precipitation to cause runoff is forecast ▪ maintain sufficient setbacks (filter strips or otherwise well-vegetated areas) from drainages and waterbodies to prevent pollution and comply with state and federal water quality regulations; setback distance should be greater for steeper slopes, higher levels of nutrients applied, and lower levels of setback ground cover ▪ employ best practices (e.g., USDA-NRCS 2011) to minimize the risk of nutrient runoff in application of liquids, slurry and solids, such as adjusting the thickness of the applied layer of manure and compost relative to slope and setback distance to minimize the chance that material will be washed downhill to waterbodies	Nutrient Management	California red-legged frog, California freshwater shrimp	Pasture

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Maintain records—regarding the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event—for at least five years Keep these records with the Nutrient Management Plan	Nutrient Management	California red-legged frog	Pasture
Do not spread manure or compost when winds are in excess of 20 miles per hour	Nutrient Management	California red-legged frog	Pasture
For liquid (irrigated) manure application: ▪ avoid saturating the soil ▪ check pipes, hoses, and other irrigation equipment daily for leaks	Nutrient Management	California red-legged frog	Pasture
When practical, compost manure before spreading to reduce the volume of material	Nutrient Management	California red-legged frog	Pasture
Design a leachate collection system and install an impermeable cover to minimize the entry of clean rain water from the top of the cover into the leachate collection system Use a minimum cubic foot (7.48 gallons) of leachate storage capacity for each ton of material placed in storage if and when containment becomes necessary	Forage Production, including Silage, Haylage and Hay Nutrient Management	California red-legged frog	Ranch Core
Adhere to the following Livestock Diversification practices specific to the Pasture subzone (if applicable): ▪ avoid heavy or prolonged grazing by sheep and goats in pastures on areas with steep slopes or sparse vegetation ▪ use prescribed controlled grazing practices, such as pasture rotation, for goats and sheep in pastures ▪ locating watering facilities in pastures on areas that promote even grazing distribution by sheep and goats and reduce grazing pressure on sensitive areas ▪ locating watering facilities in pastures away from well heads and install wellhead protection (i.e., fencing) ▪ placing watering facilities, new feed rack, and salt and mineral feeders in pastures a minimum of 300 feet from any riparian or aquatic habitat ▪ regularly moving portable/moveable structures located in pastures for the production of fowl with to avoid or minimize contamination, disease occurrence, and overgrazing ▪ placing portable/moveable structures located in pastures for the production of fowl located within the Pasture subzone a minimum of 300 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September ▪ placing floorless broiler chicken huts located within the Pasture subzone a minimum of 150 feet from	Diversification (Horse Boarding, Other Livestock)	California red-legged frog, California freshwater shrimp	Pasture

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September			
Implement dust control measures, such as wetting down paddocks and riding arenas, especially on dry, windy days Consider using low-dust or no-dust footing materials to control dust while reducing water use	Diversification (horse boarding)	Myrtle's silverspot butterfly	Ranch Core
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season	Diversification (horse boarding and other livestock) Infrastructure Management	California red-legged frog, California freshwater shrimp	
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands Minimize the amount of: ▪ water used by using sponges or hoses equipped with shut-off or low-flow nozzles ▪ soap used, especially soap with surfactants	Diversification (horse boarding) Infrastructure Management	California red-legged frog, California freshwater shrimp	Ranch Core
Adhere to the Ranch Core diversification consideration for row crops: – as part of any row crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate – use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late fall and use certified weed-free straw if purchased from outside the park or from a different ranch – incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin) – use nonlethal wildlife control (i.e., scarecrows or decoys and control garden debris) because lethal control of wildlife is prohibited – store harvested crops in enclosed structures (i.e., buildings, barrels, crates)	Diversification (Row crops)	California red-legged frog, California freshwater shrimp	Ranch Core

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Plant cover crop or cover soils with straw mulch and use at least 30% cover in fallow crop areas throughout the rainy season (until April 1)	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	California red-legged frog, California freshwater shrimp	
For row crop diversification, conduct tilling activities row crop areas, such as ripping, disking, or harrowing, after August 20 and before the first rains or November 1	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	California red-legged frog, California freshwater shrimp	Ranch Core

4.0 ACTION AREA DESCRIPTION

The action area includes all lands currently leased for ranching in the park (i.e., Point Reyes and the north district of Golden Gate), as well as adjacent lands in Point Reyes where the Drakes Beach herd currently occurs (attachment A, figure K-1). The park, located in western Marin County in central California, is a landscape ranging from dramatic headlands and expansive sand beaches to open grasslands, brush hillsides, and forested ridges. It is approximately 30 miles northwest of San Francisco and within 50 miles of the nine-county San Francisco Bay Area, the fifth largest metropolitan area in the United States. The park 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 park at the southern tip of the peninsula. Western Marin County is primarily rural, with scattered, small, unincorporated towns that serve tourism, agriculture, and local residents. NPS staff at Point Reyes administer a portion of the adjacent north district of Golden Gate for a combined management area and legislated boundary of approximately 86,000 acres.

The action area consists of gently rolling to hilly uplands with basement rocks that include the granitic spines of northern Inverness Ridge and Point Reyes proper and the broad sweep of marine sandstones and shales that lie between. Elevations range from the beaches at sea level to 600 feet on 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% on the steeper hillsides. Average hillslopes and drainage sides are about 40%.

Soils of the action area are described in detail in chapter 3 of the EIS, in the “Soils” section. Generally, rangeland soils are deep, productive, well-drained loams and sandy loams. However, many range soils are identified as having such limitations 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 overgrazing in the less sloping areas.

Vegetation in the action area is characterized by non-forested or partially forested lands, which supports a mosaic of coastal prairie and northern coastal scrub vegetation (see Ford and Hayes 2007). Most of the upland plateaus and ridgetops in Point Reyes 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. Chapter 3 of the EIS also provides further detail about the vegetation communities in the action area, in the “Vegetation, including Federally Listed Species” section.

The action area is surrounded by Drakes and Limantour Esteros and Abbotts Lagoon, which 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. Olema and Lagunitas Creeks are the two major drainages within the action area and are important for anadromous fish. Numerous wetlands and riparian areas exist throughout the action area and are locally important for wildlife habitat. Many ranch units border on the Pacific Ocean beaches and one extends to Tomales Bay.

Several of the species considered in this BA have limited geographical ranges from which all current and historical records are known. One species, the California red-legged frog, is widespread on ranch lands. Critical habitat exists in the action area for this species.

Further details about the action area are provided in "Chapter 3, Affected Environment" of the EIS, including its soils, water resources, vegetation, wildlife, tule elk, visitor use, cultural resources, socioeconomics, and air quality.

5.0 PRE-FIELD REVIEW OF LISTED SPECIES

A list of federally listed species and designated critical habitat in the action area was obtained from USFWS's Information for Planning and Conservation (IPaC) database on September 19, 2018 (USFWS 2018a) (see attachment B). Species included on this list were evaluated for their potential to occur within the action area (shown in table 5-1 below). This list was further refined by park staff to identify only those species that would potentially be affected by beef cattle and dairy ranching activities, based on knowledge of species occurrences in the park and prior consultation with USFWS regarding livestock use in the park (NPS 2001a; USFWS 2002b). Non-marine species with no potential of occurring in the action area are presented in table 5-1 but are excluded from further discussion because they meet one or more of the following conditions:

- The action area is outside the geographical or elevational range of the species;
- Species occurs in habitats that are not present in the action area;
- Species does not occur nor is expected in the action area during the time period activities would occur; or
- Species' habitat is present but there are no potential direct or indirect effects to the species.

5.1 Species Considered and Evaluated

Table 5-1 indicates whether the federally listed species under the jurisdiction of USFWS that could occur are known or expected to occur within the action area, according to the USFWS' official species list (dated September 19, 2018). Any critical habitat for these species in the action area is indicated, in addition to their general habitat preferences. Also included are species excluded from further review with a "no effect" determination, and a rationale for why is provided. No additional proposed or candidate species for listing under the ESA could occur in the action area.

TABLE 5-1: FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES UNDER THE JURISDICTION OF USFWS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Plants					
Baker's larkspur (*Delphinium bakeri*)	E	No	No	RANGE	Decomposed shale soils within moist coastal scrub

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Beach layia (*Layia carnosa*)	E	Yes	No	--	Openings in sparsely vegetated, semi-stabilized coastal sand dunes and similar areas of recent wind erosion
Marin dwarf flax (*Hesperolinon congestum*)	T	Yes	No	--	Chaparral, valley and foothill grassland; in serpentine barrens and in serpentine grassland and chaparral; 60–370 meters
Robust spineflower (*Chorizanthe robusta var. robusta*)	E	No	No	TAX[c]	Sandy soils associated with active coastal dunes and inland sites with sandy soils
Showy Indian clover (*Trifolium amoenum*)	E	Yes	No	--	Valley and foothill grassland, coastal bluff scrub; sometimes on serpentine soil, open sunny sites
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	E	Yes	No	--	Freshwater marshes
Sonoma spineflower (*Chorizanthe valida*)	E	Yes	No	--	Coastal prairie
Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta)*	E	Yes	No	--	Serpentine grassland
Tidestrom's lupine (*Lupinus tidestromii*)	E	Yes	No	--	Coastal dune
Amphibians and Reptiles					
California red-legged frog (*Rana draytonii*)	T	Yes	Yes	--	Pools of slow-moving streams, perennial or ephemeral ponds, marshes, and moist cool upland habitat
Birds					
California clapper rail (Ridgway's rail) (*Rallus longirostris obsoletus*)	E	No	No	HAB	Associated with abundant growths of pickleweed but feeds away from cover on invertebrates from mud-bottomed sloughs. Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay.
California least tern (*Sternula antillarum browni*)	E	No	No	HAB	Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas. Nests along the coast from San Francisco Bay south to northern Baja California.

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Marbled murrelet (*Brachyramphus marmoratus*)	T	No	Yes	HAB	Uses mature or old-growth forest near the coastline during summer, where it nests on large horizontal branches high up in large trees. Coastal birds that occur mainly near saltwater. Winters at sea.
Northern spotted owl (*Strix occidentalis caurina*)	T	Yes	No	NE	Nest in a dense section of old forest, well protected from open sky by a dense tree canopy. Mature forests with dense canopies and a complex array of vegetation types, sizes and ages.
Short-tailed albatross (*Phoebastria albatrus*)	E	No	No	HAB	Primarily a seabird with limited presence along coastal shorelines. Very small breeding range only in two Pacific islands, south of Japan. Resident of the northern Pacific Ocean, including California coast.
Western snowy plover (*Charadrius alexandrines nivosus*)	T	Yes	No	--	Sandy marine and estuarine shores
Yellow-billed cuckoo (*Coccyzus americanus*)	E	No	No	HAB	Relatively large blocks of riparian habitats. Cottonwood and willow trees are an important foraging habitat in areas.
Invertebrates					
Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	E	Yes	No	--	Coastal areas (dunes, scrublands and grasslands) with species of violets (preferably western dog violet [*Viola adunca*]).
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	E	No	No	RANGE	Steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*. Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County.
California freshwater shrimp (*Syncaris pacifica*)	E	Yes	No	--	Small, perennial, low-gradient coastal streams

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Fish					
Delta smelt (*Hypomesus transpacificus*)	T	No	No	RANGE	Sacramento-San Joaquin Delta. Seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay. Seldom found at salinities > 10 ppt. Most often at salinities < 2 ppt.
Tidewater goby (*Eucyclogobius newberryi*)	E	No	No	HAB	Shallow lagoons and lower stream reaches. Requires fairly still but not stagnant water and high oxygen levels. Brackish water habitats along the California coast from Agua Hedionda Lagoon to the mouth of the Smith River.

Source: USFWS (2018a)

[a] Status Codes: E = Federally listed endangered; T = Federally listed threatened.

[b] Exclusion (i.e., "*no effect*") Rationale Codes: RANGE = outside known geographical range of the species; HAB = no habitat present in action area; NE = no potential direct or indirect effects to the species; TAX = taxonomic clarification, differentiated.

[c] Brinegar and Baron (2008), on the molecular phylogeny of the *Pungentes* subsection of *Chorizanthe*, determined that a previously identified population on Point Reyes Peninsula is not *Chorizanthe robusta var. robusta*, but instead an inland form of the morphologically similar *Chorizanthe cuspidata* var. *villosa* (woolly-headed spineflower). This clarification eliminates Marin County from C. robusta var. robusta's range.

As indicated in table 5-1, six federally listed plant taxa (beach layia, Marin dwarf flax, showy Indian clover, Sonoma alopecurus, Sonoma spineflower, Tiburon paintbrush, and Tidestrom's lupine) could occur in the action area. Seven federally listed threatened or endangered animal species, including one amphibian (California red-legged frog); one bird (western snowy plover); and two invertebrates (Myrtle's silverspot butterfly and California freshwater shrimp) could occur in the action area. These species and critical habitats will be addressed hereafter in this assessment (evaluated species). The remaining species with no potential to be affected by the proposed action area will not be analyzed further based on the rationale provided above in table 5-1. Therefore, it has been determined that the proposed action will have *no effect* to Baker's larkspur, Robust spineflower, California clapper rail, California least tern, marbled murrelet, northern spotted owl, short-tailed albatross, yellow-billed cuckoo, San Bruno elfin butterfly, delta smelt, and tidewater goby.

5.2 Critical Habitat in the Action Area

Critical habitat is a term defined in section 3 of the ESA and refers to areas that contain habitat features that are essential for the survival and recovery of a federally listed species, and which may require special management considerations or protections. The ESA defines critical habitat as "(1) the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time it is listed…that…are essential for the conservation of the species (16 U.S.C. 1532(5)(A))." In other words, critical habitat represents the habitat essential for the species' recovery.

One amphibian (California red-legged frog) has designated critical habitat in the action area that could be affected by the proposed action (USFWS 2018b). Critical habitat is designated immediately adjacent to the action area for two species (northern spotted owl and western snowy plover). The proposed action could potentially affect western snowy plover critical habitat. Further detail about this critical habitat is provided below under section 6.1. The park was excluded from the 2012 critical habitat designation for the northern spotted owl because management actions in the action area already promote the subspecies' conservation (FR 77 71876). Also, because the proposed action would not affect northern spotted owl habitat, its critical habitat is not discussed further. Critical habitat for marbled murrelet does occur in the action area, but because the proposed action would not affect marbled murrelet habitat, its critical habitat is not discussed further.

6.0 EVALUATED SPECIES INFORMATION

6.1 Species Status and Biology

6.1.1 Federally Listed Plants

Although federally listed plants are not protected from take under the ESA, section 7 of the ESA requires federal agencies to use their legal authorities to promote the conservation purposes of the ESA and to consult with USFWS, as appropriate, to ensure that effects of actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species.

6.1.1.1 Beach Layia—Endangered

Legal Status. Beach layia was listed as endangered under the ESA in 1992 (57 *Federal Register* [FR] 27848). It was previously listed as endangered under the California Endangered Species Act (CESA) in 1990 (CDFW 2018). The USFWS plan to recover beach layia is found in the *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b). USFWS (2011a) conducted a five-year status review of beach layia and found sufficient evidence to recommend it be down listed to threatened status, which was announced on April 27, 2012 (77 FR 25112).

Species Description. Beach layia is succulent annual herb belonging to the sunflower family (Asteraceae). It is a winter annual, germinating in fall, flowering in spring, and dispersing seed in summer (Basor 2002). Beach layia grows up to 6 inches tall and 16 inches across, with an unbranched to highly branched growth form. It is distinguished from similar species by its fleshy leaves, inconspicuous flower heads with short, 0.08- to 0.1-inch long white ray flowers and yellow disk flowers, and bristles around the top of the one-seeded achene. The number of seed-heads on individual plants varies with plant size. Unbranched, short plants on dry, exposed sites will produce a single head, while branched plants in moist dune areas may produce more than 100 heads (USFWS 1998b).

Habitat Requirements/Ecology. Beach layia occurs on sparsely vegetated open areas on semi-stabilized coastal sand dunes and is found on coastal dunes and remnant dunes within coastal grasslands in the park (Benson 2004). It is usually found growing in association with coast buckwheat (*Eriogonum latifolium*), beach pea (*Lathyrus littoralis*), beach sagewort (*Artemisia pycnocephala*), dune bluegrass (*Poa macrantha* and *P. douglasii*), dune goldenrod (*Solidago spathulata*), sand verbena (*Abronia latifolia*), and beach-bur (*Ambrosia chammisonis*). Beach layia mostly occurs in the dunes on the western edge of the Point Reyes peninsula (NPS 2009, 2015a). The plant germinates during the rainy season between fall and mid-winter, blooms in spring (April to June), and completes its life cycle before the dry season. Populations tend to be patchy and subject to large annual fluctuations in size and distribution due to shifts in dune blowouts, remobilization, and dune stabilization. Beach layia seeds are dispersed by wind and populations occur where seeds are trapped by sparse vegetation that is not dense enough to cause shading (USFWS 1998b).

Critical Habitat in the Action Area. Critical habitat has not been designated for beach layia.

Status in the Vicinity of the Action Area. According to the California Native Plant Society (CNPS) (2018), as of 2015, there are 21 extant occurrence records of beach layia. USFWS (2011a) reported no significant change in the distribution of beach layia since the species was listed. Fourteen populations of beach layia have been identified in the park, all located along the 10-mile stretch of the Great Beach. These 14 populations are comprised of several occurrences that NPS (2015a) mapped during field surveys with both points and polygons (attachment A, figure K-2). The majority of known point occurrences are in coastal dunes outside ranch boundaries (63%), or within existing resource protection exclusion areas (17%) on the B, C, E, F, and AT&T Ranches (NPS 2015b). The other 20% of beach layia occurrences are on remnant dune features within grazed pastures (NPS 2015b), where cattle could directly impact plants through trampling, as well as indirectly via increased weeds associated with grazing disturbance (NPS, Parsons, pers. comm. 2019b). As of 2013, the B and AT&T Ranches had the greatest amount of coastal dune habitat, which comprised over 20% of both ranches (Aoyama et al. 2018). Although livestock are excluded from coastal dune habitat where most beach layia is found, the species is also affected to a small extent by grazing from deer, hares, and rabbits (USFWS 1998b). The NPS NRCA (2019c) provides the most recent condition assessment of beach layia within the park.

A complete census of all populations in the action area was performed in 2003, estimating over 66,000 plants (Imper 2014). A sampling protocol was initiated in 2004, when 8 of the 15 populations were sampled, and the boundaries recorded with GPS. The total count for beach layia that year exceeded 44,000, occupying just over 16.3 acres of dunes within only a portion of the habitat occupied by the 8 sampled populations (USFWS 2011a). In general, beach layia numbers appear to be declining in most populations, with the exception of the stable population at AT&T (Population 5) and the population at Abbotts Lagoon (Population 6), which has benefitted from a large coastal dune restoration project. Not only have plant numbers within the remnant native Dune Mat area that supported Population 6 increased since removal of the European beachgrass that surrounded this native dune area on all sides, but, after a bit of a lag, beach layia has also expanded dramatically within the dune areas restored by mechanical removal and, to a lesser extent, herbicide treatment (NPS 2019a). Numbers within fixed census plots dropped from 35,893 in 2004 to 5,689 in 2018, however, abundance in the restored population at Abbotts was estimated in 2018 to be as high as 4 million plants (NPS 2019a).

The primary threat to beach layia in the action area is the invasion of European beachgrass (*Ammophila arenaria*) and iceplant (*Carpobrotus edulis*), and other non-native plant species, which colonize open dune patches where beach layia is found (Benson 2004). Twelve of the 15 occurrences in the park were considered to be threatened by the nearby presence of the non-native invasive European beachgrass or iceplant because the monotypic stands of both invasive species virtually exclude less competitive native species (NPS 2009, 2015a). This threat is being addressed via ongoing coastal dune restoration projects to control non-native plants. Within the species range, additional threats in the action area include incidental grazing or trampling by cattle and pedestrians, potentially destroying individual plants (USFWS 1998b). Additional threats in the park include cattle trampling, coastal erosion, and conversion of primary and mid-successional dune habitat to late-successional dune habitat (NPS, L. Parsons, pers. comm., 2019b). While removal of beachgrass improves habitat for beach layia, some plants were buried at one population due to sand accumulation mobilized by mechanical removal of beachgrass from surrounding dunes (Imper 2014).

Livestock trampling was indicated as a threat when beach layia listed (57 FR 27848). The majority of known occurrences in the action area are in coastal dunes outside the action area (65%) or within existing resource protection exclusion areas (25%). The other 10% of beach layia occurrences are on remnant dune features within grazed pastures (NPS 2015a). Since 2004, the estimated beach layia population in the park has declined 84% from an estimated 35,893 plants in 2004 to 5,689 plants in 2018 (NPS 2019a). Although beach layia occurrences have increased in areas where coastal dune restoration has occurred (NPS 2019a), those subject to grazing have declined in abundance since 2004 (NPS 2019a).

6.1.1.2 Marin Dwarf Flax—Threatened

Legal Status. Marin dwarf flax was listed as threatened under the ESA in 1995 (60 FR 6671). It was listed as threatened under the CESA in 1992 (CDFW 2018). The USFWS plan for recovering Marin dwarf flax is found in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998a). USFWS (2011b) conducted a five-year status review of Marin dwarf flax and found that no change was needed to its threatened status, which was announced on April 27, 2012 (77 FR 25112).

Species Description. Marin Dwarf flax is an annual herb in the flax family (Linaceae) that grows 2 to 5.9 inches tall. It has slender, threadlike stems that are 4 to 16 inches tall. The leaves are linear and its flowers form in congested clusters with five petals are that are rose to whitish. The anthers of Marin dwarf flax are deep pink to purple and its sepals are hairy, which helps distinguish the species from other dwarf flax (*Hesperolinon* spp.) found in the same geographic area (USFWS 2011b). Its flowers bloom from May to July and is sensitive to the amount and timing of rainfall. It is pollinated by insects such as bee flies and pollen beetles. Late rains may provide the most suitable growing conditions for dwarf flax (Robison and Morey 1992).

Habitat Requirements/Ecology. Marin dwarf flax grows on serpentine soils in grasslands of Marin, San Francisco, and San Mateo Counties. Serpentine soils are formed from weathered volcanic rock, with a low calcium-magnesium ratio, a lack of soil nitrogen, potassium, or phosphorus, and elevated heavy metals (mineral toxicity). Such unique soil chemistry is inhospitable or toxic to many plants and has led to the evolution of numerous endemic plants, such as Marin dwarf flax (Igwe 2018, NPS 2001a). Marin dwarf flax is typically found in association with bunchgrasses, chaparral, or other dry grassland plant communities.

Critical Habitat in the Action Area. Critical habitat has not been designated for Marin dwarf flax.

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2015, there are 24 extant occurrence records of Marin dwarf flax in California. The known occurrences of Marin dwarf flax in the action area are on McIsaac Ranch, on generally on exposed serpentine soils with sparse vegetative cover along Nicasio Ridge (NPS 2015b, 2019d). The population varies between 10,000 to perhaps over 100,000 plants. The largest occurrence extends along the ridgetop from the McIsaac Ranch into private land and overlaps with the Tiburon paintbrush population in that area (NPS 2004). Occurrences are also located on small rocky outcrops on the Cheda and Zanardi Ranches (NPS 2001a, Rilla and Bush 2009) (attachment A, figure K-3).

The abundance of Marin dwarf flax on Nicasio Ridge appears to vary widely from year to year. Survey efforts between 1988 and 2000 were similar, but the number of occurrences and estimates of individual plants differed substantially, and new occurrences were found in 1999 and 2000. This suggests the distribution of Marin dwarf flax on Nicasio Ridge is not fully known, and it may be found at other sites in the future resulting from seed dispersal, weather, or localized disturbances (NPS 2004).

The activities that have contributed to the decline of Marin dwarf flax within its range include habitat loss to human development, recreation, trampling, and competition with native and non-native species (USFWS 2002b). Limited information is available about the tolerance of Marin dwarf flax to grazing or soil disturbance, and the effects of livestock grazing on Marin dwarf flax were unknown at the time of its listing under the ESA (USFWS 1998a). However, the effect of livestock grazing on rare plant populations on serpentine soils is generally beneficial via decreased accumulation of nitrogen that promotes annual grass invasions (Weiss 1999, USFWS 2011b, Beck et al. 2015). The species is present in all known patches and numbers appear stable in comparison to previous years (NPS 2019d).

6.1.1.3 Showy Indian Clover—Endangered

Legal Status. Showy Indian clover was listed as endangered in 1997 (62 FR 54791). No recovery plan for the species has been completed. USFWS (2007b, 2012a) has conducted two five-year status reviews of showy Indian clover and determined that no change was needed to its endangered status.

Species Description. Showy Indian clover is an annual plant in the pea family (Fabaceae). It is erect with hairy stems and leaves. It grows from 14 to 27 inches, having purple flowers with white tips, growing in dense round or ovoid heads that are approximately 1 inch in diameter. The flowers are not subtended by the circular toothed bract present in many other clovers. It blooms from April to June (USFWS 2007a).

The species' original range, known from 24 historic locations, was from Mendocino County south to Sonoma, Marin, Alameda, and Santa Clara Counties, and east to Napa and Solano Counties (USFWS 2007a). It has been reduced to one natural population in Marin County, two small experimental populations in Sonoma County, and two experimental populations in the action area (USFWS 2012b).

Habitat Requirements/Ecology. Showy Indian clover has been found in a variety of habitats including low, wet swales, grasslands, and grassy hillsides up to 310 meters (1,020 feet) in elevation (USFWS 2012b).

Critical Habitat in the Action Area. Critical habitat has not been designated for showy Indian clover.

Status in the Vicinity of the Action Area. In 1994, the single remaining wild population of showy Indian clover was found in the front yard of a private residence in coastal Marin County. In July 2006, the USFWS and the NPS introduced the species to two sites on coastal prairie land on D Ranch (USFWS 2012b, Jeffery 2016). In spite of a prolonged period of winter drought since introduction, mature showy Indian clover plants survived in 17 of the 45 experimental plots by 2015. In those 17 plots, 61 plants were counted with 158 full-sized flowering heads (Jeffery 2016). Future monitoring is needed to determine if this introduced population will persist (Jeffery 2016), which is performed by the USFWS. See Jeffery (2016) for a map of the location of this population on the D Ranch.

The listing rule for Showy Indian clover (62 FR 54791) suggested that some historic locations could have been eliminated due to grazing. However, livestock grazing was not an impact on the one known natural population at Dillon Beach at the time of listing or the first 5-year review (USFWS 2007b). Gopher activity was a primary source of plant mortality and other native herbivores (deer, rabbits, voles, snails, slugs, and insects) could have deleterious effects to showy Indian clover plants (USFWS 2012b). The introduced population on the D Ranch is divided by a fence with cattle grazing on only one half.

6.1.1.4 Sonoma Alopecurus—Endangered

Legal Status. Sonoma alopecurus was listed as endangered under the ESA in 1997 (62 FR 54791). It is not listed under the CESA (CDFW 2018). At the time of its listing, Sonoma alopecurus was only known from five natural populations, two of which were in the action area. A recovery plan for this species has not been completed. USFWS (2011c) conducted a five-year status review of Sonoma alopecurus and found that no change was needed to its endangered status, which was announced on April 27, 2012 (77 FR 25112).

Species Description. Sonoma alopecurus is a perennial grass growing 12 to 30 inches tall with erect stems and a compressed spike-like inflorescence. The spikelets are usually tinged violet-gray near the tip. The awn is straight and exceeds the lemma body by 1.0 to 2.5 mm (0.04 to 0.1 in). It is a variety of the widespread nominate species, which is found in wet meadows and shorelines in California, the eastern U.S., and Eurasia. This variety is distinguished from *Alopecurus aequalis* var. *aequalis* by its more robust, upright appearance, generally wider panicle, violet-gray tinged spikelets, and longer awn (USFWS 2002b). Individual plants flower at different times throughout the late spring and early summer, so it is difficult to accurately estimate numbers of plants.

Habitat Requirements/Ecology. Historically, Sonoma alopecurus has been found in riparian areas, both within and alongside the stream channel, and in permanent or seasonally flooded freshwater marshes. In the action area, this grass is found within low-gradient swales in dunes (dune slacks) and in grasslands. Other plants commonly associated with Sonoma alopecurus include: Pacific potentilla (*Potentilla ansrina* spp. *pacifica*), seep monkeyflower (*Mimulus guttatus*), floating pennywort (*Hydrocotyle ranunculoides*), common velvetgrass (*Holcus lanatus*), water parsley (*Oenanthe sarmentosa*), manna grass (*Glyceria occidentalis*), sedges (*Cyperus* spp.), and rushes (*Juncus* spp.) (USFWS 2011c)

Sonoma alopecurus flowers from May to July. This species, like other grasses, is primarily wind-pollinated and limited information is available on its reproductive biology (USFWS 2002b). It also reproduces vegetatively (via rhizomes). The species is difficult to propagate and several attempts to introduce the species from seed have failed (USFWS 2011c).

Critical Habitat in the Action Area. Critical habitat has not been designated for Sonoma alopecurus.

Status in the Vicinity of the Action Area.

According to the CNPS (2018), as of 2010, there are 20 extant occurrence records of Sonoma alopecurus in California. In 1986, only one population was known in the action area (USFWS 2011c). In 2004, NPS (2004) reported four occurrences of Sonoma alopecurus, all within pastures on agricultural lands, among populations near Abbotts Lagoon, on the G and H Ranches; on the F Ranch; and on the AT&T lease/permit (attachment A, figure K-4). At one point, there were 10 populations in the park; 4 are now considered extirpated, leaving 6 of the 7 existing populations of this species in the park (Parsons and Ryan 2019a). The six populations include several new "wild" populations that were found in recent years (Parsons and Ryan 2019a). The currently extant populations in the action area are clustered in a small (4.6 square mile) area between Creamery Bay and Abbotts Lagoon in freshwater wetlands that occur either among coastal dune systems or in historic dune soils currently supporting grasslands directly adjacent to the coastal dunes (NPS 2015a; Ryan and Parsons 2016).

Three separate attempts have been made to establish new populations at Point Reyes—one in 1987, one in 2002 (USFWS 2011c), and one in 2014/2015 (Parsons and Ryan 2019a). The 1987 introduction attempt failed (USFWS 2011c), and the 2002 effort to establish four new populations was also thought to have failed until park staff found plants in one of the plots in 2014 (NPS 2015a). However, no inflorescences have been found in that plot in two subsequent monitoring events in 2015 and 2017 (Parsons and Ryan 2019a). In 2014/2015, NPS attempted another series of introductions, transplanting Sonoma alopecurus plants to sites that were carefully selected based on biotic and abiotic conditions similar to the most successful "wild" populations. Two of these sites failed in the first year; one site failed after the second year; and the fourth site is still extant, but the number of inflorescences has dropped dramatically each year (Parsons and Ryan 2019a).NPS began monitoring Sonoma alopecurus in the early 1980s, and, because populations experience wide fluctuations between years, the methodology was refined in 2000 to better define population boundaries and improve census methods (USFWS 2011c). NPS (2016) provides a history of monitoring for Sonoma alopecurus and further discusses the effects of grazing on the species. Since 1983, the park has counted individual flowers of known populations somewhat regularly. However, because Sonoma alopecurus is a clonal species, it is difficult to accurately estimate number of plants (NPS 2009). Thus, starting in 1983, NPS has counted inflorescences or stalks of flowers instead as a way to monitor population status. Populations have been monitored fairly regularly since 2000.

At the time of listing, populations of Sonoma alopecurus were reported to have declined due to competition from non-native invasive plants, trampling and grazing by cattle and low regeneration (62 FR 54791). Furthermore, populations of Sonoma alopecurus can be substantially reduced due to competition from aggressive emergent wetland species such as sedges and rushes (USFWS 2002b). Results of monitoring of Sonoma alopecurus in the action area, described above, suggest that alopecurus thrives in wetlands that are grazed just enough to reduce competing vegetation (NPS 2004). All natural populations of Sonoma alopecurus in the action area are currently managed by grazing (USFWS 2011c).

During 2018, Sonoma alopecurus numbers were low in almost every population; however, populations are highly variable so it is difficult to determine whether this was a temporary dip or a general trend of declining populations (Parsons and Ryan 2019a). In general, for most of the populations, the cause of this decline is unknown, although grazing regime, including intensity and seasonality, may play an important role (Parsons and Ryan 2019a). NPS annual monitoring reports, submitted to USFWS, provide a detailed summary of monitoring data for all populations through 2019 (e.g., Parsons and Ryan 2018a; 2019a). Figure K-5 in attachment A demonstrates the variability of Sonoma alopecurus inflorescence tallies among populations in the action area from 1999 to 2017.

All known occurrences of Sonoma alopecurus in the park occur in pastures that have been historically grazed, and most are likely still subject to grazing. As stated by NPS (2001a) and USFWS (2002b), two of the occurrences are located along fences separating grazed and ungrazed areas, growing only on the grazed sides of the fences. It is difficult to determine the exact proportion of plants subject to cattle grazing because fence data is not always accurate, and ranchers stop or reduce grazing in certain areas (NPS, Parsons, pers. comm. 2019b). Sonoma alopecurus competes with a number of non-native annual grass and forb species that were not present historically (Parsons and Ryan 2019a). Thus, grazing is important for reducing competition from other plants. One historic population of Sonoma alopecurus in the action area disappeared following exclusion of cattle from the site (Parsons and Ryan 2019a).

6.1.1.5 Sonoma Spineflower—Endangered

Legal Status. The Sonoma spineflower was listed as endangered under the ESA in 1992 (57 FR 27848). It was listed as endangered under the CESA in 1990 (CDFW 2018). The USFWS plan to recover Sonoma spineflower is found in the *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b). USFWS (2010a) conducted a five-year status review of Sonoma spineflower and determined that no change was needed to its endangered status.

Species Description. Sonoma spineflower is a member of the buckwheat family (Polygonacea). It is an annual that grows 3.9 to 11.8 inches tall on sandy soils. Its foliage is pubescent and it has basal leaves that are 0.4 to 2.0 inches long and typically wider near the tip. Flowers, appearing in June through August, are white to lavender to rose in color and 0.20 to 0.24 inches long and occur in dense, ball-shaped, pinkish clusters with green bracts below (USFWS 2010a). The species is very similar in overall appearance to the endangered Howell's spineflower (*Chorizanthe howellii*), which grows in coastal dunes north of Fort Bragg in Mendocino County, and is closely related to the threatened Monterey spineflower (C. *pungens* var. *pungens),* which grows from the Monterey Peninsula to Santa Cruz County, and the Ben Lomond spineflower (*C. p.* var. *hartwegiana),* which grows in Santa Cruz County.

Habitat Requirements/Ecology. The habitat of Sonoma spineflower consists of well-drained, sandy soils in coastal grasslands. The species occurs in areas where seedlings can establish and avoid competition from other native and non-native species. Its seed dispersal is facilitated by spines that attach to passing wildlife. In areas where ranching occurs, seed dispersal could also be facilitated by cattle. It is unknown whether the species forms a dormant seed bank. Sonoma spineflower has a peak blooming season of only three weeks between June and early July, emitting a strong floral scent that attracts pollinators. After being pollinated, the plant loses its color and sets seed. After about a month, the dull brown flowers begins to disintegrate and the spiny seeds are dispersed on the ground nearby (USFWS 1998b).

Critical Habitat in the Action Area. Critical habitat has not been designated for Sonoma spineflower.

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2010, there are 3 extant occurrence records of Sonoma spineflower in California. Historically, it was more widespread in the park, occurring near the Point Reyes Post office, then located west of Schooner Bay, as well as north of Creamery Bay in Drakes Estero (USFWS 1998b). USFWS (1998b) reported that the species was thought to have been widespread in Marin and Sonoma Counties, but was believed to be extinct for 77 years, although Parsons and Ryan (2018b) reported that little historical data was recorded about the species. In

1980, the species was rediscovered in the action area south of Abbotts Lagoon, in the same pasture on G Ranch where a population of Sonoma alopecurus is located. At the time, this population was estimated to cover around 1,000 square feet (0.02 acre) and had increased to nearly 17,000 square feet (0.39 acre) by 1984 due to presumably natural population fluctuations (USFWS 1998b). The CNPS monitored the population annually since 1983, but NPS took over monitoring in the early 2000's. Since 2010, the areal extent of the wild population has ranged from 3.2 acres (2012) to 4.2 acres (2016) (Parsons and Ryan 2019b). Though population numbers of Sonoma spineflower vary dramatically from year to year, the population boundary of the main G Ranch population has been largely unchanged, which shows a high degree of site fidelity (Parsons and Ryan 2019b). Figure K-6 in attachment A shows the location of the main population on G Ranch and introduced populations on G, F, and AT&T Ranches. An introduction on the H Ranch appears to have failed (Parsons and Ryan 2019b).

To downlist the Sonoma spineflower, a stated goal of the USFWS (1998b) was to establish and maintain two new populations (USFWS 1998b). The park has performed several introductions in grazed pastures at G Ranch, F Ranch, and AT&T Ranch, at least five of which have been successful in establishing new occurrences (NPS 2015a; Parsons and Ryan 2019b). Some populations have persisted and grown substantially, including five populations dating from before 2005, as well as six newer introductions since then (Parsons and Ryan 2019b). The sites chosen for planting were those regularly frequented by cattle to ensure that cover of other native and non-native species did not competitively exclude Sonoma spineflower (NPS 2004; Parsons and Ryan 2019b).

Due to variations in sampling and wide year-to-year fluctuations, population trends are uncertain, and the long-term viability of the introduced population(s) is not known (USFWS 2010a). Figure K-7 in attachment A, from Parsons and Ryan (2019b), shows the estimated abundance of Sonoma spineflower within the main wild population on G Ranch. NPS has established a preliminary management objective for maintaining Sonoma spineflower above different threshold abundance levels for wet and dry years. As shown in figure K-7 in attachment A, this objective has been mostly achieved, which includes supporting at least 30,000 plants in "wet" (>25 inches) years and at least 300,000 individuals in "dry" years (<25 inches). Based on these data, management objectives have been met nine (9) of the last 13 years, with 2015-2017 meeting objectives, but not 2018 ("dry" year; Parsons and Ryan 2019b). Six of the last seven years have had significantly lower average plant densities than 2005, the first year NPS used sampling to estimate numbers, despite some dramatic climatic variation in terms of rainfall (Parsons and Ryan 2019b). In the wild population, Sonoma spineflower population estimates continued to decline in 2018, posting some of the lowest estimates recorded since monitoring began in 2005. In general, the wild population and nearby introduction sites on G Ranch appear to have been in a slump since 2011, with the possible exception of 2015, where numbers equaled or exceeded the 14-year average of 327,668 (Parsons and Ryan 2019b). As trends within introduced populations at adjacent sites (F Ranch, Schooner Creek, and AT&T) were dissimilar, this would suggest that this trend is unrelated to inter-annual climatic variations or microclimate differences but must be driven by factors localized to each general population area (Parsons and Ryan 2019b). These factors could include intensity and timing of cattle grazing, intensity and timing of grazing by other herbivores, including ground-dwelling mammals, and pollinator dynamics (Parsons and Ryan 2019b).

The rarity of Sonoma spineflower makes it exceptionally vulnerable to disturbances such as non-native invasive plants (i.e., non-native grasses) and native species such as coyote brush (*Baccharis pilularis*). Spread of yellow bush lupine (*Lupinus arboreus*) also poses a threat, which is native to California but is not believed to be native to Marin County. Other potential threats to Sonoma spineflower in the action area include trampling by hikers and equestrians and unauthorized off-road vehicle use (USFWS 2010a); however, these uses are infrequent near extant populations, and a dirt road at the Abbotts Lagoon population has been re-routed and marked to eliminate off-road vehicle traffic.

In 2009, USFWS awarded the park with funding to: (1) remove invasive plants (i.e., common velvetgrass, yellow bush lupine, and non-native grasses) from within and adjacent to the Abbotts Lagoon population; (2) realign a dirt road that runs through the Abbotts Lagoon population; (3) collect seeds and accession; (4) establish additional seed introduction plots; (5) collect soils and other physical and biological information to better select introduction sites; and (6) to assist park staff with tracking grazing.

6.1.1.6 Tiburon Paintbrush—Endangered

Legal Status. Tiburon paintbrush was listed as endangered under the ESA in 1995 (60 FR 6671). It was listed as threatened under the CESA in 1990 (CDFW 2018). The USFWS plan to recover Tiburon paintbrush is found in the *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998a). USFWS (2012a) conducted a five-year status review of Tiburon Paintbrush and determined that no change was needed to its endangered status.

Species Description. Tiburon paintbrush is a semi-woody perennial with erect, branched stems that range from 1 to 2 feet tall. It is known in six locations—one each in Napa and Santa Clara Counties, three on Ring Mountain in eastern Marin County, and one on Nicasio Ridge in the action area.

Habitat Requirements/Ecology. Tiburon paintbrush grows on serpentine soils, similar to Marin dwarf flax, as described above under *Habitat Requirements/Ecology* in section 6.2.1.2. It is often found in association with an evergreen, spiny-leafed ceanothus taxa (NPS 2001a).

Critical Habitat in the Action Area. Critical habitat has not been designated for Tiburon paintbrush.

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2013, there were 7 extant occurrence records of Tiburon paintbrush in California. Within the action area, Tiburon paintbrush occurs within one population on serpentine soils on Nicasio Ridge. This occurrence covers approximately 11 acres on the McIssac Ranch and adjoining private ranchland (NPS 2015b). Tiburon paintbush locations in the action area are shown in attachment A, figure K-3.

The number of Tiburon paintbrush plants on Nicasio Ridge was 100 individuals in 1998, 41 in 1999, 84 in 2000, and 68 in 2001 (NPS 2004). In 2018, the population of Tiburon paintbrush at Nicasio Ridge consisted of 176 individuals. The "main patch" of the population was censused at 142, and two outlier patches totaled 7 and 27 individuals, each slightly down from 2017 totals, but still in the upper range when compared to historic figures (NPS 2019d).

6.1.1.7 Tidestrom's Lupine—Endangered

Legal Status. Tidestrom's lupine was federally listed as endangered under the ESA in 1992 (57 FR 27848). This species was listed as endangered under the CESA in 1987 (CDFW 2018). The USFWS plan to recover Tidestrom's lupine is found in the *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b). The latest five-year status review of Tidestrom's lupine determined that no change was needed to its endangered status (USFWS 2009a).

Species Description. Tidestrom's lupine, also commonly known as clover lupine, is a creeping perennial herb and a member of the pea family (Fabaceae). It is found in two disjunct areas: throughout the northern portion of the Monterey Peninsula in Monterey County and from the northwest portion of Marin County at Point Reyes National Seashore to the Russian River, Sonoma County. Tidestrom's lupine is distinguished from other lupines in the area number of leaflets (typically 3 to 5), small leaflet size (1.3–2.0 centimeters long) (0.5-0.8 inch), and dense hairs on the foliage. Flowering occurs from May through June (USFWS 2009a).

Habitat Requirements/Ecology. Tidestrom's lupine occurs on unstabilized and partially stabilized sand dunes, in association with Douglas' bluegrass (*Poa douglasii*), beach evening-primrose (*Oenothera drummondii*), bluff wallflower (*Erysimum menziesii* ssp. *concinnum*), beach morning glory (*Ipomoea pes-caprae*) coast dandelion (*Agoseris apargioides*), beach-bur (*Franseria chamissonis*), beach sagewort (*Artemisia pycnocephala*) and sand verbena (*Abronia umbellata*) (USFWS 2009a). It is found in coastal dunes on the western edge of the Point Reyes peninsula (NPS 2009, 2015a). It has a low tolerance for burial compared with larger dune plants of the pea family, so it is not found in accreting foredunes, but grows in stable to slightly mobile dunes. However, it expanded rapidly within areas subject to high disturbance during the Abbott Lagoon Coastal Dune Restoration Project (NPS 2019a).

Tidestrom's lupine is primarily pollinated by bees, in particular *Bombus vosnesenskii* (USFWS 2009a). It is also known to be wind-pollinated, and during recent monitoring periods, no bees or other flying insects were observed on or near any plants (Parsons 2018). Ants may play some role in pollination when they collect nectar, but the effectiveness of these insects at pollinating Tidestrom's lupine is unknown (Parsons 2018). Tidestrom's lupine reproduces by seed, which are large and long-lived, and deposited in the vicinity of the plant base. Seeds require some type of seed coat degradation, such as scarification by blowing sand, for germination. Thus, seedbank dynamics are extremely important for this species.

Critical Habitat in the Action Area. Critical habitat has not been designated for Tidestrom's lupine.

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2013, there are 19 extant occurrence records of Tidestrom's lupine in California. There are currently 10 populations of Tidestrom's lupine in the action area; the remaining populations are on private, municipal, or State Park beach properties. Tidestrom's lupine populations are found along the Point Reyes Beach stretching from A Ranch north to Abbotts Lagoon. These 10 populations are composed of several occurrences that NPS (2015b) has mapped during field surveys with 13 polygons and 57 points. Approximately 50% of known occurrences in the action area are in coastal dunes outside ranch boundaries and another 35% are within existing resource protection exclusion areas on the B and AT&T Ranches. The other 15% of Tidestrom's lupine occurrences are on remnant dune features within grazed pastures on the F Ranch (NPS 2015b), where cattle could directly affect plants through trampling, as well as indirectly via increased weeds associated with grazing disturbance. Figure K-8 in attachment A shows the general locations of Tidestrom's lupine populations in the action area.

The main threat to Tidestrom's lupine in the action area is from non-native invasive plants, primarily European beachgrass and iceplant. Almost all the populations at Point Reyes exist within islands of native dune habitat that are surrounded by European beachgrass and/or iceplant (Parsons 2018). These invasive plants directly compete with Tidestrom's lupine and indirectly affect the plant by providing habitat for increased numbers of native deer mice (*Peromyscus maniculatus*) that can eat up to 82% of the seeds of Tidestrom's lupine (NPS 2015a). As compared to native plant communities, predation from deer mice on Tidestrom's lupine has been documented to be 70% higher near European beachgrass, effectively reducing the potential for successful reproduction of this species (NPS 2015a). Encroachment by invasive plants may have eliminated one population (Population #5) (Parsons 2018). Other threats include trampling by humans and large animals, including cattle. In 2010 within the action area, very few fruits were produced because many reproductive plants reverted to a non-reproductive status after being trampled in spring 2009 (NPS 2015a). However, in the action area, most occurrences of Tidestrom's lupine are in areas largely excluded from cattle grazing (USFWS 1998b).

Due to the invasion of non-native European beachgrass and iceplant and the associated indirect seed predation by deer mice, population viability analyses in the mid- to late-2000's indicated that almost all of the park's Tidestrom's lupine populations appeared headed towards extinction (Dangremond et al. 2010). During this study, researchers noted adverse effects to some populations from trampling by cows and suggested that trampling by livestock was the cause of some plants going from a reproductive to non-reproductive state. This study pre-dates the dune restoration actions that the park has performed, where mechanical dune restoration created large expanses of early successional habitat, and Tidestrom’s lupine responded almost immediately. In 2013, numbers of Tidestom’s lupine were estimated at approximately 20,500 individuals. By 2014, Tidestrom’s lupine had established in most portions of the mechanically restored dunes and in several of the areas treated with herbicide, and the population appeared to have increased exponentially to almost 74,111 individuals (Parsons 2019).

Recent monitoring of Tidestrom’s lupine populations in the action area is described in detail by Parsons (2019). Ten Tidestrom’s lupine populations were censused or sampled every year for the first five years of monitoring (2001-2005). After 2005, populations were monitored in 2007, and then every year from 2010 to 2017. Only three of the park’s 10 monitored populations are potentially growing to stable, sizeable historic populations, including Population 1 (Abbotts Lagoon), Population 8 (AT&T Ranch Radio Tower), and Population 9 (one of the populations north off North Beach). The other populations are either continuing to decline (B Ranch South; Population 7; B Ranch North/Population 6; Davis/Population 3) or are somewhat stable, but very small (North Beach/Population 2; Abbotts North/Population 4) (Parsons 2019). Population 1 is the largest Tidestrom’s lupine population in the action area, occupying a large expanse of open dune habitat southwest of Abbotts Lagoon. Originally documented in 1983, it presently occupies over 50 acres. Sampling data collected over a non-consecutive period of 16 years provide estimates of over approximately 150,000 to 283,000 individual Tidestrom’s lupine plants (Parsons 2019) (attachment A, figure K-9). Population 5, which numbered 21 plants in 1991, was extirpated by 2000. Also, an introduced population of 134 planted seedlings (Population 12) in 2005 declined by 2010 to a point where plants were no longer present. Based on an initial Population Viability Analysis, this seed predation had reduced seedling recruitment to the extent that two of the three populations evaluated—Population 1 (Abbotts Lagoon) and Population 2 (North Beach)—appeared unstable (Dangremond et al. 2010). In a follow-up Population Viability Analysis of eight populations conducted using data collected in 2008–2009, three populations in particular appeared to be especially vulnerable, including Population 7 (B Ranch South), Population 6 (B Ranch North), and Population 3 (Davis) (Pardini and Knight, unpub. data, n.d.).

6.1.2 Federally Listed Wildlife

6.1.2.1 California Red-legged Frog – Threatened

Legal Status. The California red-legged frog was listed as a threatened species in 1996 (61 FR 25813). The *Recovery Plan for the California Red-legged Frog* (USFWS 2002a) was completed in 2002 (67 FR 57830).

Species Description. The California red-legged frog is the largest native frog in the western United States, ranging from 1.5 to 5.1 inches in length. USFWS has recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). The common name for this species derives from its belly and hind legs, which are often red or salmon pink in adults (USFWS 2002a). The abdomen and hind legs of adults are often red. The frog’s back is brownish, gray, olive, or reddish in color with small black flecks and larger irregular dark blotches. Spots in its dorsal area usually have light centers (Stebbins 2003). The California red-legged frog once ranged across much of California, including portions of the Sierra Nevada Mountain Range and was historically documented in 46 counties. The species now remains in around 240 streams or drainages in 23 counties, representing a loss of 70% of its former range (USFWS 2002a).

Habitat Requirements/Ecology. The California red-legged frog is associated with perennial ponds, and low-gradient, slow-moving perennial or seasonal streams, including natural and manmade ponds, including ponds used by cattle. They have been detected in all habitat types surveyed by NPS, with the highest proportion of detections (approximately 75%) occurring in marshes or ponds (NPS 2019e). The species also uses a variety of other habitats, including riparian areas, grasslands and adjacent upland areas during the non-breeding season. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used (USFWS 2018c). Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer sheltering habitat. The breeding season typically runs from November through April; California red-legged frogs may live 8 to 10 years (USFWS 2002a). Populations of California red-legged frogs fluctuate from year to year depending on hydrologic conditions of breeding sites. It is common for adult red-legged frogs to remain in the breeding area year-round, but juveniles disperse widely over the landscape during their first winter and will occupy almost any available water source (Ford et al. 2013). When breeding conditions are favorable, red-legged frogs can experience high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites (USFWS 2002a). Dispersal distances are typically less than 0.5 mile, with records of a few individuals moving between 1 and 2 miles. Dispersal movements do not avoid any landscape feature or vegetation type and individuals have been found to cross closely grazed fields and plowed agricultural lands (Fellers and Kleeman 2007). To support California red-legged frog breeding, a waterbody must hold water continuously for a minimum of 20 weeks, beginning in the spring (i.e., long enough for breeding and tadpole development) (75 FR 12816). The minimum depth of breeding habitat is 20 inches. Breeding habitat does not need to be available every year, but it must be available at least once within the frog's lifespan for breeding to occur (USFWS 2002a). Deep-water pools, ponds, and lake areas are often not suitable for breeding because they contain predatory fish. Adults typically use shoreline areas with dense, shrubby or emergent vegetation, such as cattails or dense stands of overhanging willows as breeding and rearing habitat (75 FR 12816). The species' diet is highly variable; adults consume invertebrates, small tree frogs and mammals, while larvae eat mostly algae. Feeding activity mostly occurs along the shoreline and on the surface of the water. Near coastal dune systems, frogs occur in freshwater marsh wetlands in adjacent grasslands, as well as in dune swale wetlands.

USFWS (2002b) determined that grazing in the action area is generally compatible with the conservation of California red-legged frog populations and their habitat. Ranching in the action area is beneficial to red-legged frogs through the maintenance of stock ponds and the breeding habitat that they provide. Continued grazing would help maintain open-water habitat and allow for increased sunlight necessary for frog basking and the growth of algae, the primary tadpole food. Grazing would also help maintain habitat suitability of breeding ponds by preventing emergent vegetation such as cattails or bulrushes from becoming dominant or by limiting the growth of dense annual grasses around ponds, which reduces both the amount of open water habitat and the duration of pool inundation (USFWS 2002b, Huntsinger et al. 2007). In 2002, after reviewing the status of the California red-legged frog in the park and the potential effects to it from beef and dairy ranch activities, and other cumulative effects, USFWS (2002a) determined that renewal of ranching permits in the park is "*not likely to jeopardize*" the continued existence of California red-legged frog. Additionally, USFWS (2002b) reported that continued grazing in the action area would cause disturbance to critical habitat in the sense that some stock ponds used as breeding habitat will be disturbed. However, they found those effects to be temporary and relatively short term in duration, so that renewing ranching permits would "*not likely destroy or adversely modify*" designated California red-glegged frog critical habitat.

Critical Habitat in the Action Area. Critical habitat for the California red-legged frog was designated in 2001 (66 FR 14626) and revised in 2006 (71 FR 19244) and 2010 (75 FR 12816). Critical habitat includes three units in Marin County, one of which encompasses most of the southern portion of the Point Reyes Peninsula with the other two being located on the east side of the Tomales Bay watershed (USFWS 2018b). California red-legged frog Critical Habitat Unit MRN-3 spans the southern portion of Point Reyes peninsula, from Point Reyes Lighthouse east along Drakes Bay to Bear Valley and north past the northernmost tip of Drakes Estero and extending east into the Olema Creek watershed (attachment A, figure K-10). The action area is within this designated critical habitat for California red-legged frog.

Maintaining populations of California red-legged frogs requires protecting all essential habitat components—breeding habitat, nonbreeding habitat, and migration corridors. A buffer is needed around all three areas to ensure that outside activities do not indirectly degrade any of the three habitat components (Fellers and Kleeman 2007). Due to the complex life history and dispersal capabilities of the red-legged frog, the primary constituent elements (PCEs) of California red-legged frog critical habitat are found throughout the watersheds in the action area. They include aquatic areas for breeding (PCE 1), as described above, nonbreeding habitat (PCE 2), and upland habitat for foraging and shelter (PCE 3), all interconnected by unfragmented dispersal habitat (PCE 4). Outside the breeding season, adults may disperse to forage and seek shelter in small-mammal burrows, leaf litter, and other moist sites near riparian areas. The PCE for nonbreeding upland habitat (PCE 3) is typically within 300 feet of an aquatic feature. Suitable dispersal habitat (PCE 4) consists of all upland and wetland habitat that connect two or more patches of aquatic breeding habitat that is free of barriers and that connects two or more patches of aquatic breeding habitat within 0.7 mile of one another. Dispersal barriers would include heavily traveled roads or moderate to high density human development (75 FR 12816–12959). Ponds with small populations of California red-legged frogs, but surrounded by unsuitable upland habitat or cut off from other breeding ponds by dispersal barriers, do not have the primary constituent elements for red-legged frog critical habitat (USFWS 2002a).

Status in the Vicinity of the Action Area. Although extirpated from most of its range in California, the California red-legged frog is still locally abundant in a few locations, including the action area. Suitable aquatic and upland habitat is found throughout the action area, including components that are used by the California red-legged frogs for feeding, resting, mating, and dispersal. The action area is within Recovery Unit 3 (North Coast and North San Francisco Bay) and falls within Core Area #13 (Point Reyes Peninsula) of that Recovery Unit (USFWS 2002a). The conservation needs for the Point Reyes Peninsula core area are: (1) protecting existing populations from current and future urbanization; (2) creating and managing alternative breeding habitats; and (3) protecting dispersal corridors. Some of the largest remaining populations of the species are found within this area, where there are more than 120 breeding sites with a total adult population of perhaps a thousand frogs (Fellers and Guscio 2002, Pawley and Lay 2013). Based on 13 years of monitoring at a known breeding pond in the park, the breeding female population of that pond is generally stable or increasing (Fellers et al. 2017).

Populations of the California red-legged frog in the action area are relatively robust where habitat is available. Many of the California red-legged frog breeding sites in the action area are artificial stock ponds constructed on lands that have been grazed by cattle for more than 150 years (USFWS 2002b). Creation of stock ponds and other small impoundments on ranches over the past 100 years has likely resulted in increased numbers and an expansion in range for the California red-legged frog in Point Reyes (Fellers and Kleeman 2007). Other important aquatic habitats and associated riparian areas for red-legged frogs in the action area are low-gradient creeks that have late-season water flow or water retention in pools. Such creeks support relatively few documented breeding sites of the species in the action area, but may serve as connector and refuge habitats. The most important of these are Kehoe Creek and Abbotts Lagoon Creek on the north end of the peninsula, and Schooner Creek, which drains south into Drakes Estero. Portions of all three of these creeks, including areas that are known red-legged frog sites, are fenced off from livestock access. Cattle are excluded from Kehoe Creek below the confluence of its north and south forks and along parts of both forks. The lower 0.4 mile of the south fork of Abbotts Lagoon Creek and most of its 0.5-mile long north fork is fenced off from cattle. Also, portions of Schooner Creek's west fork and east fork are excluded from grazing (NPS 2001a, USFWS 2002b). Elsewhere, numerous wet swales, seasonal springs, and ephemeral pools provide dispersed travel and feeding habitats (USFWS 2008). Additionally, while frogs have mostly been documented in ponds and marshes in the park, surveys by Halstead and Kleeman (2017) found California red-legged frogs in 18 of the 21 coastal dune drainages along the Great Beach. These occurrences were located in both the grassland and dune portions of linear swales or drainages, with most of the frogs found in small pools along these drainages

(Halstead and Kleeman 2017). During recent surveys in the park, the probability of detecting California red-legged frogs at surveyed sites varied among years, with a mean detection rate of 0.43 (range = 0.22–0.67). Although no trend is apparent in these data, recent breeding habitat restoration and construction efforts for California red-legged frogs have occurred in the park (NPS 2019c). Figure K-10 in attachment A shows the distribution of documented California red-legged frog occurrences in the action area.

Surveys for California red-legged frogs have been conducted on most sites in the action area containing suitable aquatic habitat. As of 2001, those surveys had documented occurrences at 76 sites on ranches in the park, with 51 in livestock ponds, 11 in riparian areas, and 14 in ephemeral pools, wetlands and springs, with a large proportion located at stock ponds (attachment A, figure K-10). Of these known red-legged frog occurrences, only one is in an area where livestock are excluded (NPS 2001a). NPS (2019e) indicates approximately 136 red-legged frog occurrences within the action area, associated with approximately 120 breeding ponds.

Surveys for red-legged frogs have been less thorough in riparian areas than at stock ponds and future surveys may detect red-legged frog occurrences in creeks where they have not yet been documented. Research employing radio telemetry has also documented California red-legged frogs to be highly mobile, moving considerable distances from their breeding ponds (Fellers and Kleeman 2007).

In the 1996 final listing rule for the California red-legged frog, the USFWS cited livestock grazing as a contributing factor in the decline of the species. However, in its 2006 critical habitat designation (71 FR 19244), the USFWS acknowledged that: “our understanding of the threats of livestock grazing and stock pond development described in the previous final listing of the species has changed. Therefore, we believe grazing helps contribute to the conservation of the California red-legged frog and its habitat.” Within Recovery Unit 3, California red-legged frogs are threatened primarily by water management and diversions, predation and competition from non-native species, livestock, and urbanization (USFWS 2002a). Other threats include the spread of invasive species, particularly iceplant and European beachgrass, because California red-legged frogs have been shown to avoid areas where these species are present (Halstead and Kleeman 2017).

Based on the documented presence of California red-legged frogs in the action area, the potentially affected habitats, and the biology and ecology of the California red-legged frog, the NPS has determined that California red-legged frogs are present in the action area and use many locations in the action area for breeding, sheltering, foraging, and dispersal.

6.1.2.2 Western Snowy Plover – Threatened

Legal Status. The Pacific Coast designated population segment (DPS) of this small shorebird was listed as threatened in 1993 (58 FR 12864). USFWS received a petition to delist the DPS in 2006 and found that it was not warranted (71 FR 20607). The *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover* (USFWS 2007c) was completed in 2007 (72 FR 54279). USFWS (2006) conducted a five-year status review of the DPS and determined that no change was needed to its threatened status.

Subspecies Description. The western snowy plover is a small shorebird distinguished from other plovers (*Charadriidae* sp.) by its smaller size, pale brown upper parts, dark patches on either side of the upper breast, and dark gray to blackish legs. Snowy plovers weigh from 34 to 58 grams (1.2 to 2 ounces) and range in length from 15 to 17 centimeters (5.9 to 6.6 inches). Individual birds 1 year or older are considered to be breeding adults and the average life span is approximately 3 years.

The Pacific coast population of the western snowy plover is defined as those individuals that nest beside or near tidal waters, and includes all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays and estuaries from southern Washington to southern Baja California, Mexico.

Habitat Requirements/Ecology. Some western snowy plovers remain in their coastal breeding areas year-round, while others migrate south or north for the winter. On the California coast, most adults arrive at the nesting sites during April, with maximum numbers present from mid-May to late June. Fledging occurs from late June through August and late-season broods may extend into the third week of September. Western snowy plovers will renest after loss of a clutch or brood or successful hatching of a nest (USFWS 2002a).

Western snowy plovers breed above the high tide line on coastal beaches, sand spits, dune-backed beaches, salt pond levees and river bars. This subspecies forages on invertebrates in wet sand within the intertidal zone, in dry sand areas above high-tide, on salt pans, on spoil sites, and along edges of salt marshes, salt ponds, and lagoons. It sometimes probes for prey in the sand and picks insects from low growing plants (USFWS 2007c).

Controlling non-native vegetation and minimizing human-caused disturbances are necessary to ensure habitat suitability for the western snowy plover (77 FR 36728–36869). Specific management efforts include erecting enclosures around nests to protect them from predation, creating seasonal closures around nesting habitat, removing invasive plants, enhancing public awareness of the subspecies, and restoring its habitat (NPS 2015a). The primary predators of western snowy plovers are gulls, ravens, foxes, coyotes, raccoons, skunks, dogs, and feral cats. Of particular concern is the indirect effect of raven predation on nesting snowy plovers because increased numbers of common ravens in the action area have been attributed to food subsidies from beef cattle and dairy ranching practices (Kelly et al. 2002; Roth et al. 2004). Kelly (2001) reported that the highest numbers of ravens occurred near dairy ranches in the action area.

Critical Habitat in the Action Area. Critical habitat for the Pacific Coast population of western snowy plover was designated along the coasts of California, Oregon and Washington in 1999 (64 FR 68508) and 2005 (70 FR 56970) and revised in 2012 (77 FR 36728). Two coastal areas in the action area are designated critical habitat for the western snowy plover (USFWS 2018b). The Point Reyes subunit (CA 10A) occupies most of the west-facing beaches between Point Reyes and Tomales Point. This subunit currently supports both nesting and wintering snowy plovers. The Limantour subunit (CA 10B) is a 2.25-mile-long sand spit at the north end of Drakes Bay (attachment A, figure K-11). This subunit can support both nesting and wintering snowy plovers, and although nesting was not documented for many years in the early 2000s, the highest number of nests ever recorded on this beach occurred in 2018 (NPS 2018). The PCEs for these units include sparsely vegetated sandy beach above and below high tide for nesting and foraging, wind-blown sand dunes for nesting and predator avoidance, and tide-cast debris attracting small invertebrates for foraging.

Status in the Vicinity of the Action Area. The western snowy plover uses the Point Reyes peninsula as both wintering and nesting habitat. In winter, the western snowy plover is found on beaches and estuarine sand and mud flats. Wintering birds occur around the Great Beach, Drake's Beach and Estero and along Limantour Spit. Roosting snowy plovers use small depressions in the sand or in the lee of kelp, other debris, or small dunes (NPS 2015a). The western snowy plover may begin the breeding season between March–April and can lay more than one clutch to extend breeding, nesting, and rearing into mid-September (NPS 2015a). Snowy plover nesting in the action area occurs on the northern portion of the Great Beach between the South Beach parking lot and Kehoe Beach, which includes beach fronting AT&T and North Beach Dunes. Snowy plovers also occasionally nest along the western edge of Abbotts Lagoon. Nesting at Limantour Spit is limited by high spring tides, leaving much of the best nesting habitat inundated by water (NPS 2015a). Figure K-11 in attachment A shows the location of critical habitat along beaches in the action area, where western snowy plover nesting occurs adjacent to ranches in the action area.

From 1996 to 2009, numbers of nests on Point Reyes beaches ranged between 14 and 37 nests (NPS 2015a). From 1986 to 2014, an average of 15 chicks have been fledged in the park per year, ranging from 1 to 24 chicks (NPS 2017a). In 2018, 50 nests were documented, which is the highest number of nests in the last 10 years, however only 14 plover chicks were successfully fledged (NPS 2018).

USFWS (2002b) found that although western snowy plovers do not use habitats found on ranches, they could be directly affected by the unauthorized presence of trespass cattle on nesting beaches. They found that the "presence of cattle within nesting areas may result in nest failure due to western snowy plovers being flushed from their nests for extended periods of time. For the most part, the park has minimized the likelihood of such effects through the maintenance of pasture fences that exclude livestock from coastal beaches and adjacent sand dunes. Snowy plovers could be indirectly affected by the proposed action because ranches support common ravens that predate plovers and destroy plover nests. USFWS (2002b) finds "an increase in the number of ravens as result of ranching activities likely could lead to higher levels of predation on western snowy plovers by these corvids. Ongoing research has documented the interrelationship between ranching activities and ravens. Specifically, ravens opportunistically feed upon left over grains, afterbirths, carcasses, and organisms killed or injured during silage harvest."

To minimize predation by ravens and other predators, NPS initiated the use of predator exclosures around snowy plover nests in 1996. The exclosures consist of a wire fence that allows passage of plovers while keeping out mammalian predators and mesh netting on top to prevent access by avian predators. These exclosures have been effective at keeping predators away from nests, increasing the percentage of clutches hatching from an average of 14.9% prior to exclosure use (1986–1989) to 63.8% (1996–2014). In addition, the reproductive success of western snowy plovers is affected by human disturbance in the action area, which is closely monitored each year. Beach visitors have also been observed approaching active nests, which has been documented as a threat to nesting snowy plovers, especially when those visitors are accompanied by a dog (Campbell and Press 2017).

The park has undertaken dune restoration focused on removing non-native European beach grass and iceplant from areas on North Beach, in particular near Abbotts Lagoon. In 2003, the park found two plover nests in areas of non-native beach grass removal. From 2006 to 2008 there were four nests each year in the restored areas. In 2011, a large-scale mechanical removal of 90 acres of non-native European beach grass and iceplant occurred just south of Abbotts Lagoon. This large-scale restoration created a 250-acre natural dune environment. Additional efforts to remove non-natives and maintain the restored area were performed in subsequent years (Campbell and Press 2017).

6.1.2.3 Myrtle's Silverspot Butterfly – Endangered

Legal Status. The Myrtle's silverspot butterfly was federally listed as endangered under the ESA in 1992 (57 FR 27848). The USFWS (1998b) *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* was completed in 1998. USFWS (2009b) conducted a five-year status review of Myrtle's silverspot butterfly and determined that no change was needed to its endangered status.

Subspecies Description. The Myrtle's silverspot butterfly is a member of the brush-footed family (Nymphalidae). This medium-size butterfly is a subspecies of *Speyeria zerene* that averages around 2.2 inches wide (Black and Vaughn 2005). Two populations are believed to occur in the action area, along with several populations in coastal Sonoma County (USFWS 2009b). Within the action area, it occurs in areas surrounding Drake's Estero, Drake's Beach, and north of Estero de Limantour; the Great Beach from north of South Beach to just north of Abbotts Lagoon; and Tomales Point from Marshall and Kehoe Beaches to White Gulch and just north of McClure's Beach (NPS 2004, 2015a).

Habitat Requirements/Ecology. This subspecies inhabits coastal dune, coastal prairie, and coastal scrub habitats at elevations ranging from sea level to more than 600 feet and ranges as far inland as 3 miles (USFWS 1998b). A critical factor in the distribution of Myrtle's silverspot larvae is the presence of the larval host plant—the western dog violet (*Viola adunca*) (Rilla and Bush 2009). It is possible that, like other subspecies of *Speyeria zerene* and other species of greater fritillaries (*Speyeria* spp.), Myrtle's silverspot use other violet species as larval hosts, although this has not been observed (USFWS 2009b). The western dog violet is found in grasslands, grassy areas in coastal scrub, and other habitats. While the violet is rather common in grasslands near the coast, distribution of the subspecies is patchy. However, the abundance of the western dog violet alone is not a good predictor of silverspot presence (Launer et al. 1992). Several dune plant species are preferentially foraged on by Myrtle's silverspot, including, in order of preference, curlyleaf monardella, gumplant, seaside daisy, and yellow sand verbena. Less used nectar plants include yarrow, beach evening primrose, and mock heather. Within grasslands, Myrtle's silverspot butterflies may frequent non-native plant species such as bullthistle (*Cirsium vulgare*), and to a lesser extent, Italian thistle (*Carduus pynocephalus*) and rough cat's-ear (*Hypochaeris radicata*) (Adams 2004; Launer et al. 1992).

According to USFWS (2009b), the emergence of adult butterflies typically occurs from mid-June to mid-July. Although Myrtle's silverspot adults only live for about two to five weeks, the adult flight period is 2 to 3 months because of individual variation in emergence time. Eggs are laid singly by the female on dried leaves and stems of western dog violet, and within a few weeks of being laid, the larvae (caterpillars) emerge (USFWS 2009b). Caterpillars spend the fall and winter in the surrounding foliage. In the spring, they feed on nearby violets for 7-10 weeks, after which the larvae form pupae. Adult butterflies emerge from the pupal live stage after about two weeks (USFWS 2009b).

Critical Habitat in the Action Area. Critical habitat has not been designated for the Myrtle's silverspot butterfly.

Status in the Vicinity of the Action Area. The historical distribution of the Myrtle's silverspot butterfly is believed to have extended from near Fort Ross south to Punta Año Nuevo. By the 1970s, populations south of the Golden Gate were believed to be extinct and extant populations of the butterfly were believed to exist only in the action area. Reasons for its decline include urban and agricultural development, changes in natural fire patterns, and successional changes in plant communities that have reduced availability of host plants, non-native invasive plants, livestock grazing, over collecting, and other human impacts (USFWS 1998b, 2009b). Myrtle's silverspot butterflies experience large population fluctuations and increases of 10-fold or more in a single year have been observed. Due to the lack of historic data prior to 1990, it is not known if the subspecies has declined at Point Reyes (NPS 2001a). A study in the park conducted from 1991 to 1993 found that two separate populations of Myrtle's silverspot butterfly were centered at Tomales Point and North Beach. The North Beach population size was estimated at more than 1,000 individuals, but fewer than 5,000 butterflies (Launer et al. 1992). Myrtle's silverspot butterfly population surveys were conducted again by the Center for Conservation Biology from 1994 to 1998, and again in 2001 (USFWS 2009b). A small decline in overall numbers was observed up to 1998, but this trend apparently reversed in 2001, when higher numbers were observed (Adams 2004). Surveys of the North Beach and Tomales Point populations in the park in 2002 and 2003 indicated 534 and 558 individuals, respectively, although slightly different census locations and methods were used (Adams 2004; USFWS 2009b).

NPS (2001a) reported eight ranches in the action area that supported habitat for Myrtle's silverspot butterfly. Surveys by NPS for Myrtle's silverspot butterflies in 2003 showed that they were found on 13 ranches, all of which support livestock operations (Adams 2004). Although there have not been formal Myrtle's silverspot butterfly surveys in the park in recent years, NPS (2019e) has recorded occurrences on B, D, E, F, G, J, N, and K Ranches (attachment A, figure K-12). During surveys in 2011, butterflies were observed in all surveyed areas, and most of the butterflies were found at AT&T Ranch and North Beach, a moderate number on the D Ranch in proximity to the bluffs above Drakes spit, and a few at both Bull Point and Home Ranch. In 2012, the subspecies was commonly observed in dunes closest to AT&T Ranch, but none were observed near Abbotts Lagoon, similar to survey results from the original surveys in 2001–2002. Lower numbers occurred in other surveyed park areas in 2012. Myrtle's silverspot butterfly and cattle grazing have co-existed for over a hundred years (Adams 2004, NPS 2007), and NPS research does not suggest that cattle grazing has had a significant detrimental effect on the subspecies. Between grazed and ungrazed areas, the diversity of nectar plants used by Myrtle's silverspots did not differ, and the density of nectar sources was actually higher within grazed areas. In fact, biologists recorded more butterflies in grazed dunes and grasslands than in ungrazed vegetation communities (NPS 2007).

Current threats to the Myrtle's silverspot butterfly include: urban or industrial development of suitable habitat, poaching or illegal collecting, small population size, the effects of reduced host and nectar plant density due to invasive plants and forbs (particularly iceplant), road mortalities during the adult flight season, and the probable constriction of the range and distribution of this butterfly due to global climate change (USFWS 2009b). Launer et al. (1992) concluded that although grazing is beneficial to Myrtle silverspot butterfly conservation, there is a need to restore dune habitat in the action area in order to support butterfly nectar sources. In particular, Myrtle's silverspot butterfly are benefitting from the control of non-native invasive plants in coastal dune habitats, such as iceplant, particularly in areas that still support high densities of native plants that serve as nectar sources.

6.1.2.4 California Freshwater Shrimp – Endangered

Legal Status. The California freshwater shrimp was listed as endangered in 1988 (53 FR 43884). The *Recovery Plan for the California Freshwater Shrimp (Syncaris pacifica* Holmes 1895) (USFWS 1998c) was completed in 1998. USFWS (2007d) conducted a five-year status review of California freshwater shrimp and determined that no change was needed to its endangered status. The latest status-review of the species was published in 2011 (USFWS 2011d). While threats to the species are ongoing, USFWS has never issued a BO of jeopardy for the California freshwater shrimp (USFWS 2018c).

Species Description. The California freshwater shrimp is a decapod crustacean in the family Atyidae and is believed to be the only extant species of its genus. They are generally less than 2.2 inches in length from the eye orbit to tip of tail. Females are generally larger than males by the time they reach sexual maturity, at the end of the second summer. Juveniles and males typically appear translucent to nearly transparent while mature females are often brown with a tan dorsal stripe (USFWS 2011d).

Habitat Requirements/Ecology. The California freshwater shrimp is endemic to 16 coastal streams in Marin, Sonoma, and Napa Counties, north of San Francisco Bay, California. It is found in low elevation (<380 feet, low gradient [generally <1%]), perennial freshwater streams with structural diversity, including undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation. During the winter, habitat includes shallow margins of stream pools containing undercut banks and exposed living fine-root material that provide shelter and refuge from high water velocities associated with winter storm events. During summer, the California freshwater shrimp is often associated with submerged leafy branches. Both winter and summer habitat components need to be found near each other for this species to persist for prolonged periods (USFWS 1998c).

Critical Habitat in the Action Area. Critical habitat has not been designated for the California freshwater shrimp.

Status in the Vicinity of the Action Area. California freshwater shrimp reside in the Lagunitas and Olema watersheds in the action area. Of the roughly 20 streams known to support California freshwater shrimp throughout its limited range of only Marin, Sonoma, and Napa Counties, Lagunitas Creek has been the highest rated stream for its abundance and distribution of shrimp. It is also the only stream where the shrimp occur on protected lands (USFWS 1998c). The current range of the shrimp within Lagunitas Creek extends from Shafter Bridge in Samuel P. Taylor State Park downstream for about 8 miles, to a point at least 0.3 mile downstream of the US Geological Survey gage at Gallagher Bridge to roughly 1 mile below the confluence with Nicasio Creek (Serpa 2016). Shrimp habitat along the main stem of Lagunitas Creek within the park is generally protected from agricultural activities occurring in the watershed. Small numbers of shrimp were collected in 1996 and 1997 near the confluence of Olema and Lagunitas Creeks (Fong 1999). Surveys for California freshwater shrimp detected small numbers in lower Olema Creek in 2001, but none were found in the same reaches during a subsequent investigation (Lobianco and Fong 2003). The species' distribution appears to be increasing in proximity to the action area, as more recent surveys by Serpa (2016) found that Olema Creek provides viable California freshwater shrimp habitat and 2019 surveys detected shrimp in the lower reaches of Olema Creek. Native sculpin are a significant predator of the shrimp.

Within its range, populations of California freshwater shrimp are threatened by introduced fish, deterioration or loss of habitat resulting from water diversion, impoundments, livestock and dairy activities, agricultural activities and developments, flood control activities, gravel mining, timber harvesting, migration barriers, and water pollution (USFWS 1998c). Of the streams known to support California freshwater shrimp throughout its limited range, Lagunitas Creek has been the highest rated stream for its abundance and distribution of shrimp. Lagunitas and Olema Creeks are the only streams where the shrimp occur on protected lands (USFWS 1998c; Serpa 2016). Additionally, environmental factors such as the recent cycle of below average annual rainfall have likely influenced the distribution and quality of suitable habitat throughout its range (USFWS 2018c).

7.0 ENVIRONMENTAL BASELINE

As defined under the ESA, the environmental baseline includes past and present impacts of all federal, state, and private actions in the action area; the anticipated impacts of all proposed federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of state and private actions that are contemporaneous with the section 7 consultation process. Future actions and their potential effects are not included in the environmental baseline.

In combination with section 6.0, this section defines the status of the federally listed species evaluated and their habitat in the action area with respect to livestock grazing. Recent consultations with USFWS are also detailed to provide a baseline for section 7 consultation on the effects of the proposed action.

7.1 Previous Consultations with the USFWS in the Action Area

In 2001, the NPS evaluated the effects of the proposed renewal of livestock grazing permits in the park and prepared a BA as part of the consultation process with USFWS. The action area of the NPS BA (NPS 2001a) encompassed most of the same lands and waters affected by this proposed action. Table 7-2 summarizes the effects determinations from the NPS BA (NPS 2001a) and the subsequent USFWS BO (USFWS 2002a). NPS also informally consults with USFWS from 1 to 4 times a year under the USFWS BO (USFWS 2002a).

TABLE 7-2: DETERMINATIONS OF EFFECTS OF GRAZING ON FEDERALLY LISTED SPECIES BY NPS (2001a) BIOLOGICAL ASSESSMENT AND USFWS (2002B) BIOLOGICAL OPINION

Species	Listing Status[a]	NPS (2001) BA Determination[b]	USFWS (2002b) BO Determination[b]
Beach layia (*Layia carnosal*)	T	NLAA	LAA, No Jeopardy[c]
Marin dwarf flax (*Hesperolinon congestum*)	T	NLAA	NLAA
Showy Indian clover (*Trifolium amoenum*)	E	No Determination[d]	No Determination[d]
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	E	NLAA	LAA, No Jeopardy[c]

Species	Listing Status[a]	NPS (2001) BA Determination[b]	USFWS (2002b) BO Determination[b]
Sonoma spineflower (*Chorizanthe valida*)	E	NLAA	LAA, No Jeopardy[c]
Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*)	E	NLAA	LAA, No Jeopardy[c]
Tidestrom's lupine (*Lupinus tidestromii*)	E	NLAA	LAA, No Jeopardy[c]
California red-legged frog (*Rana draytonil*)	E	LAA	LAA, No Jeopardy[c]
Western snowy plover (*Charadrius alexandrines nivosus*)	T	LAA	LAA, No Jeopardy[c]
Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	E	NLAA	LAA, No Jeopardy[c]
California freshwater shrimp (*Syncaris pacifica*)	E	NLAA	NLAA

Source: USFWS (2018a)

[a] ESA determinations: NLAA = May affect, not likely to adversely affect, and LAA = May affect, likely to adversely affect.

[b] Status Codes: E = Federally listed endangered; T = Federally listed threatened. N/A = Not applicable.

[c] For an action with a *may affect, likely to adversely affect* (LAA), formal consultation with USFWS is required. In a BO, USFWS will specify that the proposed action will have one of three outcomes: *no jeopardy; jeopardy with alternatives, jeopardy without alternatives*.

[c] Showy Indian clover was not addressed by previous NPS's (2001b) consultation with USFWS's (2002a) for ranching in the action area because it was extirpated from the park at that time.

Additionally, NPS has consulted with USFWS regarding potential effects to listed species from several recent projects, including:

- Lagunitas Creek Floodplain and Riparian Restoration Project (NPS 2017b, USFWS 2018c)
- AT&T Dune Restoration Project (USFWS 2015)
- Road Improvement and Maintenance Projects (USFWS 2014)
- Chicken Operation at D Rogers Ranch (USFWS 2010b)
- Abbotts Lagoon Area Dune Restoration Project (USFWS 2009c)
- Giocomini Restoration Project (USFWS 2007e)

Table 7-3 summarizes the USFWS determinations for all recent completed section 7 consultations that have occurred previously between NPS and the USFWS.

TABLE 7-3: RECENT CONSULTATIONS WITH USFWS AND DETERMINATIONS FOR ACTIONS IN THE ACTION AREA FOR ALL FEDERALLY LISTED/PROPOSED SPECIES AND DESIGNATED/PROPOSED CRITICAL HABITAT

Project	Park Unit	Type of Project	Species Addressed	USFWS Determination[a]	Date
Lagunitas Creek Floodplain and Riparian Restoration Project (USFWS	Point Reyes	Floodplain and Riparian Enhancement	California freshwater shrimp (*Syncaris pacifica*)	LAA, No Jeopardy[b]	August 3, 2018
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			Northern spotted owl (*Strix occidentalis caurina*)	NLAA	

Project	Park Unit	Type of Project	Species Addressed	USFWS Determination[a]	Date
2018c)			Marbled murrelet *(Brachyramphus marmoratus*)	NLAA	
AT&T Dune Restoration Project (USFWS 2015)	Point Reyes	Dune Restoration	Western snowy plover (*Charadrius alexandrines nivosus*)	LAA, No Jeopardy[b]	October 14, 2015
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	LAA	
			Tidestrom's lupine (*Lupinus tidestromii*)	LAA	
			Beach layia (*Layia carnosa*)	LAA	
Road projects (USFWS 2014)	Point Reyes	Potential Improvements to 12 miles of Sir Francis Drake Boulevard	Beach layia (*Layia carnosa*)	NLAA	September 24, 2018
			Tidestrom's lupine (*Lupinus tidestromii*)	NLAA	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	
			California red-legged frog (*Rana draytonii*)	NLAA	
			Western snowy plover (*Charadrius alexandrines nivosus*)	NLAA	
Chicken operation at D. Rogers Ranch (USFWS 2010b)	Point Reyes	Chicken Egg and Meat Production	Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	April 28, 2010
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
Abbotts Lagoon Area Dune Restoration Project (USFWS 2009c)	Point Reyes	Dune Restoration	California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	June 15, 2009
			Western snowy plover (*Charadrius alexandrines nivosus*)	LAA, No Jeopardy[b]	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	LAA, No Jeopardy[b]	
			Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	NLAA	
			Beach layia (*Layia carnosa*)	NLAA	
			Tidestrom's lupine (*Lupinus tidestromii*)	NLAA	
			Sonoma spineflower (*Chorizanthe valida*)	NLAA	

Project	Park Unit	Type of Project	Species Addressed	USFWS Determination[a]	Date
Giocomini Restoration Project (USFWS 2007e)	Point Reyes	Wetland Restoration	California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			California freshwater shrimp (*Syncaris pacifica*)	LAA, No Jeopardy[b]	
			Western snowy plover (*Charadrius alexandrines nivosus*)	NLAA	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	

a ESA determinations: NLAA = May affect, not likely to adversely affect, and LAA = May affect, likely to adversely affect.

b For an action with a *may affect, likely to adversely affect* (LAA), formal consultation with USFWS is required. In a BO, USFWS will specify that the proposed action will have one of three outcomes: *no jeopardy; jeopardy with alternatives, jeopardy without alternatives*.

7.2 Monitoring Programs

7.2.1 Vegetation Monitoring

NPS monitors the condition of uplands for grazing intensity, livestock distribution, and upkeep of water supplies, fences, and roads. Monitoring is designed to determine range carrying capacities, to evaluate the effectiveness of current grazing management in maintaining or improving range resources, and to provide baseline data on range plant community successional dynamics. As described in section 1.2, "Current Management Direction," the administration of grazing lands used by beef and dairy ranches in the park is directed by the NPS *Range Management Guidelines* (NPS 1990a), revised and updated based on best available science and adaptive management of ranching activities. The UC Berkeley Range Ecology Lab recently analyzed 25 years of park RDM monitoring data and made recommendations for updating the RDM monitoring procedures (Bartolome et al. 2015). Bartolome et al. (2015) found that 1,200 pounds/acre RDM is an appropriate standard to protect soils from erosion and nutrient loss and to maximize forage production in the following year. The *Range Monitoring Handbook* (NPS 1990b) outlines the methods used to assess rangeland vegetation species composition (condition and trend) and conduct monitoring. Further detail about RDM monitoring is provided above in section 3.2.7, "Range Management and Monitoring."

Continued monitoring of livestock grazing intensity and ranch activities will be used to identify areas that could contribute sediment to streams during the rainy season, due to absence of ground cover or trailing. Livestock distribution and riparian condition monitoring will be used to help identify riparian problems likely caused by livestock, such as increased sediment in streams. Water supplies, roads, and fences in poor condition will be identified and corrected. NPS will continue this monitoring as part of the grazing lease program.

Vegetation monitoring is also conducted by the San Francisco Bay Area Network (SFAN), one of 32 NPS Inventory and Monitoring networks composed of ecologists and field technicians at the San Francisco Bay Area parks (NPS 2019f). The SFAN maintains a Plant Community Monitoring Database for selected vegetation communities from sample points in the park. This data provides baseline information about a suite of vegetation parameters that represent structure and composition metrics, such as cover by species, density of woody plants, and species richness, among others. Communities monitored include coastal prairies and coastal scrub in the park (NPS 2019f). A protocol has recently been developed to guide comprehensive, long-term plant community monitoring, with three goals: (1) to establish baseline conditions for a diversity of plant communities; (2) to detect changes in plant community structure and species composition over time relative to present-day baseline conditions; and (3) to identify trends in plant health and mortality, woody debris density (fuels), invasive plant abundance, and soil cover (McClosky 2015).

7.2.2 Rare Plant Monitoring

The rare plant monitoring program in the action area is a collaboration by park staff and volunteers with the CNPS. The monitoring is modeled from the CDFW's Natural Diversity Database, and includes locations of rare plant populations, extent of populations, numbers of individual plants, site/habitat descriptions, and potential threats to the populations. All threatened and endangered plant taxa in the action area are monitored under this program. For example, volunteers from the CNPS began monitoring beach layia in the park in the early 1980's and in 2001, NPS staff began monitoring the species (Benson 2004).

7.2.3 Wildlife Monitoring

NPS monitors wildlife populations across most of the action area through SFAN Inventory & Monitoring program, observing "vital signs" as indicators to track the status and health of park ecosystems. Scientists have chosen particular animals, habitats, and abiotic factors (e.g., water, air, soil, etc.) to monitor over a long period of time for understanding how the parks' ecosystems might be changing. SFAN managers and specialists have chosen a diverse range of vital signs to measure, including anadromous fish, marine mammals, rocky intertidal habitats, plant communities, hydrology, freshwater quality, and birds.

The SFAN collaborates with Point Blue Conservation Science (formerly the Point Reyes Bird Observatory), which has conducted landbird monitoring in the region since 1965. This program monitors landbirds in riparian habitats of Golden Gate National Recreation Area and Point Reyes National Seashore. In addition to riparian point-count surveys conducted under the vital sign monitoring program, Point Blue has also conducted annual standardized point-count surveys, nest searching, and constant effort mist-netting at select locations in the park for more than a decade (NPS 2019g). Western snowy plovers were initially monitored at Point Reyes in the 1970s by the Point Reyes Bird Observatory, and now by Point Blue Conservation Science. A similar monitoring protocol was implemented from 1986 to 1989, and again in 1995 by PBCS when declines were significant across the species' range and in particular at Point Reyes beaches. In 2008, the park and SFAN took over full responsibility for monitoring plovers within the park, consulting with Point Blue Conservation Science as needed. Also, the program uses volunteer docents to educate visitors about nesting snowy plovers and the park's conservation efforts as well as enforce seasonal beach closures and other restrictions to protect plovers (Campbell and Press 2017; NPS 2019f). The overall goal of the western snowy plover monitoring program is to determine trends in the estimated breeding population size, distribution, and reproductive success of snowy plovers at known breeding beaches in the park (Adams et al. 2014).

The US Geological Survey (USGS) conducts surveys annually at some wetlands that host California red-legged frogs, in collaboration with NPS. California red-legged frogs have received greater survey effort and research attention than other amphibian species in the park and have been detected in all habitat types surveyed (NPS 2019e) (0.74) occurring in marshes or ponds. California red-legged frogs are widespread in both Point Reyes National Seashore and Golden Gate National Recreation Area where aquatic breeding habitat occurs

7.2.4 Aquatic Monitoring

SFAN managers and specialists ranked freshwater quality as one of the most important vital signs. Small, spring-fed streams and many ephemeral tributaries flow through the grasslands, shrublands, and wetlands of the action area and drain into Tomales Bay, the Pacific Ocean, or Drakes Bay and Estero. These streams and other natural and man-made water sources are ecologically important as they transport nutrients, sediment, and oxygen through the watershed, and provide habitat for California red-legged frog and California freshwater shrimp.

In 2005, the Tomales Bay TMDL for pathogens, which included major tributaries, was developed in response to monitoring that showed exceedances of the bacteria numeric standard for the uses of shellfish harvesting and recreation. Monitoring data from the 2005 Tomales Bay TMDL staff report showed that watersheds in the action area, Lagunitas and Olema Creek, contributed some of the lowest fecal coliform bacteria loads to the bay. The Olema Creek subwatershed was the second smallest fecal coliform bacteria contributor to the bay, contributing 1% of overall fecal coliform bacteria.

Long-term trend analysis in the Olema Creek watershed indicates fecal coliform bacteria concentrations have decreased over time (1999 to 2017; Voeller et al. 2018). Although the general, long-term fecal coliform bacteria trend was downward during the study period, increases in cumulative 24-hour and five-day precipitation were associated with increases in measured fecal coliform concentrations. Short-term watershed assessment monitoring (January 2016 to May 2018) showed spatial and temporal changes by season (i.e., storm, winter baseflow, or summer baseflow). For all sample periods, an increase in fecal coliform bacteria and *E. coli* concentrations was observed moving from upstream to downstream. The highest concentrations were recorded during storm periods, whereas the lowest concentrations were observed during the winter baseflow period. Overall, the long-term decrease in fecal coliform bacteria concentrations from 1999 to 2017 parallels the greater effort toward implementation of conservation practices such as livestock water supply and installation of fencing intended to reduce pathogen, sediment, and nutrient loading to local streams throughout the watershed (Voeller et al. 2018).

7.3 Past and Current Activities within the Action Area

Past and current activities within the action area that are specifically relevant to potentially affected federally listed species are discussed below, grouped according to four categories of shared habitats. Additional past and current activities within the action area including pasture management and maintenance activities are described in chapter 2 of the EIS, in the “Ranching Overview” and “Alternative A – No Action” sections.

7.3.1 Coastal Beach and Dune Species

Large expanses of coastal dune habitat along the coast of northern California have been degraded and lost to residential and commercial development. The park has conserved the coastal beach and dune ecosystems of the Point Reyes Peninsula and NPS manages populations of several federally listed plant and wildlife species, including: beach layia, Tidestrom’s lupine, and the western snowy plover. California red-legged frogs also occur in some coastal drainages and could be affected by other past and current management activities in coastal dune ecosystems (Halstead and Kleeman 2017).

Cattle grazing has probably occurred among most dunes in the park since European settlement, particularly prior to park ownership. NPS has made efforts to exclude or at least limit cattle presence in the dunes through fencing, although cows are occasionally found within the dunes due to fencing breaks (Parsons 2018).

The park’s coastal dunes are threatened by both physical and ecological changes associated with the presence of two non-native invasive plants, European beachgrass and iceplant. The foredunes of the park were historically dominated by American dunegrass (*Leymus mollis*), the inland dunes by a diverse assemblage of native scrub species, and the back dunes by dune mat communities. As of 2013, European beachgrass makes up approximately 50% of the coastal dune vegetation, and iceplant, approximately 25% (Pawley and Lay 2013). The remaining 25% includes a mix of native American dune grass and patches of other native plants interspersed with the two invasive species (Pawley and Lay 2013). The dense root structures of European beachgrass stabilize sand and increase foredune height compared to native dunes. Dune stabilization decreases the historic natural process of frequent sand movement within interior dunes and reduces the overall proportion of early successional microhabitat, and limits the availability of early-successional microhabitat preferred by native species, which is created by small blowouts and moving sand (NPS 2015a). As of 2015, NPS had restored approximately 600 acres of coastal dunes at Point Reyes to benefit native coastal dune ecosystems, natural dune processes, and federally and state listed species that live in or use these ecosystems. Habitat is restored by removing highly invasive, non-native plant species that have greatly altered dune structure, natural processes such as sand movement, vegetation communities, and habitat function for native plants and animals uniquely adapted to this coastal environment (NPS 2015a).

7.3.2 Serpentine Soil Species

Federally listed plant species associated with serpentine soils include Marin dwarf flax and Tiburon paintbrush. Cattle grazing on ranches where Marin dwarf flax is found (Cheda, Mclssac, and Zanardi ranches) has been monitored under Special Use Permits to maintain RDM levels averaging 1,200 pounds per acre since 1987. As a result of inadequate residues in the late 1980s, the Cheda and Zanardi ranches were required to reduce livestock numbers. Since that time, all three ranches have met RDM standards in most years. These ranches were dairies for over 100 years before they switched to raising beef cattle in the 1970s. Thus, it is likely that livestock use of the serpentine plant communities on Nicasio Ridge was minimal during the century of dairying because it was remote from the ranch headquarters, which are located in valleys below. With the transition to beef operations, livestock became more dispersed and likely affect Marin dwarf flax more often today, although observed cattle impacts have varied from year to year. Rare plant monitors have documented little evidence of cattle presence in some years and reported some grazing and trampling of Marin dwarf flax in other years. The primary impact recorded has been cattle trails along the ridgetop area where the largest Marin dwarf flax occurrence are located. Although cattle favor flat areas on ridges, water availability is limited, so cattle use of the area is typically light to moderate. No consistent pattern of cattle impacts on the areas where Marin dwarf flax is found have been observed. Additionally, because of the rocky terrain and difficult access to the Nicasio Ridge, other ranch activities such as winter livestock feeding do not affect Marin dwarf flax because they are conducted in more accessible areas near ranch headquarters (NPS 2001a). Tiburon paintbrush occurs in only one population in the action area, which overlaps with the Marin dwarf flax population on Nicasio Ridge, including on the McIsaac Ranch (NPS 2004; NPS 2015b). Therefore, it is likely that cattle grazing in this area have had similar impacts on Tiburon paintbrush.

7.3.3 Coastal Scrub and Coastal Prairie Species

California’s coastal scrublands and coastal prairies have been significantly reduced and altered due to cultivation, development, and the introduction of non-native species. The CDFW has identified 30% of the plant associations within coastal scrub as “rare or worth of consideration” and coastal prairie is considered a sensitive plant community by CDFW and the California Coastal Commission (Ford and Hayes 2007). Ranching in the park is highly dependent on these vegetation communities and grazing has an important role in the management of Sonoma spineflower, and Myrtle’s silverspot butterfly. The effects of grazing on showy Indian clover populations is unknown at this time, but preliminary data suggests that grazing could potentially increase its reproduction (Jeffery 2016). Other past and current activities affecting grassland habitat for these species include the introduction and spread of non-native invasive plants and changes to the fire regime due to human settlement and the dominance of non-native annual grasses.

Cattle grazing has been occurring in the park since the 1830s and coastal prairies have experienced considerable land use changes during the past several hundred years preceding NPS management of the park, including dairy and cattle ranching, fencing, dryland farming, forage production, land development, road building, and quarries. Consequent habitat changes include altered hydrology, altered frequency and types of disturbance, and changes in plant and animal community composition (Fleischner 1994). Therefore, populations of plants and animals dependent on coastal scrub and coastal prairie ecosystems cannot be assumed to persist in the same habitat conditions to which they have evolved.

Native species in coastal scrub and coastal prairie now compete with a large number of non-native annual grasses and forbs that were not historically present (see Ford and Hayes 2007). Beginning in the late 1700s, it is believed that human settlement greatly increased the spread of Eurasian grasses and forbs, primarily from the Mediterranean Basin. These non-native species have since become more abundant than native plant species across most of California and altered natural disturbance regimes (e.g., fire frequency) of coastal prairies (Pawley and Lay 2013; Barry et al. 2015). Non-native invasive plants have also likely changed overall ecosystem functions by affecting the habitat structure and quality, species genetics, pollination dynamics, soil structure, soil microbes, soil chemistry, and even watershed hydrology, including evapotranspiration rates, stream flow and erosion and sedimentation dynamics (Mack et al. 2000).

The current fire regime for the Point Reyes area has changed dramatically since the mid-1800s as a result of the aforementioned grazing, non-native species, and human settlement. Fire suppression has resulted in large accumulations of fuels in grasslands and shrub-dominated plant communities (NPS 2004; Rilla and Bush 2009). However, historic and ongoing grazing of coastal prairie in the action area helps control the invasion of shrubs and herbaceous fuel loads (i.e. annual grasses), which decreases wildfire risk (Russell and McBride 2003; NPS 2004). Fires that result in a mosaic of burned and unburned or lightly burned areas maintain habitat heterogeneity and the impacts are relatively minor and short-term. Larger-scale, high-intensity fires that burn over large areas can have detrimental effects by creating unsuitable habitat conditions that would last for many years (NPS 2004). Grazing supports conditions that reduce large-scale, high-intensity wildfires (DiAntonio et al. 2001).

7.3.4 Wetland and Aquatic Species

Multiple past and current activities in the action area have affected species dependent on wetland and aquatic habitats in the action area. The potentially affected federally listed species include: Sonoma alopecurus, California red-legged frog, and California freshwater shrimp. The most significant activities that have affected these species include the development of stock ponds, habitat alteration by humans and livestock grazing, and consumptive water uses. Additionally, sea level rise has affected or may affect wetland and aquatic species that occur in tidally influenced habitats, including California freshwater shrimp.

Stock ponds are the most commonly used breeding sites for the California red-legged frog in the action area. Most of these facilities were constructed by former landowners and are maintained by ranchers for livestock watering. The continued maintenance of stock ponds is important for conserving California red-legged frogs and grazing may help maintain suitability for red-legged frogs by keeping ponds from being overgrown with emergent vegetation.

The watersheds in the action area, beyond the park, are expected to experience increasing human development in the form of moderately dense development permitted within the various villages, which would include infrastructure, roadways, and associated impervious surfaces (Marin County 2014). In the Lagunitas Creek watershed, development has led to increasing water demands, which impacts stream flows if current allocations are not being fully utilized because water within Lagunitas Creek is fully appropriated (NMFS 2004). Human development has also caused erosion and contributed to localized sedimentation and pollutant discharge into aquatic ecosystems during stormwater runoff.

Park visitation affects aquatic habitats due to vehicular traffic and associated pollutants from roads. Road maintenance has potentially exacerbated erosion due to ground disturbance and vegetation clearing in some areas. Poorly maintained legacy roads and trails with high levels of visitation have also exacerbated erosion in places. Storm runoff from roads and areas with high human traffic could increase sedimentation and pollutant discharge into freshwater streams that are used by California freshwater shrimp and California red-legged frog.

Numerous stream restoration projects have been conducted during the past couple decades in the action area and are expected to continue to occur. For example, the Marin Municipal Water District has implemented several streambank stabilization projects, winter habitat enhancement projects, and other habitat enhancement actions in the Lagunitas Creek watershed (MMWD 2011). Some aspects of aquatic habitat used by California red-legged frogs and California freshwater shrimp would be expected to improve as a result of these restoration actions.

8.0 EFFECTS TO EVALUATED SPECIES AND DETERMINATIONS

Potential effects on federally listed species and their habitat were evaluated using available data and maps of vegetation communities (i.e., grasslands, coastal dune, coastal scrub, riparian areas and wetlands, and forests and woodlands) in the action area (Gong et al. 2005), in combination with predicted changes in ecosystem processes resulting from continued livestock grazing and other agricultural practices under the proposed action. In addition to the effects of habitat disturbance, impacts on individual animals and populations of listed species were evaluated based on predicted changes in competition for resources at each ranch, such as potential changes to inter-and intra-species interactions (e.g., predation, herbivory, and symbiosis). The area of analysis for impacts on listed species includes the action area and surrounding contiguous habitats that are used by wildlife potentially affected by proposed management activities.

8.1 Federally Listed Plants

8.1.1 Beach Layia

8.1.1.1 Direct and Indirect Effects on Beach Layia

Effects of Livestock Grazing. Beach layia only occurs in the Range subzone, so cattle grazing is the only potential impact from the proposed action. Livestock grazing was not indicated as a potential threat to beach layia in the species' recovery plan (USFWS 1998b). Most known occurrences[1] are in coastal dunes outside the action area (63%) or in existing resource protection exclusion areas (17%). The other 20% of beach layia occurrences are on remnant dune features in grazed pastures on the B, C, E, and F Ranches, where cattle could directly affect plants through trampling and indirectly affect them via increased weeds associated with grazing disturbance. New resource protection exclusion areas on the F and E Ranches would protect approximately 22% of known beach layia occurrences that are currently exposed to grazing under existing conditions. This would further limit potential impacts of cattle trampling to approximately 12% of all known beach layia occurrences, in populations 1, 3, 5, 8, 11, and 12, located on the B, C, E, F, and AT&T Ranches (NPS, Parsons, pers. comm. 2019b). The beach layia populations located in grazed pastures are found growing in remnant dune features (NPS 2019e). Although cattle typically do not graze such dune features, they sometimes rest or loaf in these areas and could injure or kill beach layia plants (NPS, Parsons, pers. comm. 2019b). Although beach layia occurrences have increased in areas where coastal dune restoration has occurred (NPS 2019d), those subject to grazing have declined in abundance since 2004 (NPS, Parsons, pers. comm. 2019b).

Although cattle would be excluded from areas supporting nearly 90% of all known beach layia occurrences in the park, they could occasionally breach pasture fences and trample beach layia in protected coastal dunes (NPS, Parsons, pers. comm. 2019b). This could occur as a result of broken fences,

[1] Occurrences document the areas surveyed for threatened and endangered plants, in which a species is, or was, present. In many cases, an occurrence will represent several observations, or visits, to a given location.

gates being left open, or the poor siting of pasture fences in sandy areas. It should be noted that the geographic extent of beach layia is small relative to the potentially affected areas of excluded coastal dunes.

Effects of Other Ranch Activities. The proposed action would not include any new human activity within coastal dune habitats where beach layia is found. The zoning framework would ensure that cattle grazing is the only authorized land use that could potentially affect beach layia in the action area. Invasive plants could possibly spread from adjacent grasslands that are managed for grazing. Generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives.

8.1.1.2 Avoidance, Minimization, and/or Mitigation Measures for Beach Layia

The 20% of known beach layia occurrences in currently grazed areas would be reduced because 12% of occurrences would be protected by new 22- and 67-acre resource protection exclusion areas on the E and F ranches, respectively (NPS 2015b). This would eliminate potential effects of cattle trampling on all but 8% of known beach layia occurrences in the Range subzone (NPS 2015b).

To ensure that cattle grazing does not adversely affect beach layia in the action area, NPS will work with ranchers to ensure the continued exclusion of cattle from coastal dune habitats directly adjacent to beaches. Under current Range Management practices (NPS 1990a, 1990b), ranchers are responsible for the maintenance of all fences, keeping them in "good repair to ensure that cattle are confined at all times. This typically involves an annual inspection and maintenance of ranch fences and/or inspection and maintenance prior to moving cattle into a pasture. Ranchers repair any broken wires or other fence defects that could reduce their effectiveness. Additionally, adverse effects from other ranch management activities will be avoided within coastal dune ecosystems by the specification in ROAs of areas where certain ranch activities are authorized.

The avoidance, minimization, and mitigation measures that NPS would implement for beach layia, and other federally listed plants are provided previously in section 3.3, table 3-2. NPS has not developed specific mitigation measures for beach layia, so the applicable measures are those listed as applicable to all federally listed species under the *Potentially Affected Species* column.

8.1.1.3 Cumulative Effects on Beach Layia

Cumulative effects are defined differently under ESA and NEPA. Under ESA, cumulative effects are reasonably foreseeable future state, private and tribal activities only. For ESA cumulative effects, the effects of past or future federal actions are not considered. Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological assessment. ESA cumulative effects are additive to the environmental baseline (past and ongoing actions and their effects) described above in section 7.0 of this BA. Conversely, under NEPA, cumulative effects include all past and ongoing actions and their effects that are additive to the effects from all reasonably foreseeable future actions (federal and nonfederal) as well. For ESA consultation purposes in this BA, we are using the ESA definition of cumulative effects.

Reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on beach layia would be human-caused climate change and sea-level rise and wildfire. The potential for progressive sea-level rise would affect an unknown portion of coastal dune habitat potentially occupied by beach layia. In addition to the direct influence of rising water levels potentially inundating their habitat, even small changes in water level could cause significant changes in wave energy and the potential for shoreline damage from wave force. Coastal dune erosion could shift habitat for beach layia further inland, beyond the immediate effects of water level rise. However, to some extent, the negative impact of increased sand mobility could be offset by newly disturbed dune habitat along the margins of the unstable or eroded beaches, which would likely support early successional dune-colonizing plants like beach layia (USFWS 2011a). The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, could affect beach layia via unplanned wildfire or by fire suppression activities. However, this is unlikely because the species occurs in dunes with relatively low vegetative cover where wildfire is unlikely to carry. Also, coastal dunes are part of the Minimum Management Unit where prescribed fire and mechanical treatments would not occur (NPS 2004).

8.1.1.4 Conclusion

Approximately 60% of the beach layia occurrences are in the park are within coastal dunes outside the action area, and NPS, in cooperation with ranchers, have excluded cattle from nearly 20% of beach layia occurrences in the park. The remaining approximately 20% of occurrences are within areas grazed by cattle in the action area, but over half of them would be protected by new 22- and 67-acre resource protection exclusion areas on the E and F ranches, respectively. Under the proposed action, cattle trampling could affect the remaining 8% of beach layia occurrences in the Range subzone. Adverse effects would be avoided to the degree that they are unlikely to occur, but minor effects on individuals could occur. Although the overall population of beach layia in the park would not be noticeably affected, the proposed action “may affect, is likely to adversely affect” beach layia.

8.1.2 Marin Dwarf Flax

8.1.2.1 Direct and Indirect Effects on Marin Dwarf Flax

Effects of Livestock Grazing. Trampling by livestock is a potential threat to individual Marin dwarf flax plants, although little is known of the species' tolerance to grazing or soil disturbance. There is evidence that the species may benefit from a moderate level of livestock grazing due to the reduction of taller competing vegetation because the plant is subject to shading by other grasses. In the absence of grazing, the build-up of thatch from previous year's herbage could suppress the growth of Marin dwarf flax (NPS 2001a). Likewise, Weiss (1999) and Fenn et al. (2010) have suggested that moderate grazing can create more favorable conditions for native serpentine species such as Marin dwarf flax by selectively reducing annual grasses, preventing thatch accumulation, mechanically breaking down the litter and opening canopy, and limiting the enrichment of low-nutrient serpentine soils with nitrogen. USFWS (2002b) suggested that perhaps the species benefits from some levels of grazing and soil disturbance due to its coexistence with other species known to benefit from disturbance, such as harvest brodiaea (*Brodiaea elegans*) and Mariposa lily (*Calochortus* spp.). It should be noted that this effect has been shown for ecologically similar plants, or described for serpentine areas in general, but has not yet been studied for Marin dwarf flax. In its five-year status review for Marin dwarf flax, USFWS (2011b) summarized the known effects of grazing on the species as having no impacts or a likely benefit.

Effects of Other Ranch Activities. Marin dwarf flax occurs in areas that would be designated as the Range subzone under the proposed action, where only grazing would be authorized. Furthermore, Marin dwarf flax habitat is found in difficult-to-access terrain on Nicasio Ridge. Thus, ranch activities other than grazing could not potentially affect Marin dwarf flax.

8.1.2.2 Avoidance, Minimization, and/or Mitigation Measures for Marin Dwarf Flax

Under the proposed action, continued grazing would provide for livestock herbivory at a level that reduces competition from other plants to accommodate the life history of Marin dwarf flax. The adherence the park’s RDM standards (Bartolome et al. 2015) would avoid or minimize potential adverse effects of overutilization or trampling of individual Marin dwarf flax plants.

Where applicable, the avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to Marin dwarf flax from the proposed action.

The measures most applicable to Marin dwarf flax would avoid or minimize the potential the spread of non-native invasive plants, or guide their treatment, on serpentine grasslands at Nicasio Ridge.

The Nicasio Ridge occurrences are managed by Point Reyes National Seashore and monitored by Golden Gate National Recreation Area botanists (NPS 2019d). NPS would continue to monitor Marin dwarf flax annually on Nicasio Ridge for presence/absence of the species via reconnaissance level survey with GPS points or polygons and abundance estimates for distinct patches (NPS 2019d). If adverse effects were to be documented during monitoring, NPS could work with the rancher to adjust the timing and/or intensity of cattle grazing on Nicasio Ridge for the continued protection of Marin dwarf flax.

8.1.2.3 Cumulative Effects on Marin Dwarf Flax

Fire management would be the only reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on Marin dwarf flax. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy Marin dwarf flax plants. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire, but would be minimized or prevented through NPS (2004) guidance and mitigation measures.

8.1.2.4 Conclusion

Under the proposed action, NPS would implement a conservation framework that provides for managed livestock grazing at a moderate level, which helps to promote the continued reproduction and increased abundance of Marin dwarf flax on Nicasio Ridge. ROAs would also stipulate that, if necessary, grazing intensity, timing and duration would be adjusted to avoid any potential adverse effects from grazing. Also, because suitable habitat for Marin dwarf flax is distant from ranch headquarters and all locations would be in the Range subzone, no other adverse effects could result from ranch activities. Adverse effects from ranching would be avoided to the degree that they are unlikely to occur, or would be insignificant or discountable. Therefore, the proposed action “may affect, is not likely to adversely affect” Marin dwarf flax.

8.1.3 Showy Indian Clover

8.1.3.1 Direct and Indirect Effects on Showy Indian Clover

Effects of Livestock Grazing. The effects of livestock grazing on showy Indian clover are not well understood. Herbivory presents a threat to the introduced populations of showy Indian clover in the action area, but likely only due to the small populations involved. Larger, more resilient populations would likely be able to sustain moderate herbivory (USFWS 2012b). Cattle grazing, or trampling could cause plant injury or mortality, but these activities could also benefit showy Indian clover via disturbance and reduced competition from non-native plants. Populations introduced to the D ranch were separated by fencing, with one side grazed by cattle and elk, and the other side grazed only by elk. As of 2016, Jeffery (2016) reported that a subset of plants in the cattle-grazed area had the highest number of flowering heads, suggesting beneficial effects of livestock grazing.

Effects of Other Ranch Activities. Showy Indian clover occurs in areas that would be designated as the Range subzone under the proposed action, where only grazing would be authorized. Furthermore, showy Indian clover occurs in a fairly remote areas of the D Ranch. Generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. Therefore, ranch activities other than grazing would not likely affect Showy Indian clover.

8.1.3.2 Avoidance, Minimization, and/or Mitigation Measures for Showy Indian Clover

The timing (i.e., season-of-use), duration, and grazing intensity would affect whether livestock grazing has an adverse or beneficial effect on showy Indian clover in the action area. To ensure that adverse effects to introduced showy Indian clover are avoided on the D Ranch, NPS will continue to manage livestock in a manner that is compatible with its persistence. The introduced population on the D Ranch has not been monitored since its introduction by USFWS, so NPS will coordinate future monitoring efforts with USFWS.

Where applicable, the avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to showy Indian clover from the proposed action.

8.1.3.3 Cumulative Effects on Showy Indian Clover

Fire management would be the only reasonably foreseeable future state, private and tribal activity with potential for cumulative effects on showy Indian clover. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy showy Indian clover plants. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire, but would be minimized or prevented through NPS (2004) guidance and mitigation measures.

8.1.3.4 Conclusion

Only one introduced population of showy Indian clover occurs in the action area, located in areas that are both subject to grazing and excluded from grazing. NPS, in cooperation with ranchers, will apply any necessary management actions to ensure its persistence, including adjustments to grazing if necessary. Adverse effects from ranching would be avoided to the degree that they are unlikely to occur, or would be insignificant or discountable. Therefore, the proposed action “may affect, is not likely to adversely affect” showy Indian clover.

8.1.4 Sonoma Alopecurus

8.1.4.1 Direct and Indirect Effects on Sonoma Alopecurus

Effects of Livestock Grazing. Too much or too little grazing may be detrimental to Sonoma alopecurus (USFWS 2009c, 2011c). For example, Population 1 was extirpated within three years after grazing cessation, but the number of reproducing tillers at Population 5 was reduced by 90% in 2001 after cattle were released onto the site (Gennet 2004). Fowler and Fellers (1985) stated that grazing was a threat to Sonoma alopecurus occurrences in the action area. Grazing can result in trampling of individual plants, soil compaction, and influence the presence of competitive non-native invasive species. Heavy grazing of the plant can also limit its ability to photosynthesize, which could result in death or diminished reproductive output (USFWS 2011c). Conversely, USFWS reported in the listing rule in 1997 (62 FR 54791) that some grazing may be necessary to maintain Sonoma alopecurus in the face of competition from other plants. More recent understanding of the species’ ecology has revealed that the exclusion from grazing can adversely affect Sonoma alopecurus. Gennet (2004) suggests that Sonoma alopecurus may be a disturbance colonizer and a poor competitor. As a short-lived perennial wetland grass, Sonoma alopecurus is most able to establish in locations with low cover (i.e., after grazing), andit can grow rapidly to take advantage of open space. In the action area, Populations 1 and 2 and part of Population 5 were extirpated subsequent to the installation of fences that prevented cattle grazing (Ryan and Parsons 2016). Following cessation of grazing, subsequent increases in sedges (*Carex* spp.), blackberry (***Rhubus***

ursinus), and bulrush (*Scirpus* spp.) led to the disappearance of Population 1 within 3 year of grazing cessation (USFWS 2011c).

Within the park, seasonal grazing may be necessary to sustain this species because both native and, in some cases, non-native species can expand and crowd out or shade out Sonoma alopecurus (Ryan and Parsons 2019). Many of the Sonoma alopecurus populations are subject to some level of grazing, at least periodically. However, one of the larger populations, Population 3, which occurs in the dunes, has been fenced off from grazing. NPS staff currently work with the rancher to do some level of grazing of this dune swale during winter months (Parsons and Ryan 2018a). Some of the populations used to be grazed more historically (e.g., Population 8), and it is possible that the lower level of grazing intensity may be negatively impacting those populations.

Under the proposed action, all existing populations in the action area would continue to be grazed by cattle. The benefits of moderate grazing on Sonoma alopecurus is supported by research attempting to mimic the effects of grazing through vegetation clipping and finding significant increases in Sonoma alopecurus seed output (Gennet 2004). Moderate-intensity grazing, as required under the proposed action via RDM standards per Bartolome et al. (2015), would reduce competition from more abundant native plants or non-native invasive species. Based on results of a grazing study completed in the action area in 2014, the grazing regime is important, including intensity and season of use (Ryan and Parsons 2015). Seasonal grazing appears to result in more Sonoma alopecurus inflorescence production than no grazing or year-round grazing (Ryan and Parsons 2015), and is thus the preferred management tool. Under the proposed action, NPS would use ROAs to direct the timing, intensity, and duration of grazing, and is working with ranchers to institute seasonal grazing on the AT&T Ranch and seasonal exclusion of grazing around Population 5 near Abbotts Lagoon (NPS, Parsons, pers. comm. 2019b).

Effects of Other Ranch Activities. Sonoma alopecurus occurs in areas that would be designated as the Range subzone under the proposed action. Generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. The potential effects to Sonoma alopecurus from other ranch activities in the Range subzone would be limited to fence maintenance, whereby ranchers could inadvertently trample plants. This potential effect would be reduced via continued coordination with ranchers to manage the species' persistence via appropriate timing, intensity, and duration of grazing.

8.1.4.2 Avoidance, Minimization, and/or Mitigation Measures for Sonoma Alopecurus

One population, the introduced population 11 on G Ranch, would be managed with a new 7.4-acre resource protection exclusion buffer that would improve control of grazing and allow seasonal grazing for the benefit of Sonoma alopecurus. Management actions could likely involve fence construction around populations, which NPS did around Population 3 allowing cattle to be excluded in the spring and summer to avoid impacts to plants during active growth, flowering, and seed-set (Parsons and Ryan 2019a).

NPS would continue to monitor all populations of Sonoma alopecurus in the action area and coordinate with ranchers to adjust grazing if there are any documented adverse effects in pastures where Sonoma alopecurus is found. As described above, cattle grazing could be seasonally restricted during the flowering season, which could increase opportunities for population expansion.

NPS would use the information from the Ryan and Parsons (2015) study to better manage existing Sonoma alopecurus populations in the action area, including possibly managing existing populations with prescribed grazing, and to plan future areas for introduction that appear to have the right habitat and grazing conditions. NPS may continue to reintroduce populations of Sonoma alopecurus and monitor the effects of grazing in order to ensure success.

Where applicable, the avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to Sonoma alopecurus from the proposed action.

8.1.4.3 Cumulative Effects on Sonoma Alopecurus

Fire management would be the only reasonably foreseeable future state, private and tribal activity with potential for cumulative effects on Sonoma alopecurus. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy Sonoma alopecurus plants. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire but would be minimized or prevented through NPS (2004) guidance and mitigation measures.

8.1.4.4 Conclusion

Studies have shown that the Sonoma alopecurus may be a disturbance colonizer and a poor competitor. Hence cattle grazing, which removes biomass of more competitive plant species, may be beneficial to the Sonoma alopecurus. Moderate levels of grazing have been demonstrated as a beneficial effect to populations in the action area. On the other hand, heavy grazing and exclusion from grazing can adversely affect Sonoma alopecurus. Thus, the extent of cattle grazing that is advantageous for Sonoma alopecurus is unknown and so the potential for inappropriate cattle grazing exists (Ryan and Parsons 2015). NPS will continue efforts to monitor the species and apply any necessary management actions to ensure its persistence, including adjustments to grazing where necessary. While adverse effects from ranching would be avoided to the degree that they are unlikely, under certain circumstances, cattle grazing could adversely affect Sonoma alopecurus plants. Although the impacts of ranching are not expected to cause population declines, the proposed action “may affect, is likely to adversely affect” the Sonoma alopecurus.

8.1.5 Sonoma Spineflower

8.1.5.1 Direct and Indirect Effects on Sonoma Spineflower

Effects of Livestock Grazing. Both the wild and introduced populations of Sonoma spineflower lie on beef cattle ranches—G and F Ranches—that have been grazed for over a century. However, the impact of cattle on Sonoma spineflower is unclear (Parsons and Ryan 2019b). Cattle grazing could have beneficial or potentially detrimental effects depending on timing and intensity. The plant appears to be unpalatable to cows, and herbivory has rarely been observed during monitoring. Without grazing, non-native invasive plants such as yellow bush lupine could increase to the point that they threaten to outcompete Sonoma spineflower (USFWS 2010a). At the time of listing, NPS had excluded most of this population from grazing, and although plants within the exclosure grew taller than unprotected plants, grazed Sonoma spineflower plants increased in density much more rapidly during the first year of monitoring. However, during the second and third year of monitoring the plants decreased in density, with only a slight recovery in density the following year.

In 1992, Davis and Sherman conducted experiments to attempt to determine the effects of cattle grazing on the Sonoma spineflower population at Abbotts Lagoon. NPS monitored exclosures of the existing population in areas where grazing occurred year-round (Davis and Sherman 1992). Introduction plots were established near the existing population and within grassland cattle pasture area in 1988. Growth inside and around the plots of Sonoma spineflower was measured throughout the duration of the study. Over the course of four years, the grazed population saw a great increase in growth, while the non-grazed population decreased until 1991 when it slightly recovered. However, plants in the non-grazed area were 3-4 inches taller and had a greater number of inflorescences. It was also noted that the intensity of the grazing was likely to have an effect on the plants, possibly due to the negative effects of trampling by grazers. However, grazing intensity and trampling were not studied due to a lack in variation of grazing intensity within the years of study. Davis and Sherman (1992) concluded that Sonoma spineflower is likely adapted to a moderate grazing regime, and damage caused by livestock trampling is outweighed by the benefits of grazing. Livestock herbivory reduces competition with other plant species, providing for increased Sonoma spineflower reproduction, survival, and increased population size (Davis and Sherman 1992; USFWS 1998b, 2010a).

Grazing under the proposed action would help to support the continued persistence and long-term viability of Sonoma spineflower. Grazing could cause seedling injury or mortality due to trampling; however, while trampling may negatively impact individual plants, a reduction in competition through grazing of non-native grasses, forbs, and shrubs could be beneficial to the population (USFWS 1998b; Parsons and Ryan 2019b). Changes to grazing timing or reduced grazing intensity during the species' reproduction could potentially have beneficial effects by removing cattle during flowering and seed set (Parsons and Ryan 2019b).

Effects of Other Ranch Activities. Sonoma spineflower occurs in areas that would be designated as the Range subzone under the proposed action, where grazing would be only authorized activity that could potentially affect Sonoma spineflower. Other ranch activities that could potentially impact Sonoma spineflower include the use and maintenance of roads, fences, and water infrastructure (Parsons and Ryan 2019b). NPS reduced the threat posed by ranch vehicle use in 2010 by realigning a two-track ranch road that ran through the center of the main, wild population on G Ranch, installing motor vehicle barriers, and creating a new two-track alignment at least 50 feet outside the Sonoma spineflower population boundary (Parsons and Ryan 2019b). NPS reduced the threat posed by off-road vehicle use by realigning a ranch road used for ranching activities in 2010, away from the main spineflower population at Abbotts Lagoon population (USFWS 2010a).

8.1.5.2 Avoidance, Minimization, and/or Mitigation Measures for Sonoma Spineflower

NPS will continue to monitor Sonoma spineflower populations established on G and F Ranches to ensure the establishment and persistence of these populations. Over the last few decades, NPS has worked with the G Ranch operators to make several changes to grazing and agricultural infrastructure to benefit the Sonoma spineflower population. New fencing has been deliberately located far enough away from the Sonoma spineflower population, so that any potential impacts from cattle associated with fencing (e.g., congregating and rubbing on fences) is situated away from these sensitive resources (Parsons and Ryan 2019b).

To avoid or minimize the adverse effects of competition on Sonoma spineflower by non-native invasive plants, the NPS will continue to remove non-native invasive or other plants that may compete with Sonoma spineflower (i.e., yellow bush lupine and coyote brush) from within and adjacent to the Abbott's Lagoon population.

Where applicable, the avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to Sonoma spineflower from the proposed action.

8.1.5.3 Cumulative Effects on Sonoma Spineflower

Fire management would be the only reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on Sonoma spineflower. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy Sonoma spineflower plants. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire but would be minimized or prevented through NPS (2004) guidance and mitigation measures.

8.1.5.4 Conclusion

Sonoma spineflower appears to be adapted to a moderate grazing regime and, although heavy grazing can adversely affect Sonoma spineflower, the damage caused by livestock trampling is outweighed by the benefits of grazing to populations in the action area. While adverse effects from ranching would be avoided to the degree that they are unlikely, cattle grazing could adversely affect Sonoma spineflower plants. Although the impacts of ranching are not expected to cause population declines, the proposed action "may affect, is likely to adversely affect" the Sonoma spineflower.

8.1.6 Tiburon Paintbrush

8.1.6.1 Direct and Indirect Effects on Tiburon Paintbrush

Effects of Livestock Grazing. The effect of livestock grazing on rare plant populations growing on serpentine soils is generally beneficial via decreased accumulation of nitrogen that promotes annual grass invasions (Weiss 1999, Beck et al. 2015). Incidental consumption of the flowers and fruits by cattle could potentially negatively impact reproduction, but cattle grazing is beneficial in keeping invasive grass low (USFWS 2012a). As described above under "Direct and Indirect Effects" section for Marin dwarf flax in section 8.1.2.1, cattle grazing likely increased on Nicasio Ridge in the 1970's when the Cheda, Mclssac and Zanardi ranches converted from dairy to beef cattle. However, the grazing intensity of serpentine plant communities where Tiburon paintbrush grows has been limited by the lack of available water. Additionally, as with Marin dwarf flax, some herbivory by cattle on Tiburon paintbrush has been observed during some years of monitoring of the species, while no grazing of Tiburon paintbrush has been reported in other years. It has also been noted that cattle may avoid the unpalatable *Ceanothus* spp. with which the paintbrush is often associated (NPS 2001a).

Effects of Other Ranch Activities. Tiburon paintbrush occurs in areas that would be designated as the Range subzone under the proposed action, where only grazing would be authorized. Furthermore, Tiburon paintbrush habitat is found in difficult-to-access terrain on Nicasio Ridge. NPS would continue to conduct monitoring, and if adverse effects are documented, could work with the rancher to adjust the timing and/or intensity of cattle grazing on Nicasio Ridge for the continued protection of Tiburon paintbrush.

8.1.6.2 Avoidance, Minimization, and/or Mitigation Measures for Tiburon Paintbrush

Livestock grazing would continue on Nicasio Ridge at an intensity that reduces competition from other plants, but limits adverse effects of overutilization or trampling of individual Tiburon paintbrush plants. NPS would require adherence to the park's RDM standards (Bartolome et al. 2015). NPS monitors the occurrences of Tiburon paintbrush at Nicasio Ridge annually, which involves a full census and mapping the spatial extent of occurrences using GPS (NPS 2019d). NPS would continue to conduct monitoring, and if adverse effects are documented, could work with the rancher to adjust the timing and/or intensity of cattle grazing on Nicasio Ridge for the continued protection of Tiburon paintbrush.

Where applicable, the avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to Tiburon paintbrush flax from the proposed action. The measures most applicable to Marin dwarf flax would avoid or minimize the potential the spread of non-native invasive plants, or guide their treatment, on serpentine grasslands at Nicasio Ridge.

8.1.6.3 Cumulative Effects on Tiburon Paintbrush

Fire management would be the only reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on Tiburon paintbrush. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy Tiburon paintbrush plants. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire but would be minimized or prevented through NPS (2004) guidance and mitigation measures.

8.1.6.4 Conclusion

Livestock grazing on serpentine soils is generally beneficial to Tiburon paintbrush, so long as grazing intensity is not excessive. The current level of grazing on Nicasio Ridge would continue as under existing conditions, which monitoring data has shown to be generally compatible with the continued persistence of Tiburon paintbrush. Adverse effects from ranching would be avoided to the degree that they are unlikely to occur, but individual plants could be affected, and due to the small population size, the proposed action "may affect, is not likely to adversely affect" Tiburon paintbrush.

8.1.7 Tidestrom's Lupine

8.1.7.1 Direct and Indirect Effects on Tidestrom's Lupine

Effects of Livestock Grazing. Although cattle grazing has been associated with the extirpation of Tidestrom's lupine elsewhere in Marin County, the recovery plan for the species did not cite grazing as a primary threat (USFWS 1998b). Approximately 50% of known Tidestrom's lupine occurrences are in coastal dunes outside the action area and another 35% are within existing resource protection exclusion areas. The remaining 15% of Tidestrom's lupine occurrences from population numbers 2 and 9 are on coastal dunes within grazed pastures on the F Ranch, where cattle could continue to directly impact plants through trampling, as well as indirectly via increased weeds associated with grazing disturbance. Dangremond et al. (2010) noted impacts on some populations from trampling by cows and suggested that trampling by livestock was the cause of some plants going from a reproductive to non-reproductive state. However, since most of the population of this species is either outside the action area or inside exclusion areas, Tidestom's lupine population declines are mainly due to non-native plant invasion and mice. While adverse impacts from ranching would continue under the proposed action, the largest population, located southwest of Abbotts Lagoon, is stable with more than 200,000 plants and is excluded from grazing areas (Parsons 2018). Furthermore, a new 67-acre resource protection exclusion area on the F Ranch would protect all known Tidestrom's lupine occurrences that are potentially impacted by grazing under existing conditions.

Although the potential for adverse impacts to Tidestom's lupine from ranching would be eliminated by new resource protection exclusion areas, a small number of Tidestrom's lupine occurrences could be negatively impacted if cattle breach pasture fences and loaf in coastal dunes (NPS, Parsons, pers. comm. 2019b). Cattle trespassing in coastal dunes could occur in situations where pasture fences are poorly sited in sandy areas, where posts fall over or sand dunes drift over fences, where pasture fences are inadequately maintained by rancher, of if gates are left open.

Effects of Other Ranch Activities. Tidestrom's lupine occurs in areas that would be designated as the Resource Protection subzone under the proposed action. Thus, no other ranch management activities would be authorized, and cattle grazing would be removed once fencing is established to delineate the subzone. Subsequently, grazing could only potentially affect Tidestrom's lupine if pasture fences were breached

8.1.7.2 Avoidance, Minimization, and/or Mitigation Measures on Tidestrom's Lupine

The potential effects of cattle grazing on approximately 80% of known Tidestrom's lupine occurrences would be avoided for by NPS continuing to enforce fence maintenance requirements to exclude cattle from coastal dune habitats. This usually includes an inspection of all fences by ranchers prior to moving cattle into a pasture. Also, the sizeable and growing Population 9 would be protected from livestock grazing with a new 68.5-acre resource protection exclusion area on the F ranch. This exclusion area would also prevent cattle from impacting all remaining known Tidestrom's lupine occurrences within the small Population 2, which are currently exposed to grazing.

Where applicable, avoidance, minimization and mitigation measures listed previously for beach layia (see section 8.1.1.2) would serve to reduce potential effects to Tidestom's lupine from the proposed action.

8.1.7.3 Cumulative Effects on Tidestrom's Lupine

Reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on Tidestrom's lupine would be human-caused climate change and sea-level rise. As discussed above for beach layia, potential for progressive sea-level rise would affect an unknown portion of coastal dune habitat potentially occupied by Tidestrom's lupine. Coastal dune erosion could shift suitable dune habitat for Tidestrom's lupine further inland, but to some extent, newly disturbed dune habitat along the margins of the unstable or eroded beaches would likely continue to support early successional dune-colonizing plants like Tidestrom's lupine (USFWS 2011a). The fire management program for the park could impact Tidestrom's lupine via unplanned wildfire or by fire suppression activities. However, this is unlikely because the species occurs in dunes with relatively low vegetative cover where wildfire is unlikely to carry. Also, coastal dunes are part of the Minimum Management Unit where prescribed fire and mechanical treatments would not occur (NPS 2004).

8.1.7.4 Conclusion

Tidestrom's lupine mostly occurs in dune areas that are mostly excluded from grazing and where other ranch activities are not authorized, except when cattle occasionally escape designated pastures and potentially trample Tidestrom's lupine plants. However, these potential effects would continue to be avoided to the degree that they are unlikely to occur, or would be insignificant or discountable if were to occur. Therefore, the proposed action "may affect, is not likely to adversely affect" Tidestrom's lupine.

8.2 Federally Listed Terrestrial Wildlife

8.2.1 California Red-legged Frog

8.2.1.1 Direct and Indirect Effects on California Red-legged Frog

Effects of Livestock Grazing. Livestock grazing in the action area could adversely affect the California red-legged frog in numerous ways, summarized in table 8-1 and based on pages 20-22 of the recovery plan for the species (USFWS 2002a).

TABLE 8-1: POTENTIAL EFFECTS OF LIVESTOCK GRAZING ON CALIFORNIA RED-LEGGED FROG

Livestock Effect	Potential Effect on California Red-legged Frog Habitat
Emergent vegetation removed	Emergent vegetation used for anchoring egg masses. Excessive vegetation may reduce sunlight needed for basking and growth of algae, which is chief tadpole food.
Shading vegetation removed (emergent and bank side)	Chiefly harmful to adults, for whom shaded refugia may be critical in drier inland areas during the summer.
Insect habitat vegetation removed	Harmful to adults and juveniles that mainly feed on invertebrates for which bank side vegetation is prime habitat.

Livestock Effect	Potential Effect on California Red-legged Frog Habitat
Alteration of stream morphology by caving in banks	May cause loss of pool habitat in streams.
Excess trampling of shallow margins of ponds or streams	Risk of trampling egg masses, tadpoles and adults or destroying vegetation.
Excess water drawdown in ponds	May strand egg masses, tadpoles or adults.
Excess sediment from cattle-induced erosion	Could cause filling of pond habitat, reduce primary productivity.
Change hydrological regime by accelerating runoff	Pools may dry before metamorphosis completed.
Excess nutrients from livestock manure	Possible impact where animals concentrated - requires study.

Source: USFWS (2002b)

The proposed action could adversely affect California red-legged frog habitat due to trampling and vegetation removal around stock ponds, streams, or adjacent upland habitats. Livestock activity in and around stock ponds or streams may mobilize sediments or contribute to erosion and sedimentation. If excess sedimentation occurs in ponds or streams where red-legged frogs breed, it is possible that their egg masses would suffocate from being buried under sediments. Heavy loss of sediments due to livestock trampling of the streambed could result in down-cutting of channels which could further degrade the stability of banks, and functions of the riparian ecosystem. Cattle loafing in stock ponds could also destroy egg masses or trample tadpoles and adult frogs, although most ponds are large enough that tadpoles and adult frogs can take refuge in deep water. The extent to which such disturbance occurs and its effect on red-legged frogs is not known, but populations have persisted in the action area where livestock grazing has occurred for many decades.

The effects to California red-legged frog from livestock would be relatively short-term in duration; in most cases, light-to-moderate levels of livestock use would have no overall adverse effect on California red-legged frog breeding habitat within stock ponds and streams. In fact, the relatively large numbers of California red-legged frogs in the action area are mostly found in stock ponds and red-legged frogs have persisted for several decades where grazing has occurred. The level of vegetation maintained on grazed lands within the action area would be sufficient to maintain numerous small wetland areas that are used seasonally by red-legged frogs (Ford et al. 2013). Frogs sheltering in terrestrial locations would be at risk from livestock trampling or habitat alteration throughout most of the action area.

Livestock grazing of uplands could adversely affect aquatic habitats used by red-legged frogs by causing accelerated runoff due to reduced vegetation cover and soil compaction. Also, livestock urine and feces could run off into small creeks and stock ponds that support California red-legged frogs, which includes waste lagoons at dairies and other confined livestock feeding areas. Nutrient loading, bacteria, and suspended solids associated with such runoff may result in alteration of pH, dissolved oxygen, excessive nitrogen, or pathogens which could adversely affect all life stages of red-legged frogs. USFWS maintains that unmanaged livestock grazing (overgrazing) can negatively affect riparian and instream aquatic habitat to the detriment of California red-legged frogs.

Riparian areas along creeks could be adversely affected by ranching operations, as red-legged frogs occupy wetlands and riparian areas that are both accessible and inaccessible to cattle. Livestock grazing would continue to occur on some predominantly intermittent streams that are not protected from cattle grazing and potentially support red-legged frogs. There could also be potential adverse effects to water quality due to stormwater runoff from dairies. Lastly, the American bullfrog (*Lithobates catesbeianus*) is a non-native predator of California red-legged frog that has reduced or caused the extirpation of numerous populations (USFWS 2002a). Bullfrogs have also been implicated for the increasing spread of the deadly chytrid fungus between water bodies (Yap et al. 2018). However, in the action area, the proportion of sites at which American bullfrogs were detected was nearly an order of magnitude less than for California red-legged frogs (NPS 2019c). Most American bullfrog detections in the action area occurred in the Olema Valley (NPS 2019c), but bullfrogs have been observed in Tomasini Creek and some East Pasture ditches in the Lagunitas Creek watershed (Fellers and Guscio 2002), and are also present on Drakes Head (NPS, Kleeman, pers. comm. 2019h).

Although stock ponds benefit California red-legged frogs by providing habitat, the maintenance of stock ponds could result in killing or injuring red-legged frogs during grading, excavation, or other related activities. However, the possibility that ponds could wash out due to lack of maintenance and erosion of dams, or failure to stop headcuts below dams, poses a greater threat to red-legged frog breeding habitat. Pond maintenance could also increase the potential spread of chytrid fungus into new areas if it were to occur in the park in the future and appropriate precautions were not taken. While actions should be taken to minimize the spread of chytrid fungus between different areas of the park, a three-year study of ponds in Olema Valley found chytrid fungus at a majority of the ponds during at least one year of the study. Even though the fungus is present, no recent die offs of the California red-legged frog have been observed (Fellers et al. 2011).

Effects of Other Ranch Activities. The application of organic fertilizer (e.g., manure) on forage crops could affect California red-legged frog habitat if excessive nutrients enter surface waters, including wetlands and streams. However, manure spreading under the proposed action is unlikely to have adverse effects on red-legged frogs because ranchers are not permitted to spread manure within 200 feet of any natural bodies of water in addition to the other mitigation measures listed below. Also, red-legged frog tadpoles and adults have been observed in highly nutrient-enriched ponds, suggesting that they are tolerant of such conditions (NPS 2001a).

The use of herbicides for weed management could also impair water quality and have adverse effects on California red-legged frogs because the active and inert ingredients of pesticides and herbicides are known to have deleterious effects on amphibians (Cox and Surgan 2007). For example, glyphosate (the active ingredient in a common herbicide) has been found to be poisonous to frogs and other amphibians and is extremely toxic to the tadpoles. Herbicide drift has been documented as occurring nearly 100 feet away from its application (Segawa et al. 2001). A 2006 Stipulated Injunction and Order in US District Court for the Northern District of California imposed avoidance buffers around California red-legged frog upland and aquatic habitats for certain pesticides in California, which, for ground applications, extend 260 feet from the edge of red-legged frog aquatic habitats in areas with adjacent suitable upland habitat (i.e., uncultivated or undeveloped land) (California Department of Pesticide Regulation 2006). Therefore, implementing the required260-foot avoidance buffer for use of certain herbicides around suitable California red-legged frog habitat would avoid any adverse effects from those herbicides on the species.

Ranch diversification under the proposed action could affect California red-legged frog through mortality, capture, injury, harassment, and harm of individual subadults and adults. Young juvenile California red-legged frogs dispersing from the stock ponds in the action area may move into or across areas where pigs, chickens, sheep, or goats are foraging. Additional types of livestock would be authorized only in the Pasture and Ranch Core subzone, which together comprise approximately 30% of the action area but does not include any breeding ponds. Foraging animals, such as chickens, could harass and/or kill dispersing juvenile frogs, and larger livestock could trample California red-legged frogs. Moving chicken huts using motor vehicles could result in adverse effects to California red-legged frogs dispersing into and from the uplands around the ponds. Also, red-legged frogsdisperse up to a mile or two from aquatic habitats, so could be killed or injured on lands subject to pasture management activities (e.g., forage crop mowing), other vegetation manipulation (e.g., shrub management), or vehicular use of ranch roads and maintenance of ranch roads. The presence of additional guard dogs and domestic cats could cause direct injury or mortality to the California red-legged frogs as well. Under the proposed action, increased human activities (i.e., new types of livestock, row crops, stabling horses, paid ranch tours and farm stays, small-scale processing of dairy products, and sales of local agricultural products) could also attract native predators such as raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), striped skunks (*Mephitis mephitis*) and spotted skunks (*Spilogale putorius*). This increase in predator density may threaten some individual California red-legged frogs.

8.2.1.2 Avoidance, Minimization, and/or Mitigation Measures for California Red-legged Frog

USGS, in collaboration with NPS, conducts surveys annually of some wetlands that host California red-legged frogs. Future monitoring data would be used to inform any necessary changes to cattle grazing in pastures with California red-legged frog habitat, such as adjustments in the number of animals, season of use, or duration of use. Furthermore, habitat for California red-legged frogs would be considered in each individual ROA, which would specify areas to be avoided by certain ranch activities, including mowing, shrub management, weed management, and nutrient management.

The park would minimize impacts on California red-legged frog by not authorizing ranch activities other than grazing in the Range subzone, which would comprise approximately 70% of the action area and contain nearly all the surface water resources in the lands under grazing lease/permits. The resource protection subzone would protect an additional 12.1 miles of streams, 8.3 acres of ponds, and 372.1 acres of wetlands from direct impacts from cattle. In general, the adherence to RDM standards would provide for maintenance of herbaceous vegetation cover and protection from soil erosion. Because seasonal upland habitats and travel corridors of California red-legged frog could also occur in the Pasture or Ranch Core subzones, NPS would require ranchers to implement several avoidance, minimization, and mitigation measures. These measures were provided previously in section 3.3, table 3-2, and those applicable to California red-legged frog are identified under the "Potentially Affected Species" column. In addition, the measures pertaining to "All federally listed species" would apply to California red-legged frog and were listed above for federally listed plants in section 8.1.1.2.

For all ranch activities, NPS would require that California red-legged frog usage in the vicinity of ranch activities be taken into consideration for project timing. In general, in-stream and riparian activities would be implemented in the period between June 1 and October 31, unless project-specific recommendations from regulators or the NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or riparian habitats outside the June through October timeframe must be approved in advance by project regulators. In addition, any use of heavy machinery would avoid California red-legged frog habitat except where deemed necessary by NPS to address resource protection needs. If a project site occurs in potential California red-legged frog habitat, a NPS biologist would conduct a preconstruction survey of potential California red-legged frog habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for California red-legged frog no more than 48 hours before the start of construction activities. The biologist would look for individual frogs, evaluate the likelihood of usage, and determine if additional biological monitoring is needed during construction to ensure that individuals present are removed or avoided. To limit the potential adverse effect of increased native predator populations due to ranch activities, NPS would require ranchers to implement measures to minimize potential food sources for predatory wildlife such as ravens, raccoons, opossums, and skunks. By avoiding activities that could support an unnatural abundance of such predatory species, potential effects on California red-legged frogs would be reduced.

For project areas located within habitats with known presence of California red-legged frog, or critical movement corridors, temporary high-visibility fencing would be installed around the project perimeter, and installation would be overseen by a NPS biologist. Openings would be restricted to areas of construction site access. The purpose of the temporary fencing would be to prevent debris and workers from entering adjacent habitats. If suitable California red-legged frog breeding habitat is present, project activities would occur between July 1 and October 15 to avoid impacts on breeding California red-legged frog or egg masses. NPS will also require that a biologist monitor initial ground-disturbing activities within 300 feet of California red-legged frog habitat, who would have the authority to halt work activities that may adversely affect California red-legged frog until they no longer occupy the project area. Relocation of California red-legged frog would be performed only by individuals approved in advance by CDFW and USFWS.

To avoid or minimize potential impacts from road upgrade and decommissioning, stream crossings, infrastructure management, or waterway stabilization, NPS would require that culverts be designed to minimize habitat fragmentation and barriers to California red-legged frog movement. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions would be required in salmonid streams to allow passage for fish and other aquatic organisms. All structural crossings would need to be designed to pass low and high flows and provide passage for as many different aquatic species and age classes as possible. In addition, in-stream crossings would not be designed for placement within 300 feet of known California red-legged frog breeding areas.

For all authorized activities, NPS would require avoidance, minimization, and mitigation measures to reduce impacts to surface water and groundwater resources, preventing potential adverse effects to California red-legged frogs. Projects within potential California red-legged frog habitat would be designed to minimize disturbance to vegetation near or in permanent and seasonal pools of streams, marshes, ponds, or shorelines with extensive emergent or weedy vegetation. NPS would require that any use of heavy machinery avoid water bodies and riparian zones. Any use of heavy machinery would also avoid lands designated by the NRCS as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible. All construction projects would have to prepare and implement a spill prevention and clean-up plan, a Stormwater Pollution Prevention Plan, or similar document. The plan would address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas. See table 3-2 for a complete description of these, and other measures to avoid, minimize, or mitigate impacts to water resources used by California red-legged frog.

For authorized diversification activities, NPS would require ranchers to implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables (such as rolling dips for roads) and/or to prevent concentrated flow from causing erosion (such as roof gutter downspouts with energy dissipaters, and French drains). Ranches would also need to divert rainfall and runoff away from high use areas with animal waste (such as stalls, manure piles, paddocks, and arenas) via methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season. Also, for horse boarding, ranchers would be required to route water from horse wash areas to a filter strip, into a plumbing system, or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands, and minimize the amount of: (1) water used by using sponges or hoses equipped with shut-off or low-flow nozzles; and (2) soap used, especially soap with surfactants. Furthermore, on up to 2.5 acres of row crops, which could be authorized on disturbed land in the Ranch Core subzone on ranches with existing ranch complexes, NPS would require ranchers to incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin).

For nutrient management activities, such as manure spreading in the Pasture subzone, ranchers would have to maintain records for at least five years regarding the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event. Ranchers would need to keep these records with their Manure Management

Plan. For liquid (irrigated) manure application, ranchers would avoid saturating the soil, and check pipes, hoses, and other irrigation equipment daily for leaks. Also, when practical, ranchers would be required to compost manure before spreading in order to reduce the volume of material. Lastly, manure, manured bedding, compost, and process water would not be stored or applied within a 100-foot setback to any down-gradient surface water unless a 35-foot wide vegetated buffer or physical barrier (i.e., a berm) is substituted for the 100-foot setback, or an alternative conservation practice or field-specific condition is installed that provides pollutant reductions equivalent to or better than achieved by the 100-foot setback. Manure and contaminated bedding materials would be placed in contained storage or composting locations, for later disposal or composting; such locations would have roofs, tarps, or other cover sufficient to keep rainfall out during the rainy season, and two to four walls or sides sufficient to keep contents in place. See table 3-2 for a complete description of these, and other measures to avoid, minimize, or mitigate potential impacts to California red-legged frog from nutrient management activities.

To avoid or minimize adverse effects of herbicides to California red-legged frog, NPS would require that any use of herbicides will conform to state and federal regulations, including any relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates, and may require the planning assistance of a licensed Pest Control Advisor. This consultation would address measures to minimize the use of high-persistence herbicides and to minimize the potential for leaching to surface and groundwater leaching potential. Also, NPS would require that ranchers consider using herbicides that are specifically formulated and approved for use in water when applying herbicides to uplands that may have California red-legged frogs present. Also, ranchers would have to consider the use of multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment. See table 3-2 for a complete description of these, and other measures to avoid, minimize, or mitigate potential impacts to California red-legged frog from IPM activities.

8.2.1.3 Cumulative Effects on California Red-legged Frog

Fire management would be the only reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on California red-legged frog. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. A large-scale unplanned wildfire would likely have long-term, adverse effects on California red-legged frogs, which include the removal of emergent and bank vegetation within streams and ponds, and the increased sedimentation due to accelerated stormwater runoff. However, small-scale prescribed burns would offer long-term benefits to California red-legged frogs by restoring natural vegetation structure and reducing the risk of catastrophic fire. To protect California red-legged frogs, areas to be treated by mechanical means or prescribed fire will have a buffer area of 30 feet established around known breeding habitat (NPS 2004).

8.2.1.4 Conclusion

The vast majority of California red-legged frogs in the action area are found in artificial stock ponds or on streams that have been historically, if not currently, exposed to livestock grazing. USFWS (2002b) determined that grazing in the action area is generally compatible with the conservation of California red-legged frog populations and their habitat. Continued ranching in the action area may both enhance California red-legged frog populations and be detrimental to habitat in certain situations, depending on the grazing practices and overall habitat conditions of a particular site. Adverse effects from ranching would be minimized through appropriate grazing regimes and other avoidance, minimization, and mitigation measures to the degree that negative population-level effects would be unlikely. Ongoing monitoring of red-legged frog populations would provide data in support of additional conservation practices, if necessary, to avoid or minimize adverse effects. Due to localized adverse impacts that could significantly affect some individuals, continued ranching in the action area "may affect, is likely to adversely affec*t*" the California red-legged frog.

8.2.2 Western Snowy Plover

8.2.2.1 Direct and Indirect Effects on Western Snowy Plover

Effects of Livestock Grazing. Grazing in western snowy plover habitat could adversely affect nesting individuals via disturbance to birds or trampling of nests and crushing of eggs. The presence of cattle within nesting areas could also result in nest failure due to western snowy plovers being flushed from their nests for extended periods of time. However, this potential impact would only occur if livestock were to escape pasture fences and trespass onto beaches and coastal dunes occupied by western snowy plovers, which occurs only rarely in the action area.

Effects of Other Ranch Activities. Ranch management activities in the action area could pose a risk to western snowy plovers by supporting higher numbers of predatory species, especially common ravens that prey upon snowy plover eggs and chicks. Raven populations could be subsidized by ranch activities that provide food sources, such as livestock feeding and forage mowing that inadvertently kills birds and small mammals that ravens feed upon. Ravens could therefore occur in greater numbers than in the absence of beef and dairy ranches and observations suggest they are most common on the outer Point Reyes peninsula (NPS 2001a) in proximity to beaches used by western snowy plovers. Ravens are known predators on western snowy plover chicks and eggs (Roth et al. 1999) and accounted for 38–65% of failed snowy plover egg clutches between 1986 and 1995 (Hickey et al. 1995).

8.2.2.2 Avoidance, Minimization, and/or Mitigation Measures for Western Snowy Plover

NPS would continue to minimize the likelihood of livestock trespassing on beaches by requiring that pasture fences be inspected and maintained annually to ensure that livestock cannot access beaches or coastal dunes. This includes an inspection of all pasture fences in the action area prior to moving cattle into a pasture. ROAs would also require annual fence maintenance to repair any broken wires or other fence defects that could reduce their effectiveness. In general, the enforcement of pasture fence maintenance would limit the potential for direct adverse effects to snowy plovers to a degree that no take would occur, and overall effects would be insignificant.

To mitigate the indirect effects of raven predation due to ranch activities that support them, the NPS has eliminated the existence of carcass dumps and other waste areas on ranches by requiring ranches to quickly collect and dispose of any dead livestock and fowl carcasses outside the park, typically at the nearest disposal site in Petaluma. NPS would continue to enforce this requirement. Also, NPS would require that cattle afterbirths be made unavailable to ravens by moving calving indoors or finding ways to ensure that afterbirths and dead livestock are disposed of quickly. Additionally, where agricultural diversification is proposed to be allowed, NPS would require methods to reduce feeding opportunities for common ravens at ranches and dairies. Raven access to cattle feed would be avoided by requiring ranches to cover or remove feed troughs or place them in structures, where possible, to discourage ravens from accessing stored grain or other livestock feed, and by storing harvested crops in enclosed structures and cleaning up waste grain around troughs. In addition, raven abundance would be discouraged by mitigation measures that reduce wildlife mortality during forage mowing, especially silage harvesting. This includes conducting harvest mowing, except for silage, outside bird nesting season; mowing from inside the middle of the field toward the outside, increasing the likelihood for wildlife escape, and using flushing bars attached to the mower to flush incubating birds and mammals before the mower reaches them; and not mowing at night because it results in higher wildlife mortality, including adult birds that do not flush from their nests as readily at that time.

8.2.2.3 Cumulative Effects on Western Snowy Plover

The reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on the western snowy plover include recreational activities beyond those analyzed in this BA (see chapter

2 of the EIS, under “Public Use and Enjoyment” for alternative B) and the effects of human-caused climate change and sea-level rise.

Recreational activities that could affect the western snowy plover include hiking, beach going, water sports, horseback riding, fishing, camping, wildlife watching, and similar outdoor activities. Nesting or overwintering western snowy plovers could be disturbed by humans, although any adverse effects would be short-term and not likely to reduce snowy plover nest success. Trash produced by recreationists, if not properly disposed, could also attract ravens and other predatory wildlife to beaches where snowy plovers nest and thereby increase the likelihood of nest depredation.

The potential for progressive sea-level rise would affect an unknown portion of habitat used by western snowy plover. In addition to the direct influence of rising water levels potentially inundating their habitat, even small changes in water level could cause significant changes in wave energy and the potential for shoreline damage from wave force. Coastal dune erosion could shift western snowy plover nesting habitat further inland, beyond the immediate effects of water level rise. However, to some extent, the negative impact of increased sand mobility could be offset by new nesting habitat along the margins of the unstable or eroded sections of beach.

8.2.2.4 Conclusion

The continuation of ranching in the park under the proposed action would include the creation of human trash and agricultural feed stocks in the Ranch Core subzone and forage production mowing activities on 1,000 acres in the Pasture subzone, which could be used by common ravens and support increased raven abundance. Over the long term, nesting western snowy plovers could be indirectly affected due to predation from ravens. In spite of avoidance, minimization, and mitigation measures that could reduce this adverse indirect impact, continued ranching in the action area “may affect, is likely to adversely affect” the western snowy plover DPS.

8.2.3 Myrtle’s Silverspot Butterfly

8.2.3.1 Direct and Indirect Effects on Myrtle’s Silverspot Butterfly

Effects of Livestock Grazing. Grazing activities within the habitat of the Myrtle's silverspot butterfly may result in trampling of eggs, larvae, and adults. Additionally, grazing in the subspecies’ habitat may result in destruction of host or nectar plants via consumption, trampling, soil compaction, erosion, and other deleterious effects. Conversely, grazing activities may assist in habitat maintenance by removing competitive vegetation and minimizing vegetative cover which increases the density of nectar sources (Murphy and Launer 1992). In fact, studies have suggested that managed grazing may be necessary to ensure the persistence of nectar sources, and by extension Myrtle’s silverspot butterflies, in coastal grasslands. Murphy and Launer (1992) concluded that an area grazed more intensively than pastures in the action area supported the higher concentrations of adult Myrtle’s silverspot butterflies, and probably also butterfly larvae, which depend upon concentrations of western dog violet host plants. Although inadvertent trampling of host plants by cattle may be considered a relatively minor threat, the impacts of grazing on the persistence of western dog violets, and by extension Myrtle’s silverspot butterflies, remains unknown (Launer et al. 1992; USFWS 2009a).

Most documented occurrences of Myrtle's silverspot butterflies in the action area are within pastures grazed by cattle. Two populations inhabit the park within coastal dune habitat, instead of a single population as described in the listing (USFWS 1998b, Adams 2004, USFWS 2009b). At time of the species' listing, USFWS believed that cattle grazing significantly decreased the habitat quality of the Myrtle's silverspot butterfly (USFWS 1998b). A study by Adams (2004) in the park compared grazed and ungrazed vegetation communities for differences in the density and distribution of nectar sources and the host plants, finding that: (1) nectar source species richness was not significantly affected by grazing;

(2) nectar source species density was greater within grazed areas; (3) although cattle graze the dune areas, they appear to prefer grazing within grasslands rather than on the dunes, thus, cattle grazing may have little effect on the composition of dune plants; (4) seasonal fluctuations in plant phenology and seasonal weather may be highly variable and could affect the distribution of butterflies between dunes and grasslands; and (5) Myrtle’s silverspot butterflies use nectar sources in grazed lands more than predicted. Adams (2004) was unable to survey enough western dog violets to ascertain the effect of grazing on this host plant. Likewise, the five-year status review by USFWS (2009b) concluded that a moderate grazing regime, as used by cattle ranchers in the action area, did not significantly affect the distribution of Myrtle's silverspot butterfly.

In summary, the effects of grazing on Myrtle's silverspot butterfly host plants (i.e., western dog violet) and its food sources (i.e., nectar plants) have been debated, but recent research suggests that well-managed grazing is compatible with the subspecies’ conservation. While the optimal grazing regime most beneficial to Myrtle’s silverspot is not yet known (USFWS 1998b), enough evidence exists to conclude that cattle grazing under the proposed action would not adversely affect Myrtle’s silverspot butterflies. Livestock grazing would benefit butterflies documented on the 7 ranches with known occurrences in the action area (D, E, F, N, Home, J and K Ranches) and would enhance suitable habitat on other ranches.

Effects of Other Ranch Activities. Under the proposed action, the effects of human activities on Myrtle's silverspot butterfly include maintenance of ranch roads and vehicular traffic in Myrtle's silverspot butterfly habitat. Specifically, excessive dust from road grading or from routine vehicular traffic may prevent respiration of the early stages through clogged spiracles. Additionally, these activities may result in individuals being injured or killed as a result of collisions with or being run over by tractors, vehicles, or other moving equipment. Dust may also affect the host and nectar plants by inhibiting their ability to photosynthesize, and thus cause plants to die or minimize its rate of development. Further, dust could interfere with the plants reproductive activity by coating reproductive parts with an impenetrable layer of film, thus inhibiting reproductive success or reducing the availability of nectar for butterflies to forage on.

Additionally, actions to reduce the spread of invasive plants would maintain habitat for nectar sources and host plants used by Myrtle’s silverspot butterfly. However, because treatments would involve some clearing of vegetation, or the potential use of herbicides silverspot butterflies would be susceptible to adverse impacts. Furthermore, the control of invasive species could adversely impact silverspot butterflies in areas where native plants are scarce and butterflies feed on invasive plants, such as bull thistle (*Circium vulgare*).

8.2.3.2 Avoidance, Minimization, and/or Mitigation Measures for Myrtle’s Silverspot Butterfly

Generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. Because the Range subzone comprises approximately 70% of the action area, potential impacts to Myrtle’s silverspot butterfly would be reduced. NPS also would require ranchers to implement several avoidance, minimization, and mitigation measures, provided previously in section 3.3, table 3-2. Those applicable to the Myrtle’s silverspot butterfly are identified under the “Potentially Affected Species” column. In addition, the measures pertaining to “All federally listed species” would apply to Myrtle’s silverspot butterfly and were listed above for federally listed plants in section 8.1.1.2.

Adverse effects from overgrazing would be avoided by the continued adherence to the park’s *Range Management Guidelines,* which specify the appropriate minimum levels of RDM of 1,200 pounds per acre and include resource protection measures to avoid negative effects of grazing within grasslands and dune areas. These guidelines would ensure against overgrazing of needed nectar plants and western dog violets (host plants) and provide for diverse vegetation structure and plant species composition within the action area.

For all ranch activities, reconnaissance-level surveys would be performed by a project biologist to determine whether suitable habitat for Myrtle's silverspot butterflies is present in the project area. If larval host or nectar plants were present, and Myrtle's silverspot butterflies were documented within the project vicinity, a project biologist would perform a survey to determine presence or absence utilizing widely accepted scientific protocols. Also, host plants, including *Viola adunca*, would be protected with a clearly demarcated 20-foot buffer zone. NPS would require that Myrtle's silverspot butterfly usage in the vicinity of ranch activities be taken into consideration for project timing. In addition, for project areas located within habitats with known presence of Myrtle's silverspot butterfly, temporary exclusion fencing would be installed around the project perimeter. Exclusion fencing would be highly visible, and installation would be overseen by the project biologist. The purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats. Any use of heavy machinery would avoid Myrtle's silverspot butterfly habitat except where deemed necessary by NPS to address resource protection needs.

To avoid the potential adverse effects of shrub management to Myrtle's silverspot butterflies, NPS would limit shrub management efforts to areas previously occupied by grassland, as shown by historical photographs, or with soil types appropriate to support grassland, according to the USDA, NRCS Soil Survey and associated Ecological Site Descriptions. To avoid the potential adverse effects to Myrtle's silverspot butterflies from diversification activities that could cause high levels of dust in proximity to suitable habitat, NPS would require ranchers to implement dust control measures such as wetting down paddocks and riding arenas (especially on dry, windy days), or consider using low- or no-dust footing materials to control dust while reducing water use. Lastly, as described above for California red-legged frog, NPS would require ranchers to implement measures to avoid or minimize adverse effects of herbicide use. If suitable habitat for Myrtle's silverspot butterflies were present, project work would be carried out with minimum soil compaction and disturbance. Wherever possible, work would be performed with hand tools. No herbicides or fertilizers would be used in habitat that supports Myrtle's silverspot butterflies. Also, ranchers would have to consider the use of multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment. See table 3-2 for a complete description of these, and other measures to avoid, minimize, or mitigate potential impacts to Myrtle's silverspot butterfly from IPM activities.

8.2.3.3 Cumulative Effects on Myrtle's Silverspot Butterfly

Fire management would be the only reasonably foreseeable future state, private and tribal activities with potential for cumulative effects on the Myrtle's silverspot butterfly. The fire management program for the park, operated primarily by Marin County under a 2018 agreement with the park, would include both prescribed fire and mechanical treatments. Both types of fire operations could remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could potentially affect nectar sources and host plants for Myrtle's silverspot butterflies. The short-term effects of unplanned wildfire or fire suppression activities would depend on the extent and severity of the fire, but would be minimized or prevented through NPS (2004) guidance and mitigation measures. Also, native vegetation is adapted to periodic fire, and fire could benefit Myrtle's silverspot butterfly over the long term by reducing competition or stimulating seed germination of native forbs that provide nectar sources.

8.2.3.4 Conclusion

Most documented occurrences of Myrtle's silverspot butterflies in the action area are within pastures grazed by cattle. Livestock grazing could benefit Myrtle's silverspot butterflies by increasing the density of nectar sources via reduced competition from grazed plants, although heavy grazing could reduce nectar sources. The effects of grazing on Myrtle's silverspot butterfly host plants (i.e., western dog violet) and its food sources (i.e., nectar plants) have been debated, but recent research suggests that well-managed grazing is compatible with the subspecies' conservation. Other impacts from ranch activities could have a minor, adverse impact to host and nectar sources or larvae development, although effects would minimized with management activity standards and mitigation measure that would be specified in ranch ROAs. Therefore, the propose action "may affect, is likely to adversely affect" the Myrtle's silverspot butterfly.

8.2.4 California Freshwater Shrimp

8.2.4.1 Direct and Indirect Effects on California Freshwater Shrimp

Effects of Livestock Grazing. California freshwater shrimp would continue to experience localized, minor, adverse effects in some stream reaches from sedimentation of streams and continued nutrient inputs (i.e., cattle manure) from cattle. The adverse effects of grazing that could affect California freshwater shrimp would be related to reduced aquatic habitat and water quality in Lagunitas Creek and lower Olema Creek. Potential impacts to water quality would include those described above in section 8.2.1, under "California Red-legged Frog."

Livestock grazing in the action area does not occur along reaches where California freshwater shrimp occur, and livestock would continue to be separated from Lagunitas and Olema Creeks by fencing. Also, the reaches where California freshwater shrimp occur are bordered by substantial riparian vegetation, which may reduce potential impacts form pollutants or sediment in stormwater runoff from ranches. Thus, although the proposed action could contribute sedimentation and nutrient runoff from the Range subzone, the effects of grazing to California freshwater shrimp, if any, are expected to be minor and not detectable.

Effects of Other Ranch Activities. In the Lagunitas and Olema Creek watersheds, where streams provide potential habitat for California freshwater shrimp, activities in the Ranch Core subzones such as pasture management and diversification could increase erosion and sedimentation of streams. Ranch activities could also contribute nutrients and other pollutants during storm events if appropriate mitigation measures are not in place. Thus, there could be minor, adverse effects due to water quality as a result of other livestock grazing in certain wetlands and riparian areas. However, water quality in these watersheds has been improving in terms of fecal coliform bacteria concentrations from 1999 to 2017 as a result of greater effort toward implementation of water quality improvement practices on ranches (Voeller et al. 2018). Adverse impacts would continue to be reduced as ROAs would incorporate management activity standards and mitigation measures to protect water quality, and water quality improvement practices would continue to be implemented.

8.2.4.2 Avoidance, Minimization, and/or Mitigation Measures for California Freshwater Shrimp

Any adverse effects of ranching on California freshwater shrimp would be reduced by proper grazing management and adherence to RDM limits as specified in individual ranch ROAs. Numerous mitigation measures listed in Table 3-2 would serve to avoid or minimize the effects of beef and dairy ranching on California freshwater shrimp, which are generally the same as described above for California red-legged frog, under "Avoidance, Minimization, and/or Mitigation Measures" in section 8.2.1, except the measures associated with nutrient management would not apply to California freshwater shrimp because no diaries are located within the Lagunitas and Olema Creek watersheds where the shrimp are found.

Under the proposed action, NPS would cooperate with ranchers in the Lagunitas and Olema Creek watersheds to consider California freshwater shrimp in terms of project timing. Shrimp habitat in Lagunitas Creek is excluded from livestock grazing and is generally protected from ranching activities in the watershed. Ongoing erosion control work in the watershed also protects shrimp habitat (NPS 2001a). In general, work in and around streams that support California freshwater shrimp shall not begin until July 1 and shall be completed by October 15. Work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from project regulators. A full description of each avoidance, minimization, and/or mitigation measure applicable to California freshwater shrimp is provided in table 3-2.

8.2.4.3 Cumulative Effects on California Freshwater Shrimp

Fire management would be the only reasonably foreseeable future state, private, or tribal activity with the potential for cumulative effects on California freshwater shrimp. The fire management program for the park, operated primarily by Marin County under a 2018 agreement, would include both prescribed fire and mechanical treatments. A large-scale unplanned wildfire burning vegetation near Lagunitas or Olema Creeks would likely have long-term, adverse effects on California freshwater shrimp from changes in riparian vegetation cover or stream flow characteristics or increased sediment in stormwater runoff. Fire suppression activities could also have adverse effects from increased erosion from line construction or changes in water quality from retardant drops. However, because of the small size of most wildfires, the expected impact on shrimp habitat would be negligible and short term. Prescribed fire, because it is used to restore the natural vegetation structure of park habitats and reduce the risk and possible extent of catastrophic fire, could offer long-term, small-scale benefits for California freshwater shrimp by restoring natural vegetation structure and reducing the risk of catastrophic fire.

8.2.4.4 Conclusion

All stream reaches in the action area that are potentially occupied by California freshwater shrimp are excluded from grazing. The implementation of additional management activity standards and mitigation measures for ranch activities would avoid most potential adverse effects on the species. The application of added resource protection exclusion areas would further avoid or minimize effects on water quality in Lagunitas and Olema Creeks. Adverse effects from ranching would be avoided to the degree that they are insignificant or discountable. Therefore, the proposed action “may affect, is not likely to adversely affect” California freshwater shrimp.

8.3 Effects on Critical Habitat

The ESA, in addition to requiring that federal agencies not jeopardize the continued existence of endangered or threatened species, requires that their actions not result in the destruction or adverse modification of critical habitat of such species. USFWS revised the regulatory definition of “destruction or adverse modification” to mean “a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features” (81 FR 7214). USFWS also revised its critical habitat regulations in 2016 to replace the term primary constituent elements with physical or biological features (81 FR 7414). This shift in terminology, however, does not change the approach used for evaluating the effects of the proposed action on critical habitat.

UFSWS must review the proposed action’s effects on the quantity and quality of physical or biological features in the designated critical habitat and how they support a species’ life history and recovery needs. Additionally, a proposed action that precludes or significantly delays improvement in the quality and quantity of these habitat features could also result in a conclusion of “destruction or adverse modification” of critical habitat. Specifically, UFSWS must review this BA and conclude if the proposed action is likely to “destroy or adversely modify” any designated critical habitat within the action area. If either USFWS concludes that the proposed action may “destroy or adversely modify” critical habitat, the proposed action may not go forward unless a reasonable and prudent alternative is provided that would avoid the destruction or adverse modification of critical habitat.

8.3.1 California Red-legged Frog Critical Habitat

The proposed action would provide for the maintenance of numerous stock ponds into the foreseeable future, including sites that support California red-legged frog breeding habitat (PCE 1) and nonbreeding habitat (PCE 2). However, the use of these ponds by livestock could disturb this critical habitat and other small streams that also provide breeding and nonbreeding habitat. Periodic maintenance of stock ponds by ranchers could also temporarily disturb potential California red-legged frog breeding habitat (PCE 1). Grazing and ranch management activities (e.g., forage crop management and road use) in areas adjacent to suitable aquatic habitat would also disturb red-legged frog upland habitat for foraging and shelter (PCE 3) and dispersal habitat (PCE 4). However, these effects are anticipated to be temporary and relatively short term in duration. Taking into account the overall beneficial effects of livestock grazing on habitat for the species, the potential adverse effects of the proposed action "will not destroy or adversely modify" designated California red-legged frog critical habitat.

8.3.2 Western Snowy Plover Critical Habitat

Although critical habitat has been designated for the western snowy plover on the beaches of the Point Reyes Peninsula, none is located in the action area. Therefore, the proposed action "will not destroy or adversely modify" designated western snowy plover critical habitat.

TABLE 9-1: EFFECT DETERMINATIONS FOR FEDERALLY THREATENED AND ENDANGERED SPECIES, AND DESIGNATED/PROPOSED CRITICAL HABITAT THAT ARE KNOWN OR EXPECTED TO OCCUR IN THE ACTION AREA

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Plants				
Beach layia	*Layia carnosa*	E	LAA	Cattle would be excluded from areas supporting nearly 90% of all known beach layia occurrences in the park, minimizing the likelihood of trampling. However, cattle could occasionally breach pasture fences and trample beach layia in protected coastal dunes (NPS, Parsons, pers. comm. 2019b). No other ranch activities would affect the species.
Marin dwarf flax	*Hesperolinon congestum*	T	NLAA	Some levels of grazing and soil disturbance may benefit the species (USFWS 2002b).
Showy Indian clover	*Trifolium amoenum*	E	NLAA	Although some historic locations of species may have been eliminated due to livestock, cattle currently graze half of the introduced population. It is unclear if herbivory might benefit the species by disturbing areas and reducing competition from non-native plants (USFWS 2012b), but preliminary studies have suggested that grazing could increase the species' reproduction (Jeffery 2016).
Sonoma alopecurus	*Alopecurus aequalis* var. *sonomensis*	E	LAA	Grazing reduces competition from nearby plants, thus may be beneficial to the species (USFWS 1998b), but individual plants could be impacted by too little or too much grazing during certain stages of growth.
Sonoma spineflower	*Chorizanthe valida*	E	LAA	Grazing is beneficial to the species overall due to a reduction of competitive plants (Davis and Sherman 1992); however, damage from increased grazing or trampling may increase seedling mortality (USFWS 1998b).
Tiburon paintbrush	*Castilleja affinis* ssp. *neglecta*	E	LAA	Incidental consumption of flowers and fruits by cattle could potentially negatively affect reproduction; however, cattle grazing is beneficial in keeping invasive annual grasses low (USFWS 2012a).
Tidestrom's lupine	*Lupinus tidestromii*	E	NLAA	Cattle have been excluded from coastal dunes where approximately 85% known occurrence are found. Under the proposed action, cattle will be excluded from the remaining 15% of known occurrence with a new 67-acre resource protection exclusion area on the F ranch.

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Wildlife				
California red-legged frog	*Rana draytonii*	T	LAA	Continued cattle grazing would serve to maintain stock ponds via reduced encroachment of annual grasses and emergent vegetation that support the majority of breeding in the action area (USFWS 2002b). Excessive livestock use can remove too much emergent vegetation for species' habitat needs; nutrient loading associated with livestock use may have negative impacts on water quality; livestock trampling could crush all life stages of species (USFWS 2002b, Ford et al. 2013). Pond maintenance could result in short term impact but would preserve breeding habitat over the long term. Upland activities including livestock diversification and application of fertilizers or herbicides could result in adverse impacts by reducing water quality or introducing contaminants. Measures to protect aquatic resources including the implementation of the resource protection subzone would reduce adverse impacts to this species.
California red-legged frog Critical Habitat	N/A	N/A	LAA	See above under "California red-legged frog."
Western snowy plover	*Charadrius alexandrines nivosus*	T	LAA	Ranching could potentially have indirect effects by supporting higher numbers of predatory species, especially common ravens that prey upon snowy plover eggs and chicks. Potential direct effects could result from trampling and disturbance of nesting or overwintering plovers by unauthorized livestock escaping pasture fences.
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	E	LAA	Study conducted in the park found nectar source plants were not affected and may be improved by cattle grazing; grazing effects on larval host plants is unclear. The species is found more frequently in grazed areas; livestock trampling may be a minor threat (Adams 2004, USFWS 2009b).
California freshwater shrimp	*Syncaris pacifica*	E	NLAA	Potential effects from ranch activities indirectly affecting water quality via nutrient loading and sedimentation. There are no direct effects from livestock because they are excluded from Olema and Lagunitas Creeks where shrimp are known to occur (USFWS 2002b).

[a] Status Codes: E = Federally listed endangered; T = Federally listed threatened.

[b] ESA determinations: NLAA = May affect, not likely to adversely affect; and LAA = May affect, likely to adversely affect.

9.0 EFFECTS DETERMINATION SUMMARY

Livestock grazing has been shown to be generally compatible with, or to enhance the habitat for most federally listed species considered in this BA. However, there are known potentially adverse effects to California red-legged frogs and western snowy plovers. These effects would mostly be avoided or minimized under the proposed action through the implementation of management activity standards, and the mitigation measures described above in section 3.5. NPS's proposed monitoring of listed species and their habitats, described above in section 6.1, would further ensure that any adverse effects are identified and promptly avoided, minimized, or mitigated.

Table 9-1 provides a summary of the NPS effects determinations for these species, or subspecies. In most cases, the way in which ranching benefits these, and other special-status species, is by mitigating the negative effects of aggressive, highly competitive non-native plants.

10.0 NEED FOR REASSESSMENT BASED ON CHANGED CONDITIONS

This BA and findings above are based on the best current data and scientific information available. A new analysis and revised BA must be prepared if one or more of the following occurs: (1) new species information (including but not limited to a newly discovered activity area or other species information) reveals effects to threatened, endangered, proposed species, or designated/proposed critical habitat in a manner or to an extent not considered in this assessment; (2) the action is subsequently modified or it is not fully implemented as described herein which causes an effect that was not considered in this assessment; or (3) a new species is listed or critical habitat is designated which may be affected by the action that was not previously analyzed herein.

11.0 LIST OF PREPARERS

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Attachment A: Figures

Figures with the locations of threatened and endangered species within the action area are for USFWS review only and are not included in the public document.

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Attachment B: USFWS Information for Planning and Conservation Report

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IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Marin County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet *Brachyramphus marmoratus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/4467	*Threatened*
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/1123	Threatened
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/433	Endangered
Western Snowy Plover *Charadrius nivosus nivosus* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	*Threatened*
Tidewater Goby Eucyclogobius newberryi There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Myrtle's Silverspot Butterfly Speyeria zerene myrtleae No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6929	Endangered
San Bruno Elfin Butterfly Callophrys mossii bayensis There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3394	Endangered

Crustaceans

NAME	STATUS
California Freshwater Shrimp Syncaris pacifica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7903	Endangered

Flowering Plants

NAME	STATUS
Baker's Larkspur *Delphinium bakeri* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5031	Endangered
Beach Layia *Layia carnosa* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6728	Endangered
Clover Lupine *Lupinus tidestromii* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4459	Endangered
Marin Dwarf-flax *Hesperolinon congestum* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5363	Threatened
Robust Spineflower *Chorizanthe robusta var. robusta* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/9287	Endangered
Showy Indian Clover *Trifolium amoenum* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6459	Endangered
Sonoma Alopecurus *Alopecurus aequalis var. sonomensis* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/557	Endangered
Sonoma Spineflower *Chorizanthe valida* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7698	Endangered
Tiburon Paintbrush *Castilleja affinis ssp. neglecta* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2687	Endangered
Yellow Larkspur *Delphinium luteum* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3578	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
California Red-legged Frog *Rana draytonii* https://ecos.fws.gov/ecp/species/2891#crithab	Final
Marbled Murrelet *Brachyramphus marmoratus* https://ecos.fws.gov/ecp/species/4467#crithab	Final
Northern Spotted Owl *Strix occidentalis caurina* https://ecos.fws.gov/ecp/species/1123#crithab	Final
Tidewater Goby *Eucyclogobius newberryi* https://ecos.fws.gov/ecp/species/57#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Oystercatcher Haematopus bachmani This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15

Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black Swift *Cypseloides niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8878	Breeds Jun 15 to Sep 10
Black Turnstone *Arenaria melanocephala* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Black-chinned Sparrow *Spizella atrogularis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9447	Breeds Apr 15 to Jul 31
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black-vented Shearwater *Puffinus opisthomelas* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bonaparte's Gull *Chroicocephalus philadelphia* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6034	Breeds Jan 15 to Sep 30

Burrowing Owl Athene cunicularia — Breeds Mar 15 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9737

California Spotted Owl Strix occidentalis occidentalis — Breeds Mar 10 to Jun 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/7266

Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Loon gavia immer — Breeds Apr 15 to Oct 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4464

Common Murre Uria aalge — Breeds Apr 15 to Aug 15
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Common Tern Sterna hirundo — Breeds May 10 to Sep 10
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4963

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Double-crested Cormorant phalacrocorax auritus — Breeds Apr 20 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/3478

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Herring Gull Larus argentatus — Breeds Apr 20 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Least Tern Sterna antillarum — Breeds Apr 20 to Sep 10
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Long-tailed Duck Clangula hyemalis — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/7238

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Mountain Plover *Charadrius montanus* — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3638

Northern Fulmar *Fulmarus glacialis* — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Northern Gannet *Morus bassanus* — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Nuttall's Woodpecker *Picoides nuttallii* — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse *Baeolophus inornatus* — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Parasitic Jaeger *Stercorarius parasiticus* — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Pink-footed Shearwater *Puffinus creatopus* — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Pomarine Jaeger *Stercorarius pomarinus* — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red Phalarope *Phalaropus fulicarius* — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-breasted Merganser Mergus serrator — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-necked Phalarope Phalaropus lobatus — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-throated Loon Gavia stellata — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Ring-billed Gull Larus delawarensis — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Rufous Hummingbird selasphorus rufus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Scripps's Murrelet Synthliboramphus scrippsi — Breeds Feb 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

South Polar Skua Stercorarius maccormicki — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Spotted Towhee *Pipilo maculatus clementae* | Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Surf Scoter *Melanitta perspicillata* | Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Tricolored Blackbird *Agelaius tricolor* | Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Whimbrel *Numenius phaeopus* | Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

White-winged Scoter *Melanitta fusca* | Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Willet *Tringa semipalmata* | Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit *Chamaea fasciata* | Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Yellow Rail *Coturnicops noveboracensis* | Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9476

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

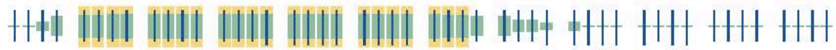
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Allen's Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

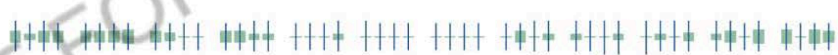


Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

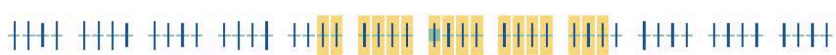
Black Oystercatcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Black Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

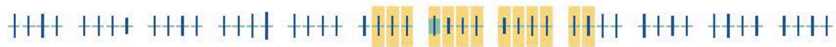
Black Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



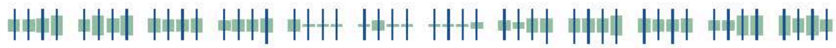
Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Black Swift
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



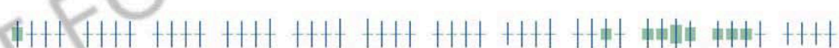
Black Turnstone
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Black-chinned Sparrow
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

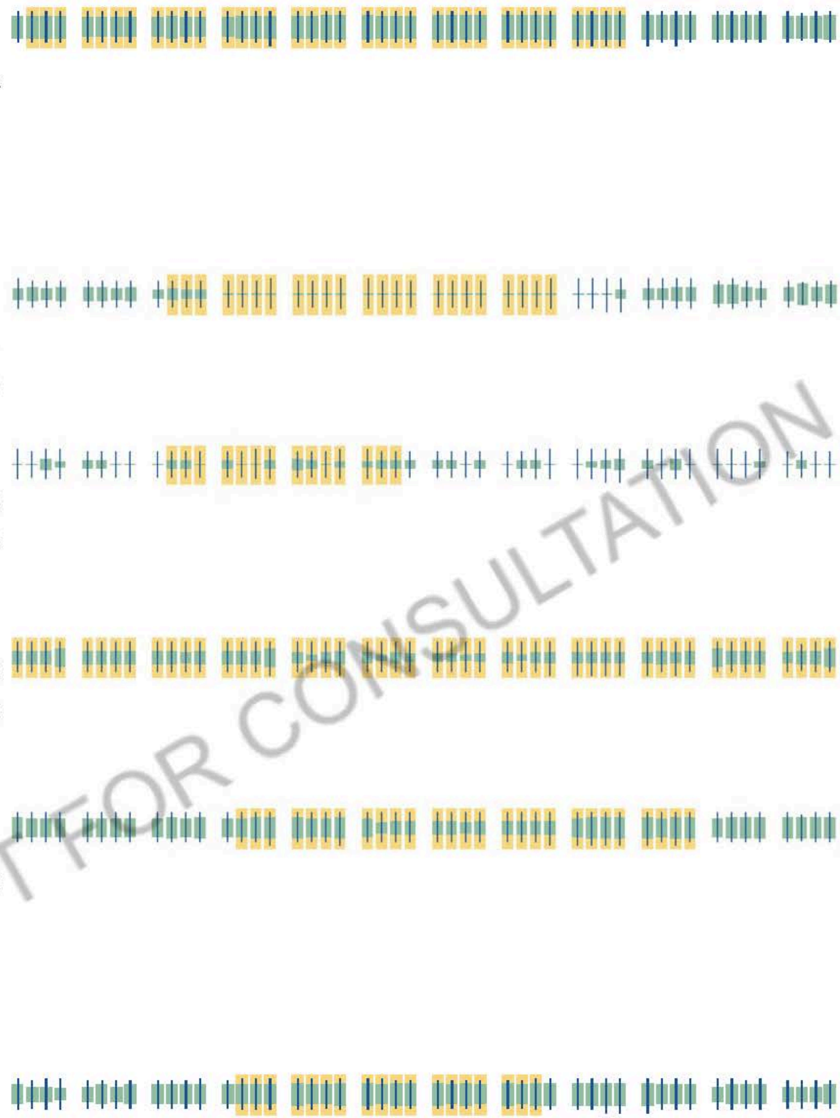
Black-legged Kittiwake
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Black-vented Shearwater
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Bonaparte's Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



Brown Pelican
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

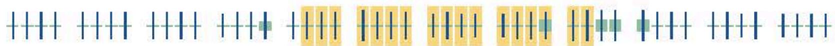
California Spotted Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Common Loon
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

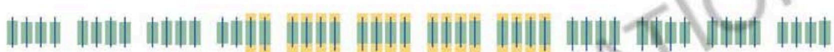
Common Murre
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Common Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



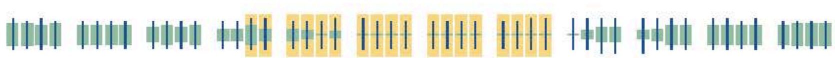
Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Double-crested Cormorant
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

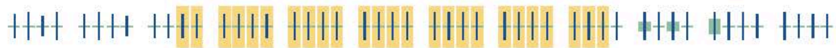


Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Herring Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

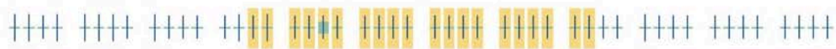


Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

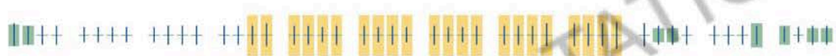


SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Least Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



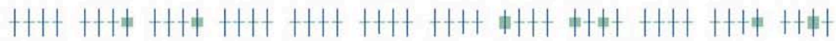
Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-tailed Duck
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

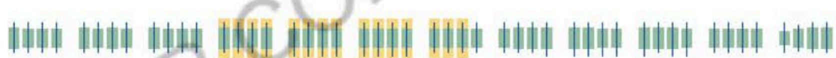
Mountain Plover
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Northern Fulmar
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Northern Gannet
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Parasitic Jaeger
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Pink-footed Shearwater
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Pomarine Jaeger
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red Phalarope
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

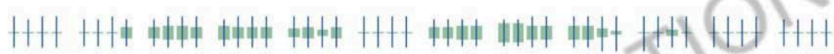
Red-breasted Merganser
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red-necked Phalarope
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red-throated Loon
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Ring-billed Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

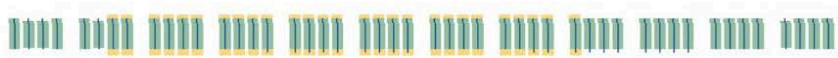
Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Scripps's Murrelet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

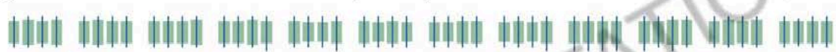


South Polar Skua
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Surf Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



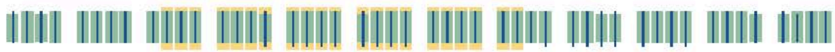
Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

White-winged Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Yellow Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE DEEPWATER
- E1UBL

ESTUARINE AND MARINE WETLAND
- E2USN

- E2EM1N
- E2EM1/USN
- E2EM1P
- E2USP

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1A
- PEM1Fh
- PEM1Ch
- PEM1R
- PEM1Ah
- PEM1/USCh
- PEM1T
- PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

- PFOC
- PSSC
- PSSA
- PSSCh
- PFOA
- PSSR
- PSSB

FRESHWATER POND

- PUBHh
- PUBFh
- PUSCh
- PABHh
- PUBF
- PUBH
- PAB/UBHh

LAKE

- L1UBH

RIVERINE

- R4SBC
- R5UBF
- R2UBH
- R3UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX L—BIOLOGICAL ASSESSMENT – NATIONAL MARINE FISHERIES SERVICE

National Park Service
U.S. Department of the Interior

POINT REYES NATIONAL SEASHORE

GENERAL MANAGEMENT PLAN AMENDMENT
ENVIRONMENTAL IMPACT STATEMENT

BIOLOGICAL ASSESSMENT

Prepared for:
National Marine Fisheries Service

August 2019

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Table of Contents

LIST OF TABLES

ATTACHMENTS

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AU	animal unit
BA	biological assessment
BMP	best management practice
BO	biological opinion
CC	California Coastal (Chinook salmon ESU)
CCC	Central California Coast (coho salmon DPS and steelhead trout DPS)
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
DO	dissolved oxygen
DPS	Designated Population Segment
EIS	environmental impact statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FR	Federal Register
GMP	general management plan
IPM	integrated pest management
MMWD	Marin Municipal Water District
NEPA	National Environmental Policy Act
NMFS	US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
north district of Golden Gate	North District of Golden Gate National Recreation Area
NPS	National Park Service
NRCS	US Department of Agriculture, Natural Resources Conservation Service
park	Point Reyes National Seashore and North District of Golden Gate National Recreation Area
Point Reyes	Point Reyes National Seashore
RDM	residual dry matter
ROA	Ranch Operating Agreements
RWQCB	Regional Water Quality Control Board
SFAN	San Francisco Area Network
SPAWN	Salmon Protection and Watershed Network

SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
U.S.C.	United States Code
USDA	US Department of Agriculture
USFWS	US Department of the Interior, Fish and Wildlife Service

1.0 INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] 153 *et seq*.), as amended in section 7(a)(1) directs federal agencies to conserve and recover listed species and use their authorities in the furtherance of the purposes of the act by carrying out programs for the conservation of endangered and threatened species so that listing is no longer necessary (50 Code of Federal Regulations [CFR] § 402). Furthermore, in section 7(a)(2), the ESA directs federal agencies to consult (referred to as section 7 consultation) with the National Marine Fisheries Service (NMFS) when their activities "may affect" a listed species under the jurisdiction of NMFS. Additionally, the 2006 *National Park Service (NPS) Management Policies* directs NPS to "inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006).

1.1 Purpose of this Biological Assessment

This biological assessment (BA) has been prepared to complete consultation with NMFS under section 7 of the ESA for the NPS's 2019 Environmental Impact Statement (EIS) for a General Management Plan (GMP) Amendment for Point Reyes National Seashore (Point Reyes) and north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively referred to as the park). This BA analyzes the potential effects of the proposed action in sufficient detail to determine to what extent the proposed activities may affect species listed under the ESA as threatened, endangered, or proposed species, and their critical habitat. This BA addresses the federally listed plant and animal taxa and their critical habitat under the jurisdiction of NMFS, meeting the following criteria:

1. taxa is known to occur in the park based on confirmed sightings;
2. taxa may occur in the park based on unconfirmed sightings;
3. potential habitat exists for the taxa in the park; or
4. potential effects may occur to the taxa from the proposed action.

This BA is prepared in accordance with legal requirements set forth under regulations implementing section 7 of the ESA (50 CFR § 402; 16 U.S.C. 1536(c)) and section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act. If any changes to the proposed action could affect listed species in a manner beyond that analyzed herein, 50 CFR § 402.16(b) would require NPS to reinitiate section 7 consultation with NMFS. Species under the jurisdiction of the US Fish and Wildlife Service (USFWS) are being addressed under a separate BA.

1.2 Current Management Direction

The *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980) designates a "Pastoral Lands" zone "to permit the continued use of existing ranchlands for ranching and dairying purposes." In 1990, NPS adopted the *Range Management Guidelines* (NPS 1990a) in response to countywide concerns about flooding and large-scale erosion control in the early 1980s. NPS has updated and adapted authorizations based on this guidance and other best available science. Recently, NPS contracted with the UC Berkeley Range Ecology Lab to review existing ranch management practices and make recommendations that NPS could consider and incorporate as part of this planning process. Collectively, these guidelines set forth standards and best management practices (BMPs) for ranching operations with the overall goal of administering the grazed rangelands in the park in a manner that provides for environmental protection and restoration, public recreation opportunities, and a visually aesthetic pastoral scene, while simultaneously permitting ranchers to continue traditional and viable agricultural operations.

The *Range Monitoring Handbook* (NPS 1990b) outlines monitoring methods to ensure that the standards as set forth in the 1990 *Range Management Guidelines* are met and incorporated into ranch lease/permits. Specifically, it outlines the methodologies used to assess rangeland vegetation species composition (condition and trend) and conduct residual dry matter (RDM) monitoring. Monitoring is designed to determine range carrying capacities, evaluate the effectiveness of current grazing management in maintaining or improving range resources, and provide baseline data on range plant community successional dynamics. NPS established RDM and vegetation species composition monitoring locations in each ranch or pasture unit between 1986 and 1990, based on the concept of key areas, a widely used rangeland monitoring concept.

The 1990 guidelines establish a minimum RDM level of 1,200 pounds/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. Park RDM monitoring has been updated to reflect recommendations by the UC Berkeley Range Ecology Lab: Bartolome et al. (2015) analyzed 25 years of park RDM monitoring data and concludes that the minimum 1,200 pounds/acre standard is appropriate based on the RDM guidelines developed by UC researchers for coastal prairie (Bartolome et al. 2006), noting that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. RDM monitoring is conducted annually.

In addition, NPS previously conducted spring species composition monitoring at key area monitoring locations during multiple, but typically, nonconsecutive years from 1987 to 2011. The coastal grassland section of the *Point Reyes Natural Resource Condition Assessment* (NPS 2019a) evaluates this data set. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review.

The 1990 guidelines identify a number of management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of permitted livestock, deferring grazing on seasonally vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive non-native plant species. NPS has implemented these techniques to address livestock-related resource degradation on particular ranches. The terms and conditions of grazing permits have been made more rigorous since adoption of the 1990 guidelines to reflect the goals stated in it. The 1990 guidelines also set forth standards for cultivation of park lands for silage crops, including providing a 200-foot buffer zone between cultivation and any natural bodies of water, marshes, to sand dunes, and a prohibition against cultivating within significant wildlife or plant areas. Use of biocides on cultivated or rangeland areas is strictly limited and must comply with NPS integrated pest management (IPM) regulations and procedures. These guidelines continue to be revised and updated based on new science and adaptive management of ranching activities.

Current management direction for federally threatened and endangered species under NMFS jurisdiction in the action area can be found in the following statutes and associated documents:

- ESA of 1973, as amended
- Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended
- 1916 NPS Organic Act
- NPS General Authorities Act of 1978
- *NPS Management Policies* 2006 (NPS 2006)
- National Environmental Planning Act (NEPA)
- Taylor Grazing Act of 1943

- *1980 Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980)
- *Recovery Strategy for California Coho Salmon* (CDFW 2004)
- *Recovery Plan for the Evolutionarily Significant Unit of Central California Coast Coho Salmon* (NMFS 2012)
- *Coastal Multispecies Final Recovery Plan: California Coastal Chinook Salmon Evolutionarily Significant Unit (ESU), Northern California Steelhead Trout Designated Population Segment (DPS) and Central California Coast Steelhead Trout DPS* (NMFS 2016a)
- *Pacific Coast Salmon Fishery Management Plan* (Pacific Fishery Management Council 2016)
- *Steelhead Trout Restoration and Management Plan for California* (CDFW 1996)

2.0 CONSULTATION HISTORY

There have been no recent discussions with NMFS regarding the proposed action.

3.0 DESCRIPTION OF THE PROPOSED ACTION

3.1 Location and Background

Beef and dairy ranching began in the Point Reyes area in in the mid-19th century and continues today. At the time Point Reyes was established, Congress allowed ranching and dairying operations to continue by limiting NPS's ability to acquire private ranch lands in an area Congress identified as the "pastoral zone." In 1970, with the support of the area's ranchers, Congress repealed the limitation on eminent domain and allowed NPS to acquire ranch lands from willing sellers. NPS began acquiring ranch lands in Point Reyes' pastoral zone soon thereafter.

The detailed history of agricultural land in the park is described in chapter 1 of the EIS. Currently, approximately 18,000 acres (20%) of Point Reyes and 10,000 acres (60%) of the north district of Golden Gate are used for beef and dairy ranching under agricultural lease/permits (see attachment A, figure L-1).[1] Twenty-four families hold lease/permits for beef cattle and dairy operations, and approximately 2,400 animal units (AUs) of livestock on beef ranches and 3,315 dairy animals are authorized on a year-round basis (see attachment A, figure K-1). Eighteen lease/permits include residential uses specific to on-site ranch operations. NPS has worked to maintain a direct relationship with the ranchers.

In spring 2014, NPS initiated development of a ranch comprehensive management plan to address high-priority management needs associated with the approximately 28,000 acres of active beef and dairy ranching on park lands. The planning effort also addressed the expansion of free-range tule elk on lands leased for ranching and other issues, including lease duration, succession, and ranch operational flexibility and diversification.

In February 2016, three environmental groups brought litigation against the ranch planning process, arguing that NPS was required to prepare an updated GMP for Point Reyes and determine whether ranching remained an appropriate use of park lands. The plaintiffs and NPS, together with most ranchers individually, the Point Reyes Seashore Ranchers Association, and Marin County, reached a court-approved multi-party Settlement Agreement on July 14, 2017. Per the settlement, NPS agreed to prepare

[1] Tables and figures are provided to NMFS as an attachment to this BA for the purposes of consultation under section 7 of the ESA. In accordance with 16 U.S.C. § 5937, species occurrences and monitoring data are not publicly disclosed herein to avoid enabling people to determine the precise location of individuals or populations of threatened and endangered species. See appendix A of the EIS for maps of publicly available data pertaining to federally listed species in the action area.

an EIS for a GMP Amendment addressing the management of the lands currently leased for ranching in the park. The Settlement Agreement requires NPS to evaluate three alternatives in the EIS—no ranching, no dairy ranching, and reduced ranching. These alternatives must not be conditioned on the discretionary termination of lease/permits by ranchers. In addition to addressing elk management and the statutorily required elements of a GMP (see below), the Settlement Agreement preserves NPS's right to give full consideration to other potential action alternatives. It also allows NPS to consider agricultural diversification, increased operational flexibility, promotion of sustainable operational practices, succession planning, and similar ranch management practices as part of any action alternative except the no ranching alternative.

NPS prepared an EIS for the GMP Amendment that evaluates the potential impacts of agricultural diversification, increased operational flexibility, ranch and dairy succession planning, and similar ranch management practices as part of several action alternatives. The purpose of the EIS is to establish guidance for the preservation of natural and cultural resources and the management of infrastructure and visitor use in the action area. In this context, the EIS addresses the future management of tule elk and leased ranch lands in the action area. Under the proposed action, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the action area. NPS would allow for continued ranching with terms of up to 20 years and would set a population threshold for the Drakes Beach herd.

3.2 Proposed Action—Continued Ranching and Management of the Drakes Beach Tule Elk Herd

The following text provides an overview of the proposed action. However, not all elements are described. See chapter 2 of the EIS for a complete description of every element.

3.2.1 Zoning Framework

NPS would apply a new management zone, the Ranchland zone, to the action area. This 28,700-acre zone would be managed to support the desired conditions for the action area defined in chapter 1 of the EIS. Six organic dairy operations and 18 beef operations would continue to operate in the park. Beef cattle would generally be allowed to graze on open grassland year-round; dairy cows would be milked twice a day, kept near the ranch complex, and fed high-nutrition feeds. NPS would issue lease/permits with up to 20-year terms to the existing ranch families to continue beef and dairy operations on approximately 26,100 acres. Current permitted use on ranches is summarized in table 3-1 below. To ensure protection of natural and cultural resources, streamline the permitting process for typical ranch activities, and provide consistent guidance to ranchers, a subzoning framework would be implemented for the Ranchland zone to define the Resource Protection, Range, Pasture, and Ranch Core subzones. This subzoning framework is based on resource sensitivity. The subzones were developed based on analysis of topography, existing sensitive resource information, and ranch management activities. By implementing a subzoning framework, NPS can better ensure resource protection by directing where more intensive activities are conducted. Because certain practices or activities would be authorized for specific subzones, the subzoning framework accommodates greater operational flexibility for ranchers while protecting park resources. Different diversification activities, which would be authorized in each subzone, are described below in "Section 3.2.10, Diversification."

The EIS for the GMP Amendment provides general percentages under each subzone. The percentage of Range and Pasture subzones would differ by ranch, based on the site topography and presence of wetlands, rare plants, and other sensitive resources. Draft maps of the zoning for each ranch operation are provided in appendix A of the EIS. These maps would continue to be refined in collaboration with ranchers.

3.2.1.1 Resource Protection Subzone

The Resource Protection subzone includes lands where no grazing would be authorized to protect park resources, including surface waters, threatened and endangered species habitat, and cultural resource locations. Limited prescribed grazing may be authorized to meet NPS resource management goals and objectives. Under the proposed action, the Resource Protection subzone would encompass approximately 2,600 acres comprising the following lands: approximately 800 acres within current lease/permit boundaries but already excluded from ranching; an additional 1,200 acres that would be excluded from ranching; and approximately 600 acres in the action area but not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd.

In this BA, areas comprising the Resource Protection subzone are referred to as "resource protection exclusion areas."

3.2.1.2 Range Subzone

The Range subzone is identified as lands where grazing would be authorized, but more intensive activities would not be allowed because of the documented presence of sensitive resources, including rare plants, wetlands, riparian/stream/pond habitats, forested areas, and critical habitat for threatened and endangered species. Additionally, this subzone includes nearly all areas with slopes greater than 20%. The authorized activities in this subzone would be limited to cattle grazing; generally, no vegetation management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. Based on analysis of existing sensitive resource data, approximately 16,900 acres (nearly 65%) of the lands under lease/permit a identified as Range subzone.

3.2.1.3 Pasture Subzone

The Pasture subzone is identified as lands where no sensitive resources are known to occur; therefore, a suite of vegetation management activities, including seeding and mowing, may be conducted in addition to grazing. The Pasture subzone includes grazed lands that are outside the Range subzone where introduced or domesticated native forage species exist and would be used primarily for the production of livestock. Approximately 9,000 acres (nearly 34%) of the area under lease/permit are identified as Pasture subzone. Nutrient management on dairies would be authorized in the Pasture subzone. Under the proposed action, some diversification activities would be authorized in the Pasture subzone as described in the "Diversification" section, below. Forage production would be authorized for several ranches; however, areas of forage production already occur in the proposed Pasture subzone. See the "Ranch Operating Agreements" and "Diversification" sections for details. Generally, construction of permanent buildings would not be authorized in the Pasture subzone.

3.2.1.4 Ranch Core Subzone

The Ranch Core subzone is identified as the developed complex of buildings and structures on most ranches. Ranches without a developed complex or buildings that are not occupied by individuals associated with ranch operations would not have a Ranch Core subzone. Approximately 180 acres (less than 1%) of the area under lease/permit are identified as Ranch Core subzone. The Ranch Core subzone would also include disturbed lands located immediately adjacent to the developed complex that do not contain or have the potential to affect sensitive resources. These disturbed lands, not to exceed 2.5 acres, would be available for diversification activities (e.g., small-scale, on-site processing of ranch products, row crops not requiring irrigation) or high intensity operations (e.g., building new infrastructure). Geographic constraints could limit Ranch Core options on individual ranches. The exact location of the Ranch Core subzone would be defined in each ranch operating agreement (ROA).

3.2.2 Agricultural Lease/Special Use Permits

Under the proposed action, NPS would issue lease/permits with 20-year terms to continue beef and dairy operations on approximately 26,100 acres (attachment A, figure L-1). The lease/permits would constitute the overall authorization for the ranch families to operate on park lands, including general terms and conditions, commitments, and standards for the operations. The lease/permit would include all the standard clauses necessary for the ranches to operate in the park. The lease/permit would also establish the process by which the ranchers would work with NPS to identify priority projects and would establish the requirement for a maintenance reserve as part of the agreement. Ranch-specific details for operations and infrastructure investment would be identified through the ROA that would be an exhibit to the lease/permit.

3.2.3 Succession

In the event an existing lessee decides to discontinue ranching, NPS would implement succession planning that is consistent with maintaining multi-generational ranching in the action area.

3.2.4 Ranch Operating Agreements

Each rancher would be required to enter into a ROA as part of the lease/permit. In addition to identifying authorized activities (e.g., beef ranching, dairy ranching, diversification activities), the ROA would identify the site-specific management and mitigation measures that apply to each ranch as well as resource and ranch operational goals and objectives, descriptions of existing and desired conditions, grazing capacity analysis, grazing management specifications, and adaptive monitoring plans. A list of management practice standards and mitigation measures for potential ranching activities are contained in appendix D of the EIS. The ROA would specify the subzones where specific activities could occur. Authorized activities identified in the ROA would be consistent with the activities and approaches analyzed in the EIS. The ROAs would be developed with each rancher and reviewed as part of the 20-year lease issuance process. Thereafter, NPS and each rancher would meet annually to discuss the ROA and ranch operations. The ROA would be updated or reauthorized following the annual meeting. Modifications to ranching operations either at the rancher’s request or to address resource issues would be reviewed for consistency with the EIS to determine whether additional environmental review is necessary. If proposed activities are not consistent with the location, intensity, and scale of what is analyzed in the EIS, additional environmental review would be necessary. If authorized by NPS, the proposed activities would be incorporated into the ROA.

3.2.5 Animal Units

Each ranch would continue to have a maximum number of AUs that are allowed to graze at one time. AUs allowed under a lease/permit would continue to be managed to meet the 1,200 pounds per year RDM standard. NPS would determine the annual adjustments to AUs based on the use of a rangeland forage production model (see appendix I of the EIS), monitoring data, NPS range program manager and rancher expertise, historical information, US Department of Agriculture (USDA) guidelines, and variation in ground conditions and weather/climate. All dairy ranch lease/permits would be permitted based on the number of dairy animals. Annually, NPS and ranchers would review performance measures, including RDM, to identify grazing levels that would ensure site conditions are maintained to meet the minimum RDM standard.

For purposes of this analysis, NPS estimates authorizations would be similar to existing lease/permits, and approximately 2,400 AUs of beef cattle and 3,130 dairy animals would be authorized.

NPS would not authorize any additional AUs for personal, noncommercial livestock. Allowances for livestock other than beef and dairy cattle would be considered and would be managed as described below in the “Diversification” section.

3.2.6 Beef Operations

Management of the 18 beef operations in the park varies. Some of these operations include use of the residential complex and other infrastructure such as barns for hay and storage, while others are grazing-only leases with limited to no use of infrastructure. Beef cattle are generally allowed to graze on open grassland year-round. Ranches in the park typically provide fall/winter feed to cattle in upland areas because of winter access constraints and limited forage species growth during those seasons. Mineral supplements such as salt licks or molasses barrels are also placed in certain pastures. Holding paddocks and areas such as those surrounding water troughs and feeding areas are considered heavy use or high-impact areas and are often devoid of vegetation.

3.2.7 Dairy Operations

The six organic dairies manage their beef grazing operations differently from the ranches. In general, they have more cattle than the beef grazing operations (table 3-1). Dairies are high intensity operations that require extensive milking, feeding, and waste management infrastructure to meet current production and water quality management standards. A typical dairy includes milking, loafing, and feed barns; structures for milk storage and processing; and often a hospital barn. Dairy operations in the park provide housing for some workers and their families. Between one and eight families are housed at each of the dairy operations.

Dairy cows are milked twice a day, kept near the ranch complex, and fed high-nutrition feeds. Roughly 10%–15% of dairy cows are either dry or non-lactating cows that are not in the milking string. Another roughly 20%–40% are heifers that are raised to eventually replace current milk cows. The dry cows are typically kept and fed in outdoor paddocks and small pastures. Heifers are fed regularly and generally graze in pastures similar to beef cattle. Current minimum organic production standards require dairy cattle to remain on pasture for a minimum of 120 days per year, and animals older than 6 months of age must get at least 30% of their dry matter intake from pasture during the grazing season (USDA-AMS 2013). Dairy cattle consume between 15 to 25 gallons of water per day (Rayburn 2007). Dairy operations have additional water needs for the management of the dairy complex, cleaning, and other tasks.

Compared to beef cattle operations, dairies produce large quantities of concentrated manure waste because of the need to keep dairy cows close to dairy headquarters for milking twice a day. Waste management is required for manure produced in the heavy-use, high-impact areas of cattle concentration, including feeding and loafing areas, the milking parlor, and corrals. Many dairy operations include loafing barns that allow the operator to keep the milking string indoors through much of the winter, which is important for both manure management and cow health. Loafing barns are covered areas where cows can shelter, particularly during inclement weather. The barns have concrete floors and drainage systems that ensure appropriate containment and management of liquid manure. These barns also make it easier for dairy ranchers to manage manure in these confined areas. Regular manure management includes scraping and storing manure in a manure management system. These quantities are managed to avoid pollution of nearby streams. The barns, milking parlors, and travel lanes between the structures are cleaned by scraping or washing manure into ponds, where the manure slurry is stored. Small pastures where cows are held between milking are typically scraped by a tractor, and the manure is stockpiled. Generally, liquid manure is sprayed or spread on pastures through a pump and irrigation system. Large trucks also spread slurry and solids by driving over pasture lands and distributing manure. These activities are conducted outside the rainy season or during dry periods.

Two Point Reyes dairies and two beef cattle operations are authorized for forage production. Table 3-1 lists acreages.

TABLE 3-1: PERMITTED ACREAGE AND LIVESTOCK USE ON RANCHES IN THE ACTION AREA UNDER THE PROPOSED ACTION

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
1	A Ranch	838	496	**Dairy:** 350 milk cows, 50 dry cows, 90 heifers, 6 bulls Max. 135 AU of dry cows and heifers at one time	**2019:** 200 milk cows, 45 dry cows, 35 heifers	Interim Lease 1715 Nunes/Hemelt	Point Reyes
2	B Ranch	1,257	516	**Dairy:** 475 milk cows, 40 dry cows, 1 bull Max. 120 AU of dry cows and heifers at one time	**2019:** 220 milk cows, 40 dry cows, 220 heifers, 4 bulls	Interim Lease 1713 Mendoza	Point Reyes
3	C Ranch	718	255	**Dairy:** 255 AUs per year including the milking string, dry cows, and heifers Max. 100 AU dry cows at one time	**2019:** 200 milk cows, 40 dry cows, 100 heifers, 2 bulls	Interim Lease 1717 Spaletta	Point Reyes
3	D Ranch Pasture A	132	36	Heifers rotated as part of overall operation		Interim Lease 1717 Spaletta	Point Reyes
4	D Ranch Pastures B and C	581	123	Beef, dairy heifers		Interim Lease 1715 Nunes/ Hemelt	Point Reyes
5	E Ranch	1,372	201	Beef, dairy heifers		Interim Lease 1715 Nunes/ Hemelt	Point Reyes
6	F Ranch	1,510	175	Beef		Interim Lease 1703 Gallagher	Point Reyes

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
7	ATT	481	35	Beef		Interim Lease 1702 D. Evans	Point Reyes
8	G Ranch	1,151	90	Beef No-till silage: 190 acres		Interim Lease 1709 Lunny	Point Reyes
9	D. Rogers Ranch	382	55	Beef, chickens		10 Year Lease AGRI-8530-1000-1001 D. Evans	Point Reyes
10	M Ranch	1,178	175	Beef		Interim Lease 1707 Grossi/ Arndt	Point Reyes
11	H Ranch	1,099	285	Beef Silage: 96 acres		Interim Lease 1701 Evans/ Rossotti	Point Reyes
12	I Ranch	1,076	856	**Dairy:** 500–510 milk cows, 70-80 dry cows, 270 heifers, 6 bulls Max. 325 AU of dry cows and heifers at one time Silage: 552 acres	**2019:** **500** milk cows, 65 dry cows, 270 heifers, 6 bulls	Interim Lease 1710 McClure	Point Reyes
13	L Ranch	1,126	400	**Dairy:** 350–360 milk cows, 40–50 dry cows and/or heifers Max. 70 AU of dry cows and heifers at one time	**2019:** 250 milk cows, 40 dry cows, 150 heifers, 3 bulls	Interim Lease 1714 McClelland/ Mendoza	Point Reyes
14	K Ranch (portion)	566	72	Beef		Interim Lease 1701 Evans/ Rossotti	Point Reyes

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
15	J Ranch	648	756	**Dairy:** 420–450 milk cows, 50–80 dry cows, 250 heifers, 6 bulls Max. 310 AU of dry cows and heifers at one time Silage: 163 acres	**2019:** 400 milk cows, 60 dry cows, 260 heifers, 6 bulls	Interim Lease 1708 Kehoe	Point Reyes
15	K Ranch (portion)	486	37	Heifers rotated as part of overall operation	Same operation as J Ranch, above	Interim Lease 1708 Kehoe	Point Reyes
16	N Ranch	924	90	Beef		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
17	Home Ranch Developed Complex	20	0	N/A		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
18	Home Ranch	2,660	300	Beef		Interim Lease 1711 McDonald/ Lucchesi	Point Reyes
19	Martinelli Ranch	259	36	Beef			Golden Gate
20	Genazzi Ranch	436	55	Beef		1 Year Letter of Authorization Genazzi	Golden Gate
21	E. Gallagher Ranch	320	35	Dairy heifers		Interim Lease 1705 B. Giacomini/ Stray /Hagan/ Basch	Golden Gate
22	McFadden Ranch	335	35	Beef		Interim Permit 1706 Giammona	Golden Gate

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
23	C. Rogers Ranch	229	39	Beef		10 Year Lease AGRI-8530-2600-1203 Rogers	Golden Gate
24	Zanardi Ranch	404	45	Beef		10 Year Lease AGRI-8530-1000-1201 Zanardi	Golden Gate
25	McIssac Ranch	1,403	135	Beef		Interim Permit 1712 McIsaac	Golden Gate
26	Cheda Ranch	808	60	Beef		Interim Permit 1712 McIsaac	Golden Gate
27	Percy Ranch ROP[a]	240	10	Beef	No stocking rate specified in ROP[a] **2019:** 10 AU	Life Estate Percy	Golden Gate
27	Percy Ranch	447	25	Beef		Interim Permit 1716 Percy	Golden Gate
28	Stewart Ranch Lupton Ranch Truttman Ranch	2,188	189	Beef		10 Year Lease AGRI-8530-1000-1006 Wisby	Golden Gate
29	Stewart Ranch Developed Complex	18	0	N/A		10 Year Lease AGRI-8530-1000-1006 Wisby	Golden Gate

Map ID	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
30	R. Giacomini Ranch	1,858	95	Beef		Interim Permit 1704 Giacomini	Golden Gate
31	Niman Ranch ROP[a]	206	45	Beef	No stocking rate specified in ROP[a] **2019:** 45 AU	Life Estate Niman	Point Reyes
31	Commonweal	575	66	Beef		10 Year Lease AGRI-8530-2600-1202 Niman	Point Reyes

[a] ROP – Reservation of Possession. Contain life estates—the number of cattle is not specified on the RUO. Numbers in the table are combined based on self-reporting by ranchers.

3.2.8 Range Management and Monitoring

The guidelines and monitoring protocols for range management would be the same as those described under "Section 1.2, Current Management Direction." The expectations and requirements contained in these guidelines would be incorporated into each ROA and updated and revised as new information becomes available.

3.2.9 Ranch Infrastructure

Under the proposed action, the following types of ranch infrastructure activities would be authorized following NPS review and approval:

- road upgrade and decommissioning
- stream crossings
- infrastructure management
- fencing
- livestock water supply
- pond restoration
- waterway stabilization

A general description of these activities can be found in chapter 2 of the EIS, and additional detail is provided in appendix D of the EIS. As part of this planning effort, size limitations and mitigation measures have been adapted from the Marin County Resource Conservation District's Permit Coordination Program, other permitting agencies, previous ranching projects, and USFWS. These mitigation measures have been incorporated into appendix D to streamline the approval process for these activities. NPS would work with ranchers and relevant external agencies to review proposed ranch infrastructure projects on an annual basis. Projects within the size and location limitations identified in the EIS and approved by NPS would be incorporated into the ROA along with all applicable mitigation measures from table D-2 in appendix D.

Activities associated with road upgrades and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as existing conditions. Fence repair and maintenance of existing fences in-place for ranch operations would continue to be the responsibility of the rancher and would follow NPS-defined wildlife-friendly fencing design. NPS would require the removal of abandoned fence on ranch lands to meet wildlife and visitor goals. Construction of temporary fencing (i.e., electric fencing) would be authorized following NPS approval. Ranch water development systems (i.e., springs, wells, storage tanks, and troughs) would continue to be used for cattle consumption, and repair and maintenance in-place would continue to be the responsibility of the rancher. Troughs would require wildlife escape ramps. Redevelopment of existing water sources and associated distribution infrastructure would be authorized following NPS review and approval. Stream crossings would generally be limited, and other activities to prevent the need for stream crossing would be evaluated first.

Establishing new water sources (e.g., new wells) would require separate environmental review and are not being analyzed in this EIS.

3.2.10 Vegetation Management

The following types of vegetation management activities would be authorized following NPS review and approval:

- upland and riparian vegetation management and planting
- mowing and IPM
- prescribed grazing

A general description of these activities can be found in the EIS under alternative A, and additional detail is provided in the management activity standards in appendix D of the EIS. The size limitations and mitigation measures for these activities have been adapted from the Marin County Resource Conservation District's Permit Coordination Program, other permitting agencies, previous ranching projects, and USFWS. These mitigation measures are intended to streamline the approval process for these activities. NPS would work with ranchers and relevant external agencies to review proposed vegetation management activities on an annual basis. Projects within the size and location limitations identified in this EIS and approved by NPS would be incorporated into the ROA along with all applicable mitigation measures from table D-2 in appendix D of the EIS.

Seeding would be limited to hand broadcast and no-till seed drill using an NPS-approved seed mix only in the Pasture and Ranch Core subzones. Seedbed preparation would be conducted in the fall, before October 15. Seeding would also be authorized where forage production is permitted. Requests for aeration would only be allowed if a need is demonstrated (e.g., via soil test).

Shrub control and weed management are conducted to maintain or increase areas of grassland habitat available for grazing activities. Coastal California grasslands are disturbance dependent, and even with grazing, some can slowly convert from grassland to shrubland (Ford and Hayes 2007). Mowing involves the timely cutting, and in some cases removal of, herbaceous vegetation for forage, control of herbaceous weeds, and woody (non-herbaceous) plants, including those that are invasive and noxious. NPS and ranchers use IPM to treat weed problems using the least toxic, effective methods of controlling weeds. Using biocides on cultivated or rangeland areas is strictly limited and must comply with NPS IPM regulations and procedures. All lease/permits require herbicides to be handled and disposed of in accordance with applicable laws, including reporting requirements. Mowing and IPM would be allowed in the Pasture and Ranch Core subzones. Site-specific management would be allowed in the Range subzone, depending on rancher requests, park vegetation management goals, and extent of infestation.

3.2.11 Other Activities (Applicable Only on Ranches Where Currently Authorized)

3.2.11.1 Forage Production

The purpose of forage production is to optimize yield and quality of forage for livestock and promote vigorous plant regrowth. These activities involve seedbed preparation, manure spreading, seeding and harvest mowing of herbaceous vegetation to provide feed for on-site consumption by livestock. Non-native grasses, such as ryegrass (*Lolium* spp.), oat grass (*Avena* spp.), and vetch (*Vicia* spp.), are typically planted. Silage is cut earlier in the season than haylage and is wetter; hay is drier and cut latest in the season. Once silage is harvested, it is stored in covered piles or bunkers; haylage is baled within several days and wrapped in plastic. Both are allowed to ferment prior to feeding to livestock. Hay is cut and dried on the ground before it is baled and preserved without fermentation.

NPS would continue to set the standards for cultivation of ranch lands for forage production following NRCS's cultivation practice recommendations. These standards would continue to prohibit plowing land with slopes greater than 20%; require a 200-foot buffer between cultivation and any natural bodies of water, marshes, or sand dunes, or on land classified by the NRCS as highly erodible; and prohibit cultivating significant wildlife or plant areas, endangered plant habitat, high visitor use areas, and archeological sites. Ranchers who produce forage would continue to be required to cultivate and plant during a period that allows a cover crop to establish prior to the fall rains and to have adequate crop residues (at least 20%) after cutting to protect the soil from erosion.

Approximately 1,000 acres on four ranches (two beef and two dairy) are currently authorized for forage production under lease/permits (see table 3-1). Forage production would continue, consistent with lease/permit language updated as necessary to reflect current NRCS conservation standards or other site-specific considerations under an approved plan. If ranchers want to discontinue forage production in permitted areas, those acres would be retired, and the total acreage of forage production in the action area would be reduced. One operation has specific language authorizing no-till haylage practices and generally does not conduct activities on the total authorized area every year. One life estate also contains authorization for silage, but the activity, other than occasional seeding and manure spreading, has not been practiced in recent years. Based on a current site-specific rancher request and subsequent NPS approval, at least 38 acres are expected to be converted to permanent pasture and no longer authorized for silage production.

3.2.11.2 Manure and Nutrient Management

Dairies would continue to produce large quantities of manure waste that ranchers would be required to manage to avoid impacts on sensitive resources. Application of animal manure and compost generated in the action area would be allowed with an approved nutrient management plan and would remain at a level consistent with existing conditions (approximately 2,500 acres, with some pastures not treated every year). Approved methods for nutrient management (e.g., storing, composting, and spreading) would be consistent with the management activity standards and mitigation measures in appendix D of the EIS. The requirements for park dairies to comply with animal waste discharge standards found at sections 22560 and 22565 of Title 27 of the California Code of Regulations would continue. Application of commercially produced compost and fertilizer would not be authorized.

3.2.12 Diversification

Diversification of ranching activities allows ranchers to react to poor forage production years, as well as and fluctuations in the economic market (e.g., the price of cattle, grain, hay). A limited number of livestock species other than beef and dairy cattle are currently authorized under personal use, including poultry, pigs, sheep, and horses. Horse boarding for approximately 15 to 20 horses currently occurs on two ranches.

New diversification activities could be allowed in the Pasture and Ranch Core subzones, as defined below with the use of management activity standards and mitigation measures specific to each activity (see appendix D of the EIS). Diversification of ranching activities could include new types of livestock, row crops, stabling horses, paid ranch tours and farm stays, small-scale processing of dairy products, (e.g. cheese), and sale of local agricultural products. Existing diversification activities authorized on ranches include one commercial free-range chicken egg and meat production operation, which is subject to NPS discretion, lease terms, and in accordance with overall resource goals. Diversification would be expanded under the proposed action. All authorized activities and associated management needs (e.g., temporary fencing and guard animals) would be required to be incorporated into the individual ROA prior to implementation. Diversification activities authorized in the Ranch Core and Pasture subzones are:

- Ranch Core subzone
  - Livestock species (pigs, chickens, sheep, and goats)
  - Horse boarding activities
  - Row crops
  - Public-serving ranch activities that support park goals for interpretation and education (i.e., farm stays, ranch tours)
  - Small scale processing of dairy products
- Pasture subzone:
  - Livestock species (sheep, goats, chickens)

NPS would evaluate individual proposals for diversification activities; these activities may be subject to additional compliance.

3.2.12.1 Ranch Core Subzone

In addition to cattle, livestock species that could be allowed in the Ranch Core subzone include pigs, chickens, sheep, and goats. Any confinement of these species would be required to meet the State Water Resources Control Board (SWRCB) regulations for waste management.

Horse boarding activities could be allowed on additional ranches in the Ranch Core subzone. The scale of these activities would be determined on a case-by-case basis for an individual ranch and would consider existing infrastructure.

Up to 2.5 acres of row crops not requiring irrigation would be allowed in previously disturbed areas in the Ranch Core subzone. Tilling and seeding would be limited to hand broadcast and no-till seed drill and would follow established mitigation measures (see appendix D of the EIS). Management of any wildlife associated with protection of row crops would not be allowed in the action area; however, ranchers would be allowed to fence row crops to exclude wildlife.

NPS would allow public-serving ranch diversification activities that support park goals for interpretation and education (e.g., farm tours in the ranch core) that do not create new management issues (i.e., traffic congestion). NPS would also authorize adaptive re-use of existing infrastructure (i.e., no new permanent infrastructure) to produce value added products, including cheese. NPS would collaborate with ranchers to develop interpretive materials for visitors.

3.2.12.2 Pasture Subzone

Sheep, goats, and chickens would also be allowed in the Pasture subzone. For grazing purposes, sheep and goats have AU equivalents of 0.15 and 0.2 AU, respectively, and for individual ranches grazing by sheep and goats in the Pasture subzone would not be allowed to exceed 10% of their authorized AU or 10 AU equivalents if the authorized AU is greater than 100 (whichever is less). The proposed action would also authorize each residentially occupied ranch to request up to 500 chickens with up to 3 associated mobile huts in the Pasture subzone. Construction of permanent infrastructure associated with new livestock species would generally not be allowed in the Pasture subzone; however, temporary fencing may be approved on a case-by-case basis. Management of any predators associated with new livestock species would not be allowed. The use of guard animals (i.e., dogs, llamas, donkeys) would be allowed with the adherence to management activity standards and mitigation measures (see appendix D of the EIS).

3.2.13 Elk Management

The management of free-range elk would allow elk in the portion of the action area within Point Reyes, but with limited geographic distribution and controls on herd size on areas under lease/permit. No new elk herds would be allowed to establish on areas under lease/permit outside the defined range of the existing herds. However, in the event of an unforeseen circumstance that causes the herds to completely move, NPS would reevaluate the impacts and management approaches as needed to ensure maintenance of a free-ranging herd in Point Reyes.

NPS would continue to work with the California Department of Fish and Wildlife (CDFW) and would continue to take actions to prevent or mitigate elk damage to ranches. To date, most actions have been taken in the Drakes Beach area. Actions could include:

- Fence repair and construction of elk crossings, including repairing fences damaged by elk and building elk crossings to allow elk to cross fences without damaging them
  - Fencing materials would be provided to ranchers for repairs, assuming materials are accepted by the rancher.
  - Alternative fence designs could be installed, particularly around seasonal pastures that would better allow elk movement across fence lines without damage to the fences.
- Habitat enhancements, including water enhancements, weed control, or pasture mowing, and prescribed grazing to increase herbaceous habitat
- Pasture offsets, including identifying access to additional pasture for ranchers to offset forage lost to grazing elk
- Hazing, including using park staff on foot to push elk in the main herd from active pastures to areas not leased for grazing

3.2.13.1 Population Level Management and Geographic Extent

NPS would actively manage the free-range elk herds within the Point Reyes portion of the action area. At Tomales Point, NPS would continue to maintain the elk fence that serves as the northern boundary to the action area, and the elk at Tomales Point would continue to be managed as a captive population. NPS would manage the herds to remain within Point Reyes, in coordination with CDFW.

3.2.13.2 Drakes Beach Herd

NPS would actively manage the Drakes Beach herd to keep it in its existing core area (i.e., between Barries Bay and the C Ranch and B Ranch boundary) at a level compatible with authorized ranching operations. NPS has determined a population target of 120 adult elk based on estimated forage consumption by elk, forage productivity on ranches, and time that elk spend on ranches, as well as NPS capacity to manage elk. While the elk population may experience a slight increase each year due to spring calving, a population count would be conducted in each fall and if necessary, elk would be removed to reach the target population size. Any removals would occur outside the calving and rut seasons. The population management goal is not anticipated to change unless there were long-term or permanent changes to existing conditions. Male elk would be allowed to wander.

NPS would manage the Drakes Beach herd to the target population size using lethal removal methods or, if practicable, translocation outside the park. Currently, the state does not allow the translocation of elk outside the park because of concerns about spreading Johne's disease. Previous efforts to move elk in or out of the park have been halted because of Johne's disease and/or chronic wasting disease policies. For translocation outside the park to be practicable, NPS would need to document that the elk are free of Johne's disease and chronic wasting disease, and the state would need to approve the move and have capacity to accept additional elk in state-managed herds. If translocation becomes a practicable option in the future, additional compliance would be completed at that time to address potential impacts on elk and other resources. Removals would consider the desired sex ratio needed to maintain the herd at a reduced number and would be consistent with natural conditions of the herd. Between 10 to 15 elk are anticipated to be removed annually using existing NPS staff, qualified volunteers or other authorized agents to maintain the herd at its target population size. Elk would be removed using methods that would result in minimal interruptions to park operations, ranchers, and park visitors.

NPS would evaluate options to donate meat to the extent possible. Options could include donation of meat to local charitable organizations, the California condor program, or tribal groups, or for the purposes of disease testing. Meat donation would occur in collaboration with the NPS Office of Public Health and CDFW. Elk carcasses that are difficult to retrieve would be left in place.

3.2.13.3 Limantour Herd

Management of the Limantour herd would be based on the concept of not allowing new herds to establish in the Point Reyes portion of the action area. Elk from the Limantour herd would be allowed to wander outside a core area, if they do not establish new herds, and they would be monitored closely and managed in consideration of ranch operations. Hazing, including lethal removal, may be used to manage the geographic extent if individuals establish outside the core use areas or to address localized impacts from the presence of elk.

No population-level management would be taken that would threaten the future existence or viability of the Limantour herd, consistent with the goals of the 1998 *Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment* to maintain viable populations of a free-range elk herd in Point Reyes and to manage with minimal intrusion to regulate population size, where possible, as part of natural ecosystem processes.

3.2.13.4 New Herds

No new elk herds would be allowed to establish in the action area. Hazing techniques would be used to prevent the establishment of new herds. More direct (lethal) action would be a method of last resort.

3.2.14 Pest Control

In-residence pest control management for rodents would continue to be allowed using traps. The use of poison or bait is not allowed on park lands.

3.2.15 Visitor Use on Ranchlands

Under the proposed action, NPS would identify broad management strategies to preserve park resources as well as indicators and standards to guide visitor carrying capacities. Recreation and other visitor activities compatible with ranching would be identified to improve visitor experience and recreational access in the action area (e.g., enhanced trail connections, improved signage, and new interpretive waysides). Additional information about visitor use under the proposed action can be found in chapter 2 of the EIS, under "Public Use and Enjoyment" for alternative B.

3.3 Avoidance, Minimization, and Mitigation Measures

The 1990 *Range Management Guidelines* identify several management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of livestock permitted, deferring grazing on seasonal vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive plants. The terms and conditions of grazing permits have been made more rigorous since adoption of the guidelines to reflect the goals stated there. Under the proposed action, NPS would implement management activity standards and mitigation measures to protect and restore resources on ranches based on results of monitoring and other site-specific factors (see appendix D of the EIS). BMPs identified in the 1990 *Range Management Guidelines* would continue to be applicable under the proposed action. NPS has also developed additional avoidance, minimization, and mitigation measures to provide for the protection of natural resources in the action area. Under the proposed action, programmatic approaches would be established for streamlined implementation of these measures under ROAs for each ranch.

Table 3-2 summarizes the mitigation measures that would be implemented to ensure the protection of federally listed species under the jurisdiction of NMFS. These measures are discussed further as they pertain to specific threatened and endangered species in "Section 8.0, Effects to Evaluated Species and Determinations."

TABLE 3-2: MITIGATION MEASURES TO BE IMPLEMENTED UNDER THE PROPOSED ACTION THAT WOULD AVOID OR MINIMIZE PROJECT EFFECTS ON LISTED SALMONIDS, AND THEIR CRITICAL HABITAT, IN THE ACTION AREA

Mitigation Measure	Activity Types	Subzone
Ensure use of heavy machinery is performed by experienced operators and ensure heavy machinery: ▪ avoids steep slopes (20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ is kept at least 10 feet from any cliffs or steep banks ▪ is only allowed based on daily fire danger rating ▪ avoids woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ is cleaned before arrival at the park; upon arrival; is inspected to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; is removed from NPS property if deficient and properly clean it at the expense of the contractor before returning to NPS property; and is cleaned before moving between sites and before storing to control the spread of plant diseases, insects, and weeds ▪ avoids significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoids waterbodies and riparian zones ▪ avoids lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	All	All

Mitigation Measure	Activity Types	Subzone
Prepare and implement a spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas ▪ prohibit petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life from passing into, or being placed where it can pass into the waters of the state ▪ require operators to have emergency spill clean-up gear (spill containment and absorption materials) and fire equipment available on site at all times ▪ use or store petroleum-powered equipment in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: – ensure that all vehicles and equipment on the site do not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel – perform fueling outside the riparian corridor ▪ If needed, design a contained area located at least 100 feet from a watercourse for equipment storage, short-term maintenance, and refueling; if possible, prohibit these activities from taking place on the project site ▪ immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence ▪ ensure that all spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries are collected, stored, and recycled as hazardous waste off site ▪ ensue that dry cleanup methods (i.e., absorbent materials, and/or rags) are available on site ▪ inspect vehicles each day for leaks and repair immediately ▪ conduct major vehicle maintenance and washing off site	All	All
Restrict vehicles and equipment to one principal access route, preferably one that has been used for past activities Stage all vehicles and equipment on roads, in specified staging areas, or on existing disturbed ranch operation sites	All	All
If access through a wetland is necessary, determine the timing of access to minimize disturbance (typically later summer is the dry time) Use low ground pressure, rubber-tired equipment	All	All
Ensure erosion control and sediment detention measures are available on-site at all times and are in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway When requested by project regulators, inspect (NPS staff or a qualified designee) in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly	All	All

Mitigation Measure	Activity Types	Subzone
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits If rain occurs while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind Install silt fencing or wattles on contour around all stockpile locations	All	Pasture and Ranch Core
Permanent fill of wetlands is not authorized without consultation and issuance of regulatory permits from the US Army Corps of Engineers and/or Regional Water Quality Control Board.	All	All
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities during the dry season, generally June 1 through October 31; exceptions may be made in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species Note that (1) work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by project regulators	All	All
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until July 1 and complete work by October 15 Note that (1) work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from project regulators	All	All
Complete revegetation as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain When timing does not coincide with suitable planting windows for permanent vegetation, use a temporary cover (e.g., weed-free mulch or weed-free straw) to protect soil until permanent vegetation can be established Use non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) in limited instances in conjunction with native species to provide fast-establishing, temporary cover for erosion control	All	All
Soil amendments are typically not needed for establishment of native vegetation in intact native soils, so if soils have been disturbed and require additional organic matter or nutrients to support native plants, use limited organic, weed-free amendments to help establish restoration vegetation Organic fertilizers may be used only above the normal high-water mark of any adjacent waterways, so if fertilizers are to be used around a listed plant, consult (project manager) with a qualified biologist or range scientists to establish a buffer zone Do not allow the use of chemical fertilizers	All	All
Remove no more than 0.10 acre of native riparian trees, shrubs, or woody perennials for a single project	All	All
Remove no more than 0.25 acre of vegetation from a streambank or stream channel where the area contains a mix of native and invasive species	All	All

Mitigation Measure	Activity Types	Subzone
Revegetate soil exposed during construction and soil above rock riprap using native seed casting In general, plant interstitial spaces between rocks riparian vegetation such as willows Use hydromulching (NO SEED INCLUDED) as a soil stabilization technique as allowed	All	All
Design culverts to minimize habitat fragmentation and barriers to aquatic movement Note that channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible	Road Upgrade and Decommissioning Stream Crossing Infrastructure Management Waterway Stabilization	All
Do not mow in the Range subzone without prior NPS approval Do not cut down trees in the mowing area Do not mow in wetlands and maintain a 35-foot buffer between wetlands and mowed areas, leaving in place scattered islands of brush to service as a corridor for wildlife species that inhabit brushy habitat NPS staff will monitor to ensure mowing does not exceed the agreed-upon area	Mowing Forage Production, including Silage, Haylage and Hay	Range
Use the following grazing methods to control weeds to the degree feasible, especially as a follow-up method that minimizes the need for repeated mechanical or chemical applications: ▪ use targeted grazing to impact weedy species when they are vulnerable, using species-specific technical guidance available from sources such as NPS; University of California, Cooperative Extension and Weed Research and Information Center; USDA, NRCS; and DiTomaso et al. (2013) ▪ avoid heavy grazing of infested areas at stages of the weedy species' phenology when herbivory favors increased tillering ▪ encourage vigorous growth of desirable grass species in infested or recently treated areas by maintaining sufficient residual dry matter in fall and winter and by allowing thick grass growth throughout winter	Integrated Pest Management Forage Production, including Silage, Haylage and Hay Upland and Riparian Vegetation Management and Planting	All
Consider the use of multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment	Integrated Pest Management	All
NPS approval is required for the use of herbicides and application must follow NPS Integrated Pest Management Guidelines and operating procedures. Ensure herbicide storage, transport, mixing, loading, and use complies with state and federal regulations including the California Department of Pesticide Regulation, the Marin County Agriculture Commission's Weed Management Plan, manufacturer's labels and instructions, Safety Data Sheets, and any guidance from a registered Pest Control Advisor. Ensure application also follows the management practices presented in Cal-IPC (2015; or future updates), including but not limited to: ▪ developing a safety and record-keeping plan that includes telephone numbers and addresses of emergency treatment centers and telephone number for the nearest poison control center prior to herbicide use. ▪ Maintaining use records for two years after herbicide application. ▪ applying the herbicide most effective and targeted to the specific weed or class of weed, at the time the plant is most vulnerable to treatment	Integrated Pest Management	All

Mitigation Measure	Activity Types	Subzone
▪ as feasible, combining the herbicide with pre- or post-treatment by other methods to increase effectiveness and minimize the amount of herbicide needed ▪ ensuring the application is performed or overseen by a state-certified applicator ▪ not applying herbicides when wind speed exceeds 10 miles per hour at plant height ▪ not applying herbicides within 24 hours of predicted rainfall or 24 hours after rainfall ▪ not applying herbicides under wet conditions due to dense fog ▪ adding a marker dye to herbicides so that workers can see excessive drift and help avoid non-target areas ▪ ensuring a spill kit ready and carrying soap and water in case of spills on skin or clothing ▪ avoiding broadcast treatments in buffer zones around sensitive habitat locations and features, such as nesting sites ▪ to the degree practicable, limiting the use of herbicides to spot spraying and follow-up treatment (i.e., of cut stumps to prevent regrowth) ▪ limiting herbicide use to controlling established stands of noxious species or invasion of exotics into restoration plantings ▪ in riparian environments, using an herbicide without a surfactant that is registered for use in an aquatic environment and on target vegetation; not conducting broadcast spraying; and taking great care to avoid contact with native species ▪ minimizing spot treatment in and around sensitive habitats ▪ avoiding mixing and loading herbicides in sensitive habitats or near waterbodies or significant wildlife and plant communities ▪ applying any extensive treatments in phases so that wildlife can leave areas during treatment ▪ not applying herbicides when wind speed and direction could cause drift to sensitive habitat areas ▪ using herbicides that are approved for use in or near water if applying near surface waters and using herbicides that will not leach into groundwater or remain for long periods in the environment		
Ensure that any use of herbicides conforms to relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates. Consult with a Pest Control Advisor and/or NPS and: ▪ address measures to minimize the use of high-persistence herbicides and the potential for leaching to surface and groundwater, especially in soil types with high leaching potential ▪ for application of herbicides to uplands that may have CRLFs or other rare amphibians present, consider the use of herbicides specifically formulated and approved for use in water ▪ consider the use of pollinator-protective strategies as described in USDA-NRCS (2014), especially when considering broadcast applications and applications when pollinator host plants are flowering. ▪ minimize the use herbicides or fertilizers in habitat that supports special-status butterflies and do not use herbicides in this habitat during Myrtle's silverspot butterfly flight season (June 15-early September)	Integrated Pest Management	All
Ensure that in-stream crossings are not designed for placement within 300 feet of known spawning or breeding areas of listed species	Stream Crossing	All

Mitigation Measure	Activity Types	Subzone
For pasture and crop fertilization, comply with Nutrient Management Plans and USDA, NRCS, guidelines for nutrient management, including but not limited to: ▪ Develop a nutrient budget that considers all sources of nutrients ▪ evaluate the risks of nitrogen and phosphorus transport using methods cited by USDA, NRCS ▪ conduct pertinent soil analyses to determine the appropriate (and maximum) level of nutrient addition, such as nutrient and pH levels and electrical conductivity, and ensure that the total nutrient loading does not exceed the amount needed to meet crop demand ▪ for cropland applications, maintain soil pH in a range that favors nutrient uptake by crops ▪ do not exceed the University of California guidelines (or industry practice when recognized by the university) for nitrogen, phosphorus, and potassium application rates and noting that lower rates are acceptable ▪ ensure application timing corresponds as closely as practicable with the timing of plant uptake by crops or pasture grasses ▪ Apply solid or liquid waste discharges to land at rates that are reasonable for crop, soil, climate, special local situations, management system, and type of manure ▪ Apply manure and wastewater discharges to land during non-rainy or non-saturated conditions, ensuring that discharges do not result in runoff to surface waters and that discharges infiltrate completely within 72 hours after application ▪ do not spread compost, manure, or fertilizer when the top 2 inches of soil are saturated or when enough precipitation to cause runoff is forecast ▪ maintain sufficient setbacks (filter strips or otherwise well-vegetated areas) from drainages and waterbodies to prevent pollution and comply with state and federal water quality regulations; setback distance should be greater for steeper slopes, higher levels of nutrients applied, and lower levels of setback ground cover ▪ employ best practices to minimize the risk of nutrient runoff in application of liquids, slurry and solids, such as adjusting the thickness of the applied layer of manure and compost relative to slope and setback distance to minimize the chance that material will be washed downhill to waterbodies	Nutrient Management	Pasture
Maintain records—regarding the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event—for at least five years Keep these records with the Nutrient Management Plan	Nutrient Management	Pasture
Do not spread manure or compost when winds are in excess of 20 miles per hour	Nutrient Management	Pasture
For liquid (irrigated) manure application: ▪ avoid saturating the soil ▪ check pipes, hoses, and other irrigation equipment daily for leaks	Nutrient Management	Pasture
When practical, compost manure before spreading to reduce the volume of material	Nutrient Management	Pasture

Mitigation Measure	Activity Types	Subzone
Do not store or apply manure, manured bedding, compost, and process water within a 100-foot setback to any down-gradient surface water unless a 35-foot-wide vegetated buffer or physical barrier (i.e., a berm) is substituted for the 100-foot setback or an alternative conservation practice or field-specific condition is installed that provides pollutant reductions equivalent to or better than achieved by the 100-foot setback Place manure and contaminated bedding materials in contained storage or composting locations for later disposal or composting; ensure such locations have roofs, tarps, or other cover sufficient to keep rainfall out during the rainy season and two to four walls or sides sufficient to keep contents in place	Nutrient Management Diversification (Horse Boarding, Other Livestock)	Ranch Core
Set back composting and waste separation facilities at least 100 feet from the nearest surface waterbody and/or the nearest water supply well Note that a lesser setback distance may be allowed by the Regional Water Board if it can be demonstrated that the groundwater, geologic, topographic, and well construction conditions at the site are adequate to protect water quality as described in the SWRCB Compost General Order, 2015 or as revised	Nutrient Management Diversification (Horse Boarding, Other Livestock)	Ranch Core
For all permits that allow forage production or row crops, obtain a conservation plan from USDA, NRCS, or NPS which identifies requirements such as silage crop residue cover, cut stubble height, row spacing, disc passes, disc depth, and number of animal days grazed	Forage Production, including Silage, Haylage and Hay Row crops	
Avoid tilling or if necessary and with prior NPS approval use shallow tillage operations (1 to 2 inches) or operations that do not invert the soil	Forage Production, including Silage, Haylage and Hay	Pasture
Do not aerate soils, unless soil compaction is demonstrated, which can be predicted using USDA, NRCS, soil maps and measured using a soil cone penetrometer, when soils are saturated and ideally are at field capacity	Forage Production, including Silage, Haylage and Hay	Pasture
Design a leachate collection system and install an impermeable cover to minimize the entry of clean rain water from the top of the cover into the leachate collection system Use a minimum cubic foot (7.48 gallons) of leachate storage capacity for each ton of material placed in storage if and when containment becomes necessary	Forage Production, including Silage, Haylage and Hay Nutrient Management	Ranch Core
Adhere to the following Livestock Diversification practices specific to the Pasture subzone (if applicable): ▪ avoid heavy or prolonged grazing by sheep and goats in pastures on areas with steep slopes or sparse vegetation ▪ use prescribed controlled grazing practices, such as pasture rotation, for goats and sheep in pastures ▪ locating watering facilities in pastures on areas that promote even grazing distribution by sheep and goats and reduce grazing pressure on sensitive areas ▪ locating watering facilities in pastures away from well heads and install wellhead protection (i.e., fencing) ▪ placing watering facilities, new feed rack, and salt and mineral feeders in pastures a minimum of 300 feet from any riparian or aquatic habitat	Diversification (Horse Boarding, Other Livestock)	Pasture

Mitigation Measure	Activity Types	Subzone
▪ regularly moving portable/moveable structures located in pastures for the production of fowl with to avoid or minimize contamination, disease occurrence, and overgrazing ▪ placing portable/moveable structures located in pastures for the production of fowl located within the Pasture subzone a minimum of 300 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September ▪ placing floorless broiler chicken huts located within the Pasture subzone a minimum of 150 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September		
Adhere to the following key points for use of all guard animals: ▪ post signs to alert the public of the presence of guard animals ▪ ensure health and safety by providing adequate food and water, routine vaccinations, de-worming, hoof trimming for donkeys and llamas Adhere to the following key points for use of guard dogs: ▪ select a suitable breed for guard dogs, such as the Maremma-Abbruzzi, Akbash, Kuvasz, Anatolian Shepherd, Great Pyrenees, or Kommondor and purchase from a reputable breeder ▪ properly train the dog to understand commands made by owner(s) ▪ rear singly, from 8 weeks of age, with the animals the dog is guarding and minimize human contact ▪ ensure some (limited) human contact to adequately socialize the dog and avoid aggressive behavior toward humans—10 minutes twice day for a puppy and once a day for an adult on pasture is typically enough contact ▪ monitor and correct any undesirable behavior ▪ do not feed any raw food Adhere to the following key points for use of llamas: ▪ use gelded adult male llamas, nonbreeding females, or females with young ▪ use only one llama per pasture ▪ monitor for aggressive behavior toward humans ▪ feed with the animals they are guarding Adhere to the following key points for use of donkeys: ▪ select donkeys from medium- to large-size stock ▪ use jennies and geldings (Jacks are usually too aggressive) ▪ feed with the animals they are guarding ▪ use only one donkey per pasture	Diversification (guard animals) Integrated Pest Management	Pasture and Ranch Core
Adhere to the Livestock Diversification practices specific to the Ranch Core subzone: ▪ place watering facilities, new feed rack, salt and mineral feeders, corrals, and feed storage facilities based on operational needs ▪ regularly clean and disinfect livestock and fowl housing, processing areas, and equipment as needed to reduce or prevent the spread of disease and pathogens by: – removing debris – cleaning surfaces – disinfecting surfaces	Diversification (Other Livestock)	Ranch Core
Implement dust control measures, such as wetting down paddocks and riding arenas, especially on dry, windy days Consider using low-dust or no-dust footing materials to control dust while reducing water use	Diversification (horse boarding)	Ranch Core

Mitigation Measure	Activity Types	Subzone
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season	Diversification (horse boarding and other livestock) Infrastructure Management	
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands Minimize the amount of: ▪ water used by using sponges or hoses equipped with shut-off or low-flow nozzles ▪ soap used, especially soap with surfactants	Diversification (horse boarding) Infrastructure Management	Ranch Core
Adhere to the Ranch Core diversification consideration for row crops: – as part of any row crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate – use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late fall and use certified weed-free straw if purchased from outside the park or from a different ranch – incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin) – use nonlethal wildlife control (i.e., scarecrows or decoys and control garden debris) because lethal control of wildlife is prohibited – store harvested crops in enclosed structures (i.e., buildings, barrels, crates)	Diversification (Row crops)	Ranch Core
Plant cover crop or cover soils with straw mulch and use at least 30% cover in fallow crop areas throughout the rainy season (until April 1)	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	Ranch Core, Pasture
For row crop diversification, conduct tilling activities row crop areas, such as ripping, disking, or harrowing, after August 20 and before the first rains or November 1	Forage Production, including Silage, Haylage and Hay Diversification (row crops)	Ranch Core

4.0 ACTION AREA DESCRIPTION

The action area includes all lands currently leased for ranching in the park (i.e., Point Reyes and the north district of Golden Gate), as well as adjacent lands in Point Reyes where the Drakes Beach herd currently occurs (attachment A, figure L-1). The park, located in western Marin County in central California, is a landscape ranging from dramatic headlands and expansive sand beaches to open grasslands, brush hillsides, and forested ridges. It is approximately 30 miles northwest of San Francisco and within 50 miles of the nine-county San Francisco Bay Area, the fifth largest metropolitan area in the United States. The park 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 park at the southern tip of the peninsula. Western Marin County is primarily rural, with scattered, small, unincorporated towns that serve tourism, agriculture, and local residents. NPS staff at Point Reyes administer a portion of the adjacent north district of Golden Gate for a combined management area and legislated boundary of approximately 86,000 acres.

The action area consists of gently rolling to hilly uplands with basement rocks that include the granitic spines of northern Inverness Ridge and Point Reyes proper and the broad sweep of marine sandstones and shales that lie between. Elevations range from the beaches at sea level to 600 feet on 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% on the steeper hillsides. Average hillslopes and drainage sides are about 40%.

Salmon and steelhead migrate from the ocean into freshwater streams in the park to spawn, and juveniles develop in freshwater before smoltification and outmigration to the ocean. Lagunitas and Olema Creeks are the two major drainages in the action area that are most important for anadromous fish (see attachment A, figure L-1). The Lagunitas and Olema Creek watersheds support the southernmost wild (no current hatchery influence) population of coho salmon along the Pacific Coast. Olema Creek is the largest undammed watershed in coastal Marin County, California (Carlisle, Reichmuth, and McNeill 2018). Steelhead use other coastal streams in the Drakes Estero watershed. Overwintering habitat for juvenile fish was listed as a primary limiting factor for coho salmon in Lagunitas Creek (Stillwater Sciences 2008; Prunuske Chatham, Inc. 2010). No ranches in the action area are in the Pine Gulch Creek watershed.

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/or 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, Abbotts Lagoon, or the Pacific Ocean. 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/or red alder stands and provide habitat for endangered salmonids (Aoyama et al. 2018).

The action area is surrounded by Drakes and Limantour Esteros and Abbotts Lagoon, which 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. Numerous minor wetlands and riparian areas exist throughout the action area and are locally important for wildlife habitat. Streams in the action area are generally small, and their tributaries are frequently ephemeral. Many streams flow through steep, narrow canyons through the coastal mountains as they flow from their headwaters toward the coast. Many ranch units border the Pacific Ocean beaches and one extends to Tomales Bay.

Vegetation in the action area is characterized by non-forested or partially forested lands, which supports a mosaic of coastal prairie and northern coastal scrub vegetation (see Ford and Hayes 2007). Most of the upland plateaus and ridgetops in Point Reyes 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. Chapter 3 of the EIS also provides further detail about the vegetation communities in the action area, in the “Vegetation, including Federally Listed Species” section.

Soils are described in detail in the “Soils” section of chapter 3 in the EIS. Generally, rangeland soils are 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 overgrazing in the less sloping areas.

Further details about the action area are provided in "Chapter 3, Affected Environment," of the EIS, including its soils, water resources, vegetation, wildlife, tule elk, visitor use, cultural resources, socioeconomics, and air quality.

5.0 PRE-FIELD REVIEW OF LISTED SPECIES

A list of federally listed species and designated critical habitat in the action area was obtained from NMFS (2018). Several marine animals listed under the ESA (i.e., abalone, North American green sturgeon, sea turtles, whales, seals, and sea lions) were eliminated from further consideration because beef cattle and dairy ranching activities in the action area only affect non-marine areas. Species included on this list were evaluated for their potential to occur in the action area (shown in table 5-1 below). Park staff further refined this list to identify only those species that would potentially be affected by beef cattle and dairy ranching activities, based on knowledge of species occurrences in the park and prior consultation with NMFS regarding livestock use in the park (NMFS 2004; NPS 2001).

5.1 Species Considered and Evaluated

Table 5-1 indicates whether the federally listed species under the jurisdiction of NMFS that could occur are known or expected to occur in the action area. Any critical habitat for these species in the action area is indicated, in addition to their general habitat preferences. No additional proposed or candidate species for listing under the ESA are expected to occur in the action area.

TABLE 5-1: FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES UNDER THE JURISDICTION OF NMFS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Habitat Preferences
Central California Coast coho salmon (*Oncorhynchus kisutch*)	E	Yes	Yes	Coastal, low-gradient streams with abundant pools formed by large woody debris
Central California Coast steelhead trout (*Oncorhynchus mykiss*)	T	Yes	Yes	Ocean and freshwater streams with high water quality, natural shade cover, and submerged rocks and vegetation
California coastal Chinook salmon (*Oncorhynchus tshawytscha*)	T	Yes	Yes	Ocean and freshwater streams with high water quality, natural shade cover, and submerged rocks and vegetation

Source: NMFS (2018)

[a] Status Codes: E – federally listed endangered; T – federally listed threatened

5.2 Critical Habitat in the Action Area

Critical habitat is a term defined in section 3 of the ESA and refers to areas that contain habitat features that are essential for the survival and recovery of a listed species, and which may require special management considerations or protections. The ESA defines critical habitat as "(1) the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time it is listed…that…are essential for the conservation of the species (16 U.S.C. 1532(5)(A))." In other words, critical habitat represents the habitat essential for the species' recovery.

The ESA, in addition to requiring that federal agencies not jeopardize the continued existence of endangered or threatened species, requires that their actions not result in the destruction or adverse modification of critical habitat of such species. NMFS revised the regulatory definition of *destruction or adverse modification* to mean "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species." Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 *Federal Register* [FR] 7214). NMFS also revised its critical habitat regulations in 2016 to replace the term "primary constituent elements" with "physical or biological features" (81 FR 7414). This shift in terminology, however, does not change the approach used for evaluating the effects of the proposed action on critical habitat.

NMFS must review the proposed action's effects on the quantity and quality of physical or biological features in the designated critical habitat and how they support a species' life history and recovery needs. Additionally, a proposed action that precludes or significantly delays improvement in the quality and quantity of these habitat features could also result in a conclusion of "destruction or adverse modification" of critical habitat. Specifically, NMFS must review this BA and conclude if the proposed action is likely to "destroy or adversely modify" any designated critical habitat in the action area. If NMFS were to conclude that the proposed action may "destroy or adversely modify" critical habitat, the proposed action may not go forward unless the applicant provides a reasonable and prudent alternative that would avoid the destruction or adverse modification of critical habitat.

The proposed action could affect two anadromous fish—Central California Coast (CCC) steelhead trout and CCC coho salmon—that have designated critical habitat in the action area (USFWS 2018a). Section 6.1 presents further detail about this critical habitat.

6.0 EVALUATED SPECIES INFORMATION

6.1 Species Status and Biology

Coho salmon, steelhead trout (steelhead), and Chinook salmon are anadromous fish species, which means they spend a portion of their life cycle in marine waters and a portion, specifically spawning and rearing, in fresh waters. All three species occur in several creeks in the action area and in the Lagunitas/Olema Creek areas of the Tomales Bay watershed. Steelhead have also been documented in the action area in some of the drainages in the Drakes Estero watershed (attachment A, figure L-1).

All three species select gravelly sections of streams for spawning, where water flow between gravel keeps the eggs and embryos well-oxygenated and facilitates fry emergence. Water temperatures and dissolved oxygen (DO) influence the survival, growth rate, and swimming ability of developing salmonids. Higher stream temperatures can lead to increased heat shock protein expression, which reduces juvenile growth and development. Low levels of DO decrease the rate of metabolism, swimming speed, growth rate, food consumption rate, efficiency of food utilization, behavior, and ultimately the survival of the juveniles (NMFS 2004; NPS 2007). Juvenile salmon and steelhead prefer well-shaded pools with dense overhead cover; abundant submerged cover composed of undercut banks, logs, roots, and other woody debris; cooler water temperature; adequate DO levels; and adequate water velocities (USEPA 2004). Preferred rearing habitat has little or no turbidity and high aquatic invertebrate forage production. As they grow larger and their habitat preferences change, juveniles move away from stream margins and begin to use deeper water areas with slightly faster water velocities, but they continue to use available cover to minimize the risk of predation and reduce energy expenditure. As water temperatures decrease in the fall and winter, fish stop or reduce feeding because of the lack of food or in response to colder water triggering slower growth rates. From December to February, winter rains result in increased stream flows and by March, following peak flows, fish again feed heavily on insects and crustaceans, and their growth rate increases. In the spring, as yearlings, salmon and steelhead undergo a physiological process that prepares them for living in the marine environment. They begin to migrate downstream in late March and early April with peak outmigration occurring in mid-May. Emigration timing is correlated with peak upwelling currents along the coast, when river or estuary productivity is sufficient for juvenile survival and growth (NMFS 2004). Differences occur between coho salmon, steelhead, and Chinook salmon life cycles, and are described further below.

6.1.1 Central California Coast Coho Salmon—Endangered

6.1.1.1 Legal Status

The CCC coho salmon evolutionarily significant unit (ESU) (i.e., Pacific salmon designated population segment [DPS]) was listed as threatened in 1996 (61 FR 56138) and reclassified as endangered, including hatchery stocks, in 2005 (70 FR 37160). In 2012, NMFS published the *Recovery Plan for the Evolutionarily Significant Unit of Central California Coast Coho Salmon* (NMFS 2012). NMFS conducted a five-year status review of the ESU in 2016 and recommended that the ESU remain listed as endangered (NMFS 2016b). The ESU was listed as endangered in 2005 under the California Endangered Species Act (CESA) (CDFW 2018a).

6.1.1.2 Species and ESU/DPS Description

Coho salmon are smaller than Chinook salmon, with spawning adults typically measuring around 16 to 28 inches and weighing from 6 to 13 pounds. Spawning males are characteristically dark red on the sides, with a dark green head and back and gray to black belly. Females are paler than males (CalFish 2018a; CDFW 2018b).

The CCC coho salmon ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California, south to and including the San Lorenzo River in central California, as well as populations in tributaries to San Francisco Bay.

6.1.1.3 Habitat Requirements/Ecology

Coho salmon are typically associated with small to moderately sized coastal streams characterized by heavily forested watersheds; perennially flowing reaches of cool, high-quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates (NMFS 2004). Most spawning males are characterized by a hooked jaw and slightly humped back. Coho salmon generally follow a three-year life cycle in which they spend the first year of life in their natal freshwater stream followed by nearly two years in the ocean before returning to their natal stream to spawn (NPS 2001). However, they do express variations to this life history. In freshwater streams, coho salmon require adequate, year-round stream flows, cold water, streamside shade, instream and off-stream shelter and pools, and access to spawning gravels with a low fine sediment component. Spawning typically occurs at the tail of pools or head of riffles, where substrate, depths, velocities, and streamside cover are adequate. Rearing habitat can widely vary, depending on flow levels and what is available. Stream habitats are associated with interstitial voids of gravels, cobbles, and boulders; large woody material that either has fallen in the channel or is growing along the banks; or undercut banks (NMFS 2012).

6.1.1.4 Critical Habitat in the Action Area

Critical habitat for the CCC coho salmon ESU was designated in 1999 (64 FR 24049) and includes all accessible river reaches from Punta Gorda in northern California, south to the San Lorenzo River in central California. Designated critical habitat for coho salmon 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). Through this designation, NMFS identified 10 essential features of critical habitat including: (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. Many streams in the action area in the Lagunitas and Olema Creek watersheds would provide essential features of designated critical habitat for coho salmon, but specific stream reaches are not designated as critical habitat. Figure L-2 in attachment A shows the watersheds in the action area that contain critical habitat for CCC coho salmon.

6.1.1.5 Status in the Vicinity of the Action Area

NPS (2001) reported that the Lagunitas watershed, including Olema Creek, supported approximately 10% of the CCC coho salmon population but could potentially support greater abundance. Coho salmon have the potential to occur year-round in the action area; however, they are most likely to occur during spawning and migration events. Watersheds in the action area known to contain coho salmon and designated critical habitat include Tomales Bay, Lagunitas Creek, and Drakes Estero. In the 1996 federal listing of CCC coho salmon population (61 FR 56138), the Lagunitas watershed, including Olema Creek, was documented to support 10% of the remaining population. The coho salmon population in the Lagunitas Creek watershed is the largest population south of the Noyo River and may represent a much larger percentage of the remaining wild coho in the ESU than the 10% quoted in the 1996 listing (NPS 2001). Historical and current data on coho salmon and steelhead populations for Lagunitas and Olema Creek watersheds have been gathered as part of the Coho Salmon and Steelhead Monitoring Program. Through this program, NPS has monitored multiple stages of coho salmon life history in the action area since 1998, performing escapement surveys of spawning adults, outmigration smolt trapping, and surveys of juveniles during summer. Historical records show coho salmon from at least 31 small coastal streams in Marin County. Coho salmon have recently been observed in 17 (55%) of these streams, most of which are tributaries to Lagunitas Creeks (Moyle et al. 2008). Coho salmon are found consistently in Lagunitas Creek, as well as in Olema Creek, Devil's Gulch, and San Geronimo Creek and its tributaries, but less consistently in other smaller tributaries to Lagunitas Creek and Olema Creek (CDFW 2004). Although coho salmon are declining throughout the ESU, the Lagunitas Creek population, including fish spawning in the tributary streams of Olema Creek, San Geronimo Creek, and Devil's Gulch, is considered persistent and moderately abundant (NMFS 2012). Two of the major tributaries on ranch lands, John West Fork Creek and Cheda Creek, support coho salmon (attachment A, figure L-2).

According to CDFW (2004), the primary problems facing coho salmon in the watersheds in the action area "are the permanent loss of access to spawning and rearing habitat above Peters Dam (Kent Lake) on Lagunitas Creek and above Seeger Dam on Nicasio Creek, 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." 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).

During the past three years of monitoring spawning adult coho salmon in the Lagunitas Creek watershed, Marin Municipal Water District (MMWD) reported 292 coho redds and 537 live coho salmon during 2015–2016; 170 coho salmon redds and 499 live coho salmon during 2016–2017; and 110 coho salmon redds and 463 live coho salmon during 2017–2018 MMWD 2016, 2018, 2019). During monitoring in 2017–2018, MMWD (2019) reported 60% of observed coho spawning in Lagunitas Creek, where 72 redds were observed. San Geronimo Creek, Devil's Gulch, and Olema Creek contributed 31 redds. Cheda Creek and the small tributaries to San Geronimo Creek contributed seven redds (MMWD 2019).

6.1.2 Central California Coast Steelhead Trout—Threatened

6.1.2.1 Legal Status

The CCC steelhead DPS was listed as a federally threatened species in 1997, a finding that was reaffirmed in 2006 (71 FR 834). NMFS (2016c) conducted a five-year status review of the CCC steelhead DPS and recommended that the DPS remain listed as threatened. Steelhead are not listed under the CESA (CDFW 2018a). The recovery plan for CCC steelhead was completed in 2016 (NMFS 2016a).

6.1.2.2 Species and ESU/DPS Description

Steelhead may be resident, freshwater fish (i.e., nonmigratory, referred to as rainbow trout) or may migrate to the open ocean (anadromous). Steelhead are indistinguishable from rainbow trout during the three-year period they typically spend in freshwater.

The CCC steelhead DPS includes all naturally spawned populations of steelhead (and their progeny) in California streams from the Russian River to Aptos Creek and drainages of San Francisco and San Pablo.

6.1.2.3 Habitat Requirements/Ecology

Steelhead found in park streams are referred to as "winter steelhead" because their timing of upstream adult migration for spawning occurs during winter when stream flows are highest and water temperatures are lowest. Main stems, tributaries, and intermittent streams may be used for spawning. Steelhead exhibit great variation in life history, but in California, they usually live in freshwater for one to two years, then typically spend two to four years in the ocean before returning to their natal stream to spawn (Moyle et al. 2008).

Unlike other anadromous species of the *Oncorhynchus* genus (i.e., salmon), steelhead may spawn more than one season before dying. Eggs develop in well-oxygenated gravel and hatch after approximately 20 to 80 days. Fry typically emerge from the gravel two to three weeks after hatching. Upon emerging from the gravel, fry rear in edge water habitats and move gradually into pools and riffles as they grow larger. Because rearing juvenile steelhead reside in freshwater all year, adequate flow and temperature are important to the population at all times. Juvenile steelhead also require adequate cover such as woody debris and undercut stream banks for hiding, which also promotes important food resources in the form of terrestrial insects (NMFS 2004). Large woody debris creates winter habitat for steelhead just as it does for coho salmon, scouring out deep pools and providing cover (NMFS 2004). In the spring, after roughly two years rearing in freshwater, the same physiological change that triggers smoltification in coho salmon is initiated in steelhead. From a combination of genetic and environmental factors, this process prepares the fish for saltwater and induces the steelhead to begin the migration toward the ocean. CCC steelhead are highly dependent on estuaries at the mouths of streams for growth and survival where they can acclimate to saltwater prior to entering the ocean as smolts (NMFS 2016a). Steelhead may spend several years in the ocean before returning to spawn and may make several spawning migrations (NPS 2001). Steelhead are generally first observed in Lagunitas Creek in late December or early January and continue spawning through April or even into May (MMWD 2019).

6.1.2.4 Critical Habitat in the Action Area

Critical habitat for CCC steelhead was designated in 2005 (70 FR 52488) and includes all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Russian River to Aptos Creek, California (inclusive), and the drainages of San Francisco and San Pablo Bays. In the Tomales Bay watershed, critical habitat does not include areas upstream of Peters Dam, Seeger Dam, and Soulajule Dam (NMFS 2019). Designated critical habitat for steelhead includes many of the streams in the park, particularly in Olema and Lagunitas Creeks. Tributaries of Drakes Estero on the peninsula are also designated as critical habitat for steelhead, including Home Ranch Creek, East Schooner Creek, and the tributary to Creamery Bay. Figure L-3 in attachment A shows critical habitat for CCC steelhead in the action area.

6.1.2.5 Status in the Vicinity of the Action Area

CCC steelhead have declined rangewide over the past 70 years that researchers and agencies have monitored populations (NMFS 2016c). As described above for coho salmon, winter habitat in the Lagunitas Creek watershed is a limiting factor (Stillwater Sciences 2008). 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). The steelhead population in Lagunitas Creek is considered to be an essential population for the recovery of steelhead in central California (NMFS 2016c). Abundance estimates for these waters are low but stable, and individual run sizes are 500 adult steelhead or fewer (NMFS 2004). Between 15 and 136 redds were observed between 2001 and 2005 (Moyle et al. 2008).

During the past three years of monitoring spawning adult steelhead in the Lagunitas Creek watershed, MMWD reported 120 steelhead redds and 43 live steelhead during 2015–2016; 35 steelhead redds and 23 live steelhead during 2016–2017; and 166 steelhead redds and 204 live steelhead during 2017–2018 (MMWD 2016, 2018, 2019). The large steelhead run during 2017–2018 translated into one of the largest juvenile steelhead populations on record (MMWD 2019).

6.1.3 California Coastal Chinook Salmon—Threatened

6.1.3.1 Legal Status

The California Coastal (CC) Chinook salmon ESU (i.e., a Pacific salmon DPS) was listed as a threatened species in 1999 (64 FR 50394). In 2005, NMFS issued a final determination that the CC Chinook salmon ESU continues to warrant listing as a threatened species, reaffirming the threatened status and ESU boundaries of CC Chinook salmon (70 FR 37160). The CC Chinook salmon ESU is not listed under the CESA (CDFW 2016). The recovery plan for the CC Chinook salmon ESU was completed in 2016 (NMFS 2016a). A five-year status review of the ESU was also conducted in 2016, recommending no change in status (NMFS 2016d).

6.1.3.2 Species and ESU/DPS Description

Chinook salmon, also referred to as king salmon, are the largest Pacific salmon species. On average, spawning adult Chinook salmon grow to be 3 feet long and approximately 30 pounds but can reach more than 5 feet long and more than 100 pounds. In the ocean, Chinook salmon are blue-green on the head and back and silver on the sides and irregular black spots on the fish’s tail, back, and upper fin. During the mating season, male Chinook salmon have a distinctive hooked nose at the top of the mouth and a ridged back. Both sexes develop a reddish tint around their back fins and tail (CalFish 2018b).

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 2016a) at this time. According to the recovery plan for CC Chinook salmon, 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 CC Chinook salmon (NMFS 2016a). 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 California Coastal ESU because of the ecological similarities between Lagunitas Creek and other coastal basins (NPS 2007). Researchers recommend that Chinook salmon in the Tomales Bay watershed and other populations between the Russian River and the Golden Gate be placed in the California Coastal ESU (NMFS 2016d). Because of the proximity of these fish to the southern boundary of the ESU, NMFS has previously treated the action area as part of the CC Chinook salmon ESU for the purposes of previous ESA consultation (e.g., NMFS 2004). During the 2016 status review, it was determined that there was no new information for including the watersheds of the action area into the ESU because of the rare Chinook salmon presence (NMFS 2016d).

6.1.3.3 Habitat Requirements/Ecology

Chinook salmon have variable life histories that allow them to take advantage of different types of spawning conditions. Migration to freshwater occurs at different times for different spawning runs of adult Chinook salmon, and the different life-histories are named for the season when most of the adults enter freshwater to spawn. The CC Chinook salmon ESU historically comprised 38 populations that included 32 fall-run populations and 6 spring-run populations, but the spring-run component is thought to be extirpated (CDFW 2016). The migration period of the fall-run Chinook salmon in the ESU ranges from October to April, during the rainy season, peaking in December. Chinook salmon have a three- to five-year life history. Most young Chinook salmon migrate to the ocean during the first few months after emergence, but some may remain in freshwater and migrate a few months later. Smolts spend a variable amount of time in estuarine habitat before transitioning to salt water. They will spend a few years feeding in the ocean, then return to their natal streams or rivers to spawn. Chinook salmon sexually mature between the ages of two and seven but are typically three or four years old when they return to spawn. Chinook salmon have similar spawning requirements to those described above for coho salmon, requiring cool, swift, well-oxygenated stream habitat. They spawn in either mainstem portions of rivers and creeks or tributaries. Because they are larger, they prefer to spawn in the largest channel sizes of all Pacific salmon, which, in the action area, only includes Lagunitas Creek. Prior to spawning, they stage in large, deep pools and use the largest substrate for spawning of any California salmonids (Moyle 2002; CalFish 2018b; CDFW 2018c).

6.1.3.4 Critical Habitat in the Action Area

The action area does not contain critical habitat for Chinook salmon. 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 2016a).

6.1.3.5 Status in the Vicinity of the Action Area

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. Adult and juvenile Chinook salmon have been observed in the action area in Lagunitas Creek in recent years. These Chinook salmon may be part of the CC Chinook salmon ESU because of the proximity of Lagunitas Creek to the range of this ESU (MMWD 2011). Chinook salmon do not occur in any other creek in the action area. Recent monitoring efforts in Lagunitas Creek have identified the presence of Chinook salmon since 2000. However, MMWD documented Chinook salmon 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). The increasing frequency of Chinook salmon in Lagunitas Creek suggests the development of a self-sustaining population, but NMFS (2004) was uncertain whether that would occur. 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 were observed in Lagunitas Creek (n=27) and San Geronimo Creek (n=5). Above average numbers of Chinook smolts were also observed in 2017, indicating that many Chinook redds and fry survived the record-high stream flows of the previous winter (MMWD 2018). Devil's Gulch, the only drainage for which long-term Chinook salmon monitoring data are available in the action area, has experienced a sharp decline in numbers (NPS 2004).

During the past three years of monitoring spawning salmonids in the Lagunitas Creek watershed, MMWD (2016) reported that Chinook salmon were nearly absent in 2015–2016, with only two redds and four live Chinook observed. However, MMWD (2018) reported that for the first time in 20 years of conducting surveys, Chinook salmon spawning appeared to exceed steelhead during 2016–2017, with 32 Chinook salmon redds and 82 live Chinook salmon. MMWD (2018) reported 27 live Chinook salmon and 22 Chinook salmon redds during 2017–2018 (MMWD 2018).

7.0 ENVIRONMENTAL BASELINE

As defined under the ESA, the environmental baseline includes past and present impacts of all federal, state, and private actions in the action area; the anticipated impacts of all proposed federal actions in the action area that have undergone formal or early section 7 consultation; and the impacts of state and private actions that are contemporaneous with the section 7 consultation process. Future actions and their potential effects are not included in the environmental baseline.

In combination with section 6.0, this section defines the status of the federally listed species evaluated and their habitat in the action area with respect to livestock grazing. Recent consultations with NMFS are also detailed to provide a baseline for section 7 consultation on the effects of the proposed action.

7.1 Salmonid Habitat in the Action Area

Major perennial streams—Lagunitas and Olema Creeks—that are habitat for federally listed aquatic species in the Tomales Bay watershed either do not have adjacent grazing or have been fenced with vegetated buffers to exclude cattle. In the action area, approximately 800 acres have been fenced to exclude cattle from sensitive resources, but these preserved acres are not reflected in current authorizations.

Coho salmon habitat in the action area occurs in the Lagunitas Creek and Olema Creek watersheds, which are approximately 53,150 and 9,390 acres, respectively. Chinook salmon habitat is only found in the Lagunitas Creek watershed. Ranch boundaries in the action area comprise approximately 6% (3,540 acres) and 56 % (5,300 acres) of the Lagunitas and Olema Creek watersheds, respectively (NPS 2019b). However, in the Lagunitas Creek watershed, ranches in the action area comprise a larger percentage of the watershed potentially occupied by salmon and steelhead because dams on Lagunitas and Nicasio Creeks block fish movement into most of the watershed upstream. Steelhead habitat is also found in the Lagunitas and Olema Creek watersheds. In addition, steelhead are found in several creeks draining into Drakes Estero, including Laguna, Muddy Hollow, Glenbrook, Home Ranch, East and North Schooner Creek. Ranches in the action area comprise approximately 47% (8,200 acres) of the 17,500-acre Drakes Estero watershed.

Table 7-1 summarizes the length of streams potentially supporting coho salmon, steelhead, and Chinook salmon, totaling approximately 24.5 linear miles of perennial or intermittent streams[2] within ranch boundaries or approximately 60% of all perennial streams within ranch boundaries. Livestock have limited access to most streams known to support coho salmon, steelhead, or Chinook salmon, but they occasionally breach exclusion fencing. Some stream reaches could experience indirect effects from livestock grazing and ranch activities in nearby uplands. Because of the minor degree of potential impacts of livestock to most streams in the action area, NMFS (2004) previously determined that any adverse effects of livestock grazing would be minimized or avoided to the degree that they are insignificant or discountable.

TABLE 7-1: LENGTH OF PERENNIAL AND INTERMITTENT STREAM REACHES[a] POTENTIALLY SUPPORTING COHO SALMON, STEELHEAD, AND CHINOOK SALMON IN THE ACTION AREA

Creek Name	Perennial and Intermittent Stream Reaches[a] 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[b]	0 miles[c]
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[d]	1.58 miles
Drakes Estero, including: • East Schooner Creek • North Schooner Creek • Home Ranch Creek	3.71 miles[e]	1.08 miles[g]

Sources: USGS (2018), USFWS (2018a)

[a] Stream reaches are defined as “perennial” or “intermittent” according to the National Hydrography Dataset (USGS 2018).

[2] Stream reaches are defined as “perennial” or “intermittent” according to the National Hydrography Dataset (USGS 2018).

[b] Does not include any reaches of Lagunitas Creek because it is not within ranch boundaries. Also does not include the lower reaches of Cheda Creek that are not within ranch boundaries. The action area does not encompass any portions of Nicasio Creek, Jewell Creek, Tomasini Creek, or other subwatersheds that potentially support salmon or steelhead in the Lagunitas Creek watershed.

[c] Does not include any reaches designated as steelhead Critical Habitat on Lagunitas Creek or Cheda Creek because those reaches are not within ranch boundaries.

[d] Does not include any reaches of Olema Creek because it is not within ranch boundaries.

[e] Does not include the majority of East Schooner Creek that is not within ranch boundaries, as well as portions of Home Ranch Creek and North Schooner Creek. Also, the action area does not encompass any portions of Laguna Creek or Glenbrook Creek, or any other subwatersheds that potentially support steelhead in the Drakes Estero watershed.

[g] Includes the lower reaches of Home Ranch Creek, East Schooner Creek, and the tributary to Creamery Bay.

Upstream of the action area, MMWD operates four reservoirs on the main stem of Lagunitas Creek and a fifth reservoir on Nicasio Creek. MMWD releases water from Kent Lake to ensure year-round minimum stream flows in Lagunitas Creek. In addition, MMWD releases periodic "upstream migration flows," 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).

7.2 Critical Habitat in the Action Area

Sections 6.1.1.4 and 6.1.2.4 describe critical habitat for the CCC coho and the CCC steelhead trout, respectively. Figures L-2 and L-3 in attachment A show critical habitat for CCC coho salmon and CCC steelhead in the action area. The action area does not contain critical habitat for CC Chinook salmon, as described above in section 6.1.3.4.

7.3 Previous Consultations with NMFS in the Action Area

In 2001, NPS evaluated the effects of the proposed renewal of livestock grazing permits in the park and prepared a BA as part of the consultation process with NMFS. The action area of NPS 2001 BA encompassed most of the same lands and waters affected by this proposed action. Table 7-2 summarizes the effects determinations from the 2001 NPS BA and the subsequent NMFS biological opinion (BO) (NMFS 2004).

TABLE 7-2: DETERMINATIONS OF EFFECTS OF GRAZING ON LISTED SPECIES BY NPS (2001) BIOLOGICAL ASSESSMENT AND NMFS (2004) BIOLOGICAL OPINIONS

Species	Listing Status[a]	NPS (2001) BA Determination[b]	NMFS (2004) BO Determination[b]
Central California Coast coho salmon (*Oncorhynchus kisutch*)	T	NLAA	LAA, No Jeopardy[c]
Central California Coast steelhead trout (*Oncorhynchus mykiss*)	T	NLAA	LAA, No Jeopardy[c]
California coastal Chinook salmon (*Oncorhynchus tshawytscha*)	T	No Determination	No Determination

Source: NMFS (2018)

[a] ESA determinations: NLAA – "may affect, not likely to adversely affect"

[b] Status Codes: T - Federally listed threatened

[c] For an action with a may affect, likely to adversely affect (LAA), formal consultation with USFWS is required. In a BO, USFWS will specify that the proposed action will have one of three outcomes: no jeopardy; jeopardy with alternatives, jeopardy without alternatives.

Additionally, NPS consulted with NMFS regarding potential effects on listed salmonids from several other projects in the park, including:

- Lagunitas Creek Floodplain and Riparian Restoration Project (USFWS 2018b)
- Road Improvement and Maintenance Projects (NMFS 2014)

Table 7-3 summarizes the NMFS determinations for all recently completed section 7 consultations that have occurred between NPS and NMFS.

TABLE 7-3: RECENT CONSULTATIONS WITH NMFS AND DETERMINATIONS FOR ACTIONS IN THE ACTION AREA FOR ALL FEDERALLY LISTED/PROPOSED SPECIES AND DESIGNATED/PROPOSED CRITICAL HABITAT

Project	Park Unit	Type of Project	Species Addressed	NMFS Determination[a]	Date
Riparian Restoration Projects (NMFS 2016e)	Point Reyes National Seashore	Floodplain and Riparian Enhancement	Central California Coast coho salmon (*Oncorhynchus kisutch*)	LAA, No Jeopardy[b]	June 14, 2016
			Central California Coast steelhead trout (*Oncorhynchus mykiss*)	LAA, No Jeopardy[b]	
Road Projects (NMFS 2014)	Point Reyes National Seashore	Potential improvements to 12 miles of Sir Francis Drake Boulevard	Central California Coast coho salmon (*Oncorhynchus kisutch*)	LAA, No Jeopardy[b]	August 18, 2014
			Central California Coast steelhead trout (*Oncorhynchus mykiss*)	LAA, No Jeopardy[b]	

[a] ESA determinations: LAA = May affect, likely to adversely affect.

[b] For an action with a *may affect, likely to adversely affect* (LAA), formal consultation with USFWS is required. In a BO, USFWS will specify that the proposed action will have one of three outcomes: *no jeopardy; jeopardy with alternatives, jeopardy without alternatives*.

7.4 Monitoring Programs

7.4.1 Salmonid Monitoring

The San Francisco Bay Area Network (SFAN) monitors populations of coho salmon and steelhead in the park. The watersheds supporting salmon and steelhead in the action area are among the most intensively monitored watersheds in the CCC ESU. Though a relatively small geographic area, the coastal Marin County watershed supports a significant proportion of coho salmon in the ESU (Carlisle, Reichmuth, and McNeill 2018).

In 1998, the SFAN program and its partners began monitoring coho salmon and steelhead in the park to track trends in their distribution and abundance at key life stages in creeks known to be inhabited. Monitoring was also designed to identify changes in salmon and steelhead habitat and to determine trends in fish fitness (e.g., length, weight) at key life stages. Monitoring, as summarized in recent monitoring reports by Carlisle, Reichmuth, and McNeill (2016, 2017, 2018), includes:

- adult escapement surveys, which document the number of adult salmonids that successfully “escape” ocean fisheries and return to their natal streams to spawn, as well as the number of redds (gravel nests where salmonids lay their eggs) created;
- outmigrant smolt trapping, where the number of smolts (at least year-old juvenile salmonids that have undergone changes to cope with a marine environment) are captured, measured, and counted as they make their way towards the ocean; and
- basin-wide juvenile coho surveys and summer index reach monitoring that seek to quantify the number of juvenile salmonids present in the watersheds during the summer.

Through SFAN monitoring efforts, significant information has been documented regarding coho salmon behavior, life history, distribution, and population trends. The scope of this life-cycle monitoring program allows for characterization of regional patterns observed in the CCC ESU (Carlisle, Reichmuth, and McNeill 2018). In addition to SFAN monitoring in the park, which is supported through funding by CDFW and administered through Point Reyes National Seashore Association and in partnership with the Watershed Stewards Program, MMWD conducts extensive monitoring on stream reaches affected by reservoirs that 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 (MMWD 2018). NPS submits salmonid monitoring data to CDFW under the state's Coastal Monitoring Program. The Coastal Monitoring Program is based on redd count surveys of stream reaches using a statistically valid sampling design expanded to adult estimates based on spawner:redd ratios. The program is now informing NMFS's five-year status reviews and provides a substantially better basis for assessing status compared to previous status reviews (NMFS 2016f).

7.4.2 Water Quality Monitoring

Small, spring-fed streams and many ephemeral tributaries flow through the grasslands, shrublands, and wetlands of the action area and drain into Tomales Bay, the Pacific Ocean, or Drakes Bay and Drakes Estero. These streams and other natural and engineered water sources are ecologically important because they transport nutrients, sediment, and oxygen through the watershed and provide habitat for coho salmon and steelhead. Lagunitas Creek and its largest tributary, Olema Creek, provide significant habitat for coho salmon and steelhead. These watersheds have been the focus of extensive monitoring by the park's SFAN Freshwater Quality Monitoring Program, as well as the SFAN Coho and Steelhead Monitoring Program, SPAWN, and MMWD's Lagunitas Creek Fisheries Program. NPS has conducted water quality monitoring in the Lagunitas Creek watershed (including Olema Creek) and tributaries to Drakes Estero since 1999, and fisheries monitoring (focused on coho salmon and steelhead) since 1994. Core parameters measured in the field included temperature (air and water), DO, pH, specific conductance, and turbidity.

The San Francisco Bay Regional Water Quality Control Board (RWQCB) listed Tomales Bay and major Tomales Bay tributaries, including Lagunitas Creek and Olema Creek, as impaired for nutrients, pathogens, and sedimentation/siltation under section 303(d) of the Clean Water Act (SWRCB 2010). In 2006, the San Francisco RWQCB adopted a total maximum daily load (TMDL) for pathogens in the Tomales Bay watershed. 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 (nitrate as nitrogen and total Kjeldahl nitrogen).

NPS has conducted water quality monitoring since 1999 on Lagunitas and Olema Creeks and their tributaries. Over the period of record, monitoring has included different objectives, sites, and regimes, including targeted monitoring to search for potential pollutant sources, often coupled with implementation of water quality improvement projects, some of which included monitoring before and after implementation. A long-term data set exists for six primary Olema Creek monitoring sites, where monthly water quality monitoring was formalized under the SFAN Freshwater Quality Monitoring Program beginning in fall 2006 (Wallitner 2016; Wallitner and Pincetich 2017). SFAN also monitors two sampling sites in the Lagunitas Creek watershed on the rotating two-year cycle described below. Point Reyes 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. Data from secondary sites are not included in this report because they are not part of the SFAN monitoring program.

The general monitoring schedule for the SFAN Freshwater Quality Monitoring Program, as described by NPS (2016, 2017), involves a rotating basin approach in which each watershed is monitored monthly for a two-year period, whereby every four years, monitoring is performed at certain sites in a watershed. The only exception to the rotating basin approach is the Olema Creek watershed, which is monitored continuously (every water year). 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 for all monitored parameters. Only half of the SFAN freshwater quality parameters have objectives established by the San Francisco Bay RWQCB or the US Environmental Protection Agency; 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. The percentage of results that fails to meet any type of objective is referred to as the failure rate. Recent monitoring in Tomales Bay, Lagunitas Creek, and Olema Creek have observed exceedances (i.e., failure rates of bacteria criteria and elevated nutrient, suspended solids, and turbidity levels in the watershed, especially associated with stormwater runoff following high-intensity storm events) (Wallitner 2016; Wallitner and Pincetich 2017).

NPS will continue to follow this water quality monitoring program to assess current aquatic conditions and identify pollution sources, including problems associated with livestock operations in the action area. Exceedance of the thresholds will require discussion between NPS and NMFS to determine if consultation is needed, and NPS will inform NMFS and investigate the cause of exceedance. If the sediment and turbidity levels are directly related to livestock operations (for example, a muddy field draining directly to a stream), NPS will inform NMFS of the measures that will be taken to avoid and/or minimize sediment entry to the stream.

7.5 Water Quality in the Action Area

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 (NPS 2013; Pawley and Lay 2013). 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. Nutrients, pathogens, and contaminants are often bound to suspended or settled sediment particles in rivers, streams, or lakes and could constitute additional pollutant sources (Pachepsky and Shelton 2011; Thompson and Goyne 2012; Walling, Webb, and Russell 1997). Additionally, current and past land uses, including historical logging, agriculture and livestock activities, road construction, and stream channel modification have led to the loss of pollutant and stormwater attenuation capacity, altered drainage patterns, and increased sediment inputs to water resources (NPS 2001).

Temperature, a parameter monitored in the park, is critical for maintaining suitable habitat for native aquatic organisms. Thermal tolerance ranges for coho salmon are 53.6 degrees Fahrenheit (°F) to 66.2°F, while steelhead can handle warmer conditions, ranging from 55.4°F to 69.8°F. Elevated water temperatures lower water to store DO, which also reduces habitat suitability for salmon and steelhead (Ketcham 2001). Based on approximately 1,300 water samples in the park from 1999 to 2005, the majority of streams fall within the suitable range of water temperatures for salmonids during most of the year. Areas where water temperature exceeds the suitable water temperature for salmon and steelhead (>68ºF) are locations where salmonids do not occur (Pawley and Lay 2013).

DO is another parameter monitored in streams that potentially support salmon and steelhead in the action area. Adequate oxygen is necessary for each life stage of salmonid development (CDFW 2004). Pawley and Lay (2013) reported that from 1999 to 2005, many samples fell below the optimum DO concentration for coldwater fish (i.e., listed salmonids). Extremely low DO conditions have been reported in the Kehoe/Abbotts watershed, in Drake's Estero/Bay at A, B, and C Ranches, and in the tributaries draining to Drakes Estero. A significant number of exceedances have also occurred in the upper portion of the Olema watershed, primarily at ranch and horse stable sites.

Specific conductance of surface waters is an indicator of dissolved solids, which can be influenced by the geology of an area as well as urban runoff (Pawley and Lay 2013). High conductivity levels in freshwater streams can be indicative of pollution such as inflow from sewage or runoff from highways. Pawley and Lay (2013) reported that from 1999 to 2005, most stream monitoring stations in the action area had specific conductance values within the range target range that would not adversely affect fish migration and estuarine habitat.

Fecal contamination comes from inadequate management of animal wastes, especially manure from dairies and ranches. In the action area, fecal coliform has been tracked an indicator of agricultural pollutant source tracking because nutrients are rapidly diluted in streams (Ketcham 2001). Pawley and Lay (2013) reported the results of monitoring total coliform and fecal coliform bacteria in Point Reyes from 1999 to 2005, finding many exceedances of total coliform in the Kehoe/Abbotts and Drakes Estero watersheds. They also reported many exceedances of fecal coliform in the Kehoe/Abbotts and Drakes Estero watersheds, with exceedances in all watersheds, particularly near dairies (Pawley and Lay 2013).

pH is a measurement of a water's acidity. Low pH, commonly a result of acid rain, can directly or indirectly cause the death of aquatic biota. Pawley and Lay (2013) reported that from 1999 to 2005, 95% of stream water samples had pH values within the acceptable range. Pawley and Lay (2013) also detailed other water quality parameters monitored in the action area, including turbidity, conductivity, total nitrogen, phosphorus, and ammonia

Aoyama et al. (2018) report that over the last 20 years in the action area, more than 85 riparian restoration and water quality improvement practices have been implemented. Projects in the Tomales Bay watershed have received funding from SWRCB under 319(h) grants and from the USDA, NRCS Environmental Quality Incentives Program. Riparian restoration projects have focused on benefits to salmonids and other sensitive aquatic resources and complying with TMDL regulations for pathogens. Practices implemented include riparian cattle exclusion fencing, erosion feature repair, stream crossings, road rehabilitation and decommissioning, and off-stream water sources. Some riparian areas are included in larger pasture units that can be managed for riparian health (Aoyama et al. 2018).

7.5.1 Tomales Bay Watershed

Recent monitoring studies in Tomales Bay, Lagunitas Creek, and Olema Creek have observed exceedances of bacteria criteria and elevated nutrient, suspended solids, and turbidity levels in the watershed especially associated with stormwater runoff following high-intensity storm events (Crunkilton 2000, as cited by NPS 2013, 2004, and 2017; SWRCB 2013; Wallitner 2016). Sampling from 2007 to 2012 recorded the most exceedances of the fecal coliform single sample contact recreation objective during the dry season at the Lagunitas Creek/Tomales Bay interface with limited exceedances of the shellfishing objective at Bay sites; no samples were taken during storm events (SWRCB 2013). Elevated fecal coliform levels were recorded in Lagunitas Creek watershed from 2007 to 2012; approximately one-third of the fecal coliform samples exceeded the single sample contact recreation objective (SWRCB 2013). Long-term trend analysis in the Olema Creek watershed indicates fecal coliform concentrations have decreased over time (1999 to 2017; Voeller et al. 2018). Although the general, long-term fecal coliform trend was downward, the effect of nonpoint source pollution was observed in that period as increases in precipitation resulting in increases in bacteria concentrations. Short-term watershed assessment monitoring (January 2016 to May 2018) showed spatial and temporal changes by season (i.e., storm, winter base flow, or summer base flow). For all sample periods, an increase in fecal coliform and *E. coli* concentrations was observed moving upstream to downstream. The highest concentrations were recorded during storm periods, while the lowest concentrations were observed during the winter. The storm sampling period had the most exceedances of the San Francisco Bay RWQCB single sample water quality objective compared to the winter and summer periods. The geometric mean objective was exceeded more in the winter when there is greater hydrologic connectivity than in summer. Overall, the long-term decrease in fecal coliform concentrations from 1999 to 2017 parallels the increased conservation practices in the watershed for reducing pathogen, sediment, and nutrient loading to local streams.

7.5.2 Drakes Bay Watershed

NPS programs and other sampling programs have observed high concentrations of total suspended solids and nutrients in Drakes Bay and Drakes Estero (NPS 2004; Pawley and Lay 2013). Surrounding land uses such as ranches and pastures for dairies and other livestock operations contribute nutrients and sediment to Drakes Bay and Drakes Estero (NPS 2004). Occasionally high bacteria counts have been observed in some drainages (Pawley and Lay 2013). Bacteria pollutant sources in this watershed include stormwater runoff from pasture and grazing land, sewage systems, wildlife, and boat discharges (CDPH 2011). Drakes Estero has been proposed as a new listing because of bacteria in the 2016 section 303(d) and 305(b) Integrated Report (San Francisco Bay RWQCB 2017).

7.6 Past and Current Activities in the Action Area

Coho salmon and steelhead in the action area have been declining since the turn of the century, with significant declines occurring as late as the mid-1950s. Most historical information on salmonid numbers is anecdotal, while quantified data are lacking. After European settlement, extensive habitat alteration by dam-construction, logging, and channelization led to declines in salmon and steelhead habitat (Moyle et al. 2008). Multiple past and current activities in the action area have affected salmon and steelhead and their aquatic habitats. The potentially affected federally listed species include: coho salmon, steelhead, and Chinook salmon. In addition to agriculture, other activities that have affected salmon in California according to Moyle et al. (2017) and could be applicable to watersheds in the action area, include: (1) dams and water infrastructure; (2) transportation infrastructure; (3) human development, (4) park visitation, (5) stream restoration projects, (6) fishing and harvesting, and (7) wildfire management.

7.6.1 Dams and Water Infrastructure

Streams, lakes, wetlands, and groundwater resources in the action area have been altered by a variety of factors such as water withdrawal (surface and groundwater), impoundments (dams and culverts), channelization and levees, channel hardening, expansion of impervious surfaces, loss of riparian buffers, and changes in runoff characteristics from changes in plant community composition. For example, the main stem of Lagunitas Creek was reduced by more than 50% by construction of Alpine Dam in 1918 and Peters Dam in 1953. Because neither dam has provisions for fish passage, their construction resulted in permanent loss of the upper portion of the drainage to anadromous fish (NPS 2004). Lagunitas Creek is used as part of the municipal water supply for Marin County. A series of dams operated by MMWD supply much of southern Marin from Kent Reservoir on the main stem and Nicasio Reservoir on Nicasio Creek. Well water diversions at the downstream end of the watershed supply MMWD's West Marin Service Area. Numerous earthen dams in the park also pose problems to aquatic habitat and fish migration (Pawley and Lay 2013).

7.6.2 Transportation Infrastructure

Stream crossings for transportation purposes cross over or through many stream channels in the action area, including culverts and bridges. Culverts vary in the degree of their impact on stream morphology but can be problematic for salmon and steelhead. If undersized or constructed improperly, culverts in danger of failing cause localized erosion, channel downcutting, and resultant aquatic habitat degradation (Pawley and Lay 2013). Culverts often create temporal, partial, or complete barriers for salmon and steelhead during their spawning migrations (Robison et al. 1999). An inventory of stream crossings on roads maintained by Marin County was conducted in 2002 and 2003, focused primarily on watersheds known to support runs of salmon and steelhead. This Stream Crossing Inventory and Fish Passage Evaluation Report identified and prioritized culvert locations to fix that would result in unimpeded passage for all species (and life stages) of salmonids (Ross Taylor and Associates 2003). In 2007, NPS removed or replaced culverts with bridges at five other sites in the Drake's Estero watershed to improve geomorphic process and fish passage. More recently, NPS, in cooperation with the Federal Highway Administration, proposed to repair 22 miles of road and adjacent parking areas in the park. This program includes road projects on Sir Francis Drake Boulevard to replace the existing culverts under at East Schooner Creek with a single-span bridge and restore and stabilize approximately 710 feet of Sir Francis Drake Boulevard that is severely eroded. Also, CalTrans recently completed improvements at two sites along Highway 1 in Olema Valley.

7.6.3 Human Development

The watersheds in the action area beyond the park are expected to experience increasing human development in the form of moderately dense development permitted in the various villages, which would include infrastructure, roadways, and associated impervious surfaces (Marin County 2014). In the Lagunitas Creek watershed, additional development could increase water demand, which would affect stream flows if current allocations are not fully used because water in Lagunitas Creek is fully appropriated (NMFS 2004). A variety of factors outside the park, such as water withdrawal (surface and groundwater), impoundments (dams and culverts), channelization and levees, channel hardening, expansion of impervious surfaces, loss of riparian buffers, and changes in runoff characteristics due to changes in plant community composition, can alter streams, lakes, wetlands, and groundwater resources in the action area. Water transport and diversion also affect stream processes such as sediment deposition and erosion, stream meandering, and flow regimes,

7.6.4 Park Visitation

Increased park visitation affects aquatic habitats because traffic and associated pollutants from roads increase. Ground disturbance and vegetation clearing associated with road maintenance and poorly maintained legacy roads and trails, coupled with heavy use in areas with high levels of visitation, could exacerbate erosion. Storm runoff from roads and areas with high human traffic could increase sedimentation and pollutant discharge into freshwater streams that are used by salmon and steelhead. In addition, road crossings could be problematic to aquatic wildlife if culverts or other crossing structures prevent fish passage. Lastly, park visitors could directly affect salmon and steelhead through disturbance during spawning due to off-trail horse use and visitors spooking fish while spawning.

7.6.5 Stream Restoration Projects

Numerous stream restoration projects have been conducted during the past couple decades in the action area, and additional projects are expected to occur. For example, MMWD has implemented streambank stabilization projects, winter habitat enhancement projects, and other habitat enhancement actions in the Lagunitas Creek watershed (MMWD 2011). Restoration activities outside the park may cause temporary increases in turbidity, alter channel dynamics and stability, and temporarily stress salmonids (Habersack and Nachtnebel 1995). However, stream restoration projects are expected to have long-term benefits from increased habitat availability and complexity, increased channel and bank stability, improved spawning habitat, decreased sedimentation, and increased shading and cover for salmonids. Some aspects of aquatic habitat in the action area are expected to improve as a result of the restoration actions described above.

Throughout the action area, more than 85 riparian restoration and water quality improvement practices have been implemented in the last two decades, including riparian cattle exclusion fencing, erosion feature repair, stream crossings, road rehabilitation and decommissioning, and off-stream water sources. The SPAWN – Lagunitas Creek-Tocaloma/Jewell Floodplain and Riparian Enhancement Project is focused on restoring floodplain and riparian habitats in the Jewell and Tocaloma areas of Lagunitas Creek watershed. Projects in the Tomales Bay watershed have received funding from SWRCB under 319(h) grants and from the USDA NRCS Environmental Quality Incentives Program, among others, to assist with assessment, design, and implementation to comply with regulations, including the pathogen TMDL (Aoyama et al. 2018).

MMWD has implemented several streambank stabilization projects, winter habitat enhancement projects, and other habitat enhancement actions in the Lagunitas Creek watershed (MMWD 2011). Multiple entities are focused on habitat enhancement and restoration in the Lagunitas Creek watershed to support endangered coho salmon. MMWD began implementing the Lagunitas Creek Winter Habitat and Floodplain Enhancement Project, implementing actions at 10 sites to enhance winter habitat and floodplain function. In summer 2018, the SPAWN program 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. Restoration activities are expected to continue in 2019 and 2020 at specific sites along the Lagunitas Creek corridor.

7.6.6 Fishing and Harvesting

Historically the Lagunitas and Olema Creek drainages supported large runs of spawning coho salmon and steelhead, with sufficient reproduction to support a fishery in Tomales Bay at the end of the 1800s (Moyle et al. 2008). Currently, fishing is closed in Lagunitas Creek and its tributaries, and in all inland freshwater steams in the park, so there is currently no take of coho salmon, steelhead, or Chinook salmon in the action area.

7.6.7 Wildfire Management

Fire may lead to temporary increases in fine sediment in streams that potentially support salmon and steelhead, which can degrade egg and fry habitat in the short term. However, wildfire can improve habitat quality for adult and overwintering fish by increasing instream wood. The most recent wildfire affecting the action area was the 1995 Vision Fire. In July 2004, the park completed a *Fire Management Plan and Environmental Impact Statement for Point Reyes National Seashore and for the Northern District of Golden Gate National Recreation Area* (NPS 2004). The plan provides a framework for all fire management activities in the park, including suppression of unplanned ignitions, prescribed fire, and mechanical fuels treatments; it is intended to guide the fire management program for the next 10 to 15 years. In accordance with NPS policy, the plan is responsive to the park's natural and cultural resource objectives, reduces risk of fire to developed facilities and adjacent communities, and provides for public and staff safety. Up to 3,500 acres annually could be burned or mechanically treated over the next decade as a result of the plan. Some of the Fire Management Units identified in the plan are in the action area. Prescribed burning could occur in the future in the action area for resource management (e.g., invasive species control). In 2018, NPS signed an agreement with Marin County to transfer most wildland fire operations and response actions to Marin County. Under this agreement, Marin County may implement mechanical treatments and conduct prescribed fire burns to reduce the risk in the Wildland Urban Interface.

8.0 EFFECTS TO EVALUATED SPECIES AND DETERMINATIONS

Potential effects to federally listed salmonids and their habitat in the action area were evaluated by considering predicted changes in ecosystem processes resulting from proposed grazing and ranch activities. The area of analysis includes watersheds in the action area that are potentially used by coho salmon, steelhead, and Chinook salmon. Additionally, potential effects on aquatic habitats downstream of the action area were considered.

8.1 Effects on Central California Coast Coho Salmon, Including Critical Habitat

8.1.1 Direct and Indirect Effects on Coho Salmon

8.1.1.1 Effects of Livestock Grazing

Grazing could affect coho salmon by increasing erosion into streams. Grazing reduces the amount of vegetation available to capture water and compacts soil, which reduces infiltration and available water capacity of rangeland soils. Soil compaction increases runoff, which carries topsoil and sediments into creeks and rivers during storm events. According to NMFS (2004), "High concentrations of suspended sediment can affect coho salmon in several ways, including increased mortality, reduced feeding efficiency, and decreased food availability (Berg and Northcote 1985; McLeay et al. 2002; Newcombe 1994; Gregory and Northcote 1993; Velagic 1995; Waters 1995). Substantial sedimentation rates could bury benthic macroinvertebrates that serve as food for coho salmon (Ellis 1936, Cordone and Kelley 1961), degrade instream habitat conditions (Cordone and Kelley 1961; Bjornn et al. 1977; Eaglin and Hubert 1993), cause reductions in fish abundance (Alexander and Hansen 1986; Bjornn et al. 1977; Berkman and Rabeni 1987), and reduce growth in salmonids (Crouse et al. 1981). Waters with high turbidity are avoided by migrating salmonids, and high amounts of suspended sediment can delay migration to spawning grounds (Bjornn and Reiser 1991). Sedimentation of redds can kill both eggs and alevins (Bjornn and Reiser 1991)."

While cattle are excluded from most riparian areas adjacent to streams used by coho salmon,[3] livestock grazing in riparian areas of tributary streams could reduce vegetative cover of tributary streams, which would reduce hiding cover for coho salmon or elevate stream temperatures to unsuitable levels. Elevated water temperatures reduce the ability of the water to hold DO, of which an adequate level is necessary for each life stage of coho salmon (CDFW 2004). In addition to increased runoff and erosion from uplands in the watershed, livestock grazing in riparian areas could also increase water turbidity, which could lead to reduced habitat for coho salmon from sedimentation of streambeds (Belsky, Matzke, and Uselman 1999). Livestock with access to stream channels could also trample stream banks and contribute excess nutrients via manure

[3] Livestock grazing is excluded from Lagunitas and Olema Creeks. In addition, cattle grazing is restricted from several tributaries that could support coho salmon.

and urine, which could affect coho salmon by increasing sedimentation and turbidity, increasing water temperatures, and reducing DO (Belsky, Matzke, and Uselman 1999).

Beef and dairy ranching in the action area could contribute nutrients, sediment, bacterial contaminants, and other pollutants into surface waters. Livestock wastes, if not contained, could contribute nutrients that stimulate algal and aquatic plant growth that, if excessive, could lead to die offs of aquatic organisms from a loss of DO as the algae decomposes. Tomales Bay and major Tomales Bay tributaries, including Lagunitas Creek and Olema Creek, are listed as impaired under section 303(d) of the Clean Water Act due to pathogens and sedimentation/siltation. In addition to other factors, agricultural activities and manure from animal feeding operations (e.g., dairies) in the action area contribute nutrients and other pollutants into waters used by coho salmon (Ghodrati and Tuden 2005; San Francisco Bay RWQCB 2016). In the Tomales Bay watershed, runoff during storm events is an important factor that affects pollutant loading and water quality on the Clean Water Act 303(d)-listed Tomales Bay and its tributaries, including Lagunitas and Olema Creeks (SWRCB 2013).

In spite of the above described potential adverse effects of livestock on coho salmon, the actual effects are likely far reduced from those noted for the following reasons: (1) livestock grazing is managed to avoid heavy grazing via monitoring that would ensure an average of 1,200 pounds per acre of RDM in the fall in accordance with Bartolome et al. (2015); (2) grazed riparian areas in grazed pasture are managed for riparian health, and riparian areas would be monitored per Aoyama et al. (2018) following guidelines from the University of California, Division of Agriculture and Natural Resources (Ward, Tate, and Atwell 2012a, 2012b); (4) livestock are prevented from accessing Olema Creek and Lagunitas Creek and numerous tributaries; (5) many streams in the action area are steep wooded canyons that preclude access by livestock; and (6) most ranches along Lagunitas Creek, Olema Creek, and elsewhere in the park, have developed upland water sources for livestock, which reduces livestock from using most intermittent streams;. See table 7-1, in section 7.1, for further detail about the length of streams potentially supporting coho salmon, steelhead, and Chinook salmon in the action area. Because of the limited access of livestock to most streams in the action area, adverse effects of livestock grazing would be mostly avoided. Furthermore, increased stormwater runoff and sedimentation from cattle grazing of upland areas is unlikely to occur in amounts that would harm coho salmon.

8.1.1.2 Effects of Pasture Management Activities

Row crops in the Ranch Core subzone could increase the potential for nonpoint source sediment and/or nutrient loading to water resources; however, restricting these activities to previously disturbed land and implementing management activity standards (see appendix D of the EIS), mitigation measures (see table 3-2 in section 3.3), and nutrient management plans would minimize or prevent adverse impacts. Many ranchers manage manure from animal feeding operations by applying it as fertilizer to fields in the action area. If applied in excess of what can be taken up by growing plants, the nutrients and coliform bacteria in manure could leach into groundwater or runoff and pollute nearby streams or wetlands. As described above, stormwater runoff is an important factor affecting pollutant loading and water quality in the 303(d)-listed Tomales Bay watershed, including Lagunitas and Olema Creeks (SWRCB 2013). The potential for water pollution from silage storage is a concern because silage leachate has high levels of nitrate, a highly mobile form of nitrogen, and extremely high biochemical oxygen demand. The highest nitrite levels in Lagunitas and Olema Creeks occur during storm events, most likely as a result of stormwater runoff on agricultural fields where manure is spread or around ranch headquarters where ground disturbance is greatest. If excessive nutrients were to occur in stormwater runoff, it could affect coho salmon or their invertebrate prey from a loss of DO associated with increased algal and aquatic plant growth. Continued ranching in the action area could have long-term, adverse effects by contributing nutrients and other pollutants into waters, although recent water quality data show a significant reduction in fecal coliform concentrations in the action area (San Francisco Bay RWQCB 2016).

8.1.1.3 Effects of Ranch Management Activities

Activities associated with ranching in the action area could indirectly affect coho salmon by causing erosion in upland areas from ground disturbance associated with human activity, vehicles, and machinery, and the maintenance and possible construction of new ranch buildings and other infrastructure. Also, the authorization and potential use of other livestock for diversification could change the type and amount of pathogens and nutrients entering streams through nonpoint sources. Adverse effects from sedimentation of streams potentially occupied by coho salmon could reduce pool depths, increase gravel embeddedness, and create wider, shallower stream channels. Adverse effects from potential nutrient and pathogen pollution from ranch management activities would be the same as described above for pasture management activities, but to a lesser extent because the Ranch Core subzone would occupy about 1% of the action area and include approximately 0.2% of stream miles.

8.1.2 Avoidance, Minimization, and/or Mitigation Measures for Coho Salmon

The potential for adverse impacts on coho salmon from the proposed action would be avoided, minimized, or mitigated through the implementation of management activity standards (see appendix D of the EIS) and mitigation measures (see table 3-2 in section 3.3). Potential effects would be minimized or prevented by implementing range management guidelines that minimize erosion and stormwater runoff. The most land-intense activities would be prohibited from the Range subzone, which includes approximately 77% of the stream miles in the action area. Most other surface water resources are contained in resource protection exclusion areas, which include fencing that excludes livestock from potential streams occupied by coho salmon. 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 would thus only directly affect habitat for salmon and steelhead on occasion if they were to breach pasture fences into excluded riparian areas. Also, dairy ranching and associated ranch practices like forage production and manure spreading would not occur in any watersheds potentially supporting coho salmon. Within the Pasture and Ranch Core subzones, management activity standards (see appendix D of the EIS) and mitigation measures (see table 3-2 in section 3.3) would be implemented to reduce impacts of ground-disturbing activities, ranch diversification activities, and livestock diversification practices that would effectively minimize any effects of sediment- or pollutant-laden stormwater runoff. Impacts in the Range subzone would be avoided or minimized through continued adherence to the RDM standards of Bartolome et al. (2015). These standards would require a “moderate” level of grazing that protects soil from erosion and maintains rangeland plant community health (Bartolome et al. 2006). Water quality has been improving in Lagunitas and Olema Creeks for the past two decades and is expected to improve due to implementation of BMPs.

Commercial fertilizer would no longer be authorized in the park under the proposed action. Runoff laden with nitrogen and phosphorus from fields following manure application is a potential source of water pollution, but effective management options would be implemented for soil and nutrient stabilization. The adherence to management activity standards (see appendix D of the EIS) would serve to avoid or minimize any potential adverse effects of leachate flowing into groundwater or surface waters, thereby minimizing and avoiding adverse effects on coho salmon. However, potential effects from pasture management would be negligible to low with the implementation of additional mitigation measures (see table 3-2 in section 3.3).

Also, all confined animal facilities (i.e., dairies) must comply with California animal waste discharge standards, which include compliance with a monitoring and reporting program, and development and implementation of site-specific management plans. Water quality has been improving in Lagunitas and Olema Creeks for the past two decades, and adverse impacts would continue to be reduced as ranchers minimize soil erosion and follow required nutrient management practices.

8.1.3 Cumulative Effects on Coho Salmon

Cumulative effects are defined differently under the ESA than under NEPA. Under the ESA, cumulative effects are reasonably foreseeable future state, private, and tribal activities only. For ESA cumulative effects, the effects of past or future federal actions are not considered. Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. ESA cumulative effects are additive to the environmental baseline (past and ongoing actions and their effects) described above in section 7 of this BA. Conversely, under NEPA, cumulative effects include all past and ongoing actions and their effects that are additive to the effects from all reasonably foreseeable future actions (federal and nonfederal). For ESA consultation purposes in this BA, the ESA definition of cumulative effects is followed.

No reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CCC coho salmon or its habitat would occur in the action area. All projects by entities other than NPS, such as state highway projects or stream restoration projects, have had prior programmatic or project-specific section 7 consultations (see section 7.3).

8.1.4 Conclusion

Although CCC coho salmon populations are declining throughout the ESU, the Lagunitas Creek population is the most abundant ESU. NPS has focused its management of coho salmon restoration on both passive (i.e., fencing) and active restoration (e.g., instream habitat enhancement). Most streams in the action area potentially used by coho salmon are excluded from grazing, and additional resource protection exclusion areas and mitigation measures would further avoid or minimize effects. Therefore, adverse effects from ranching would generally be minimized or avoided but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CCC coho salmon ESU. The proposed action is not likely to result in destruction or adverse modification of critical habitat designated for CCC coho salmon.

8.2 Effects to Central California Coast Steelhead Trout, Including Critical Habitat

8.2.1 Direct and Indirect Effects on Steelhead Trout

The effects of permitted ranch operations on steelhead under the proposed action would be the same as those described above for coho salmon. In addition to potential effects of beef ranching on approximately 8,800 acres in the Lagunitas and Olema Creek watersheds, potential effects could occur from ranching on approximately 8,200 acres in the Drakes Bay Estero watershed (see attachment A, figure L-3). Dairy ranching would not affect steelhead because steelhead do not occur in the watersheds where the six dairies are located (Drakes Bay, Kehoe and Abbotts Lagoon; see attachment A, figure L-3). Cattle are excluded from direct access to Lagunitas and Olema Creeks, the two most significant streams occupied by steelhead in the action area. In the few riparian areas where beef cattle are not excluded from perennial streams, cattle herbivory and trampling could alter riparian vegetation and hydraulic and geomorphic processes, which could negatively affect aquatic habitat and water quality in streams occupied by spawning adult and developing juvenile steelhead. Cattle could also infrequently breach fences into riparian areas because they are drawn to the cooler temperatures, shade, available water, and high-quality forage, particularly during seasonally dry periods (Belsky, Matzke, and Uselman 1999). Also, haylage would continue to be authorized on approximately 175 acres on the G Ranch, and manure spreading could occur on approximately 115 acres on the E Ranch, both in the Drakes Estero watershed where steelhead could occur downstream in Schooner and Creamery Bays.

8.2.2 Avoidance, Minimization, and/or Mitigation Measures for Steelhead Trout

The potential for adverse impacts on steelhead from the proposed action would be avoided, minimized, or mitigated through the implementation of mitigation measures (see table 3-2 in section 3.3). Continued compliance with TMDL regulations for pathogen in Tomales Bay would dictate that necessary measures are taken to minimize or prevent potential adverse impacts on water quality, which could affect steelhead. Ranchers' application of management activity standards (see appendix D of the EIS) would also reduce erosion and minimize potential sediment- or pollutant-laden stormwater runoff into streams. Livestock grazing would continue to be avoided in riparian areas of streams potentially supporting steelhead.

The zoning framework would specify that only grazing would be authorized in approximately 70% of the action area, minimizing impacts on fish that could result from more intensive agricultural activities. Also, new resource protection exclusion areas would protect approximately 370 acres in the Drakes Estero watershed, which includes resource protection exclusion areas to prevent cattle grazing along the Drakes Estero shoreline, including portions of Creamery Bay, Schooner Bay, and Home Bay. This acreage includes new exlosures along approximately 1.35 miles of perennial streams on North Schooner Creek between the D and M Ranches, along lower Home Ranch Creek and the adjacent tributary to Home Bay, and at the inlet of Creamery Bay. In the Olema Creek watershed, new resource protection exclusion areas would 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 the upper reaches of Devil's Gulch with a new 60-acre exclosure, and an additional 5 acres of resource protection exclusion areas would be implemented along other reaches of important aquatic habitat.

8.2.3 Cumulative Effects on Steelhead Trout

There are no reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CCC steelhead or its habitat within the action area.

8.2.4 Conclusion

Nearly all stream reaches in the action area that are potentially occupied by steelhead are excluded from grazing. The implementation of additional management activity standards and mitigation measures for ranch activities would avoid most potential adverse effects on the species. The application of added resource protection exclusion areas would further avoid or minimize effects. Adverse effects from ranching would be avoided, but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CCC steelhead DPS. Furthermore, the proposed action is not likely to result in destruction or adverse modification of critical habitat designated for CCC steelhead.

8.3 Effects to California Coastal Chinook Salmon

8.3.1 Direct and Indirect Effects on Chinook Salmon

The effects of permitted cattle operations on CC Chinook salmon under the proposed action would be the same as those described for coho salmon and would be restricted to beef cattle operations in the Lagunitas Creek watershed (see attachment A, figure L-1). These effects would result from livestock grazing potentially indirectly affecting aquatic habitat and water quality in streams occupied by spawning adult and developing juvenile Chinook salmon. The geographic context of these effects would be less because of the smaller number and more restricted distribution of Chinook salmon relative to coho salmon in the action area.

8.3.2 Avoidance, Minimization, and/or Mitigation Measures for Chinook Salmon

The potential for adverse impacts on CC Chinook salmon from the proposed action would be avoided, minimized, or mitigated through the implementation of mitigation measures (see table 3-2 in section 3.3). The implementation of management activity standards (see appendix D of the EIS) on ranches would help reduce erosion and minimize potential sediment- or pollutant-laden stormwater runoff into streams. In addition, livestock grazing would continue to be avoided in riparian areas of streams potentially supporting Chinook salmon.

8.3.3 Cumulative Effects on Chinook Salmon

There are no reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CC Chinook salmon or its habitat within the action area.

8.3.4 Conclusion

Stream reaches in the action area that are potentially occupied by Chinook salmon are excluded from grazing. The implementation of additional management activity standards and mitigation measures for ranch activities would avoid most potential adverse effects on the species. The application of added resource protection exclusion areas would further avoid or minimize effects. Adverse effects from ranching would be avoided, but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CC Chinook salmon ESU.

9.0 EFFECTS DETERMINATION SUMMARY

Livestock grazing has been shown to be compatible with the continued persistence of the federally listed salmon and steelhead considered in this BA. Potential effects on listed salmon and steelhead would continue to be avoided or minimized under the proposed action via implementation of numerous added mitigation measures. Additionally, the continued monitoring of salmon and steelhead and their habitats would ensure that any adverse effects are identified and adequately avoided, minimized, or mitigated.

Table 9-1 provides a summary of the effects determinations for these species, subspecies, or DPS/ESU. In most cases, the way in which livestock grazing benefits these and other special-status species is by mitigating the negative effects of aggressive, highly competitive non-native plants.

TABLE 9-1: EFFECT DETERMINATIONS FOR FEDERALLY THREATENED AND ENDANGERED SPECIES, AND DESIGNATED/PROPOSED CRITICAL HABITAT THAT ARE KNOWN OR EXPECTED TO OCCUR IN THE ACTION AREA

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Fish				
Central California Coast coho salmon	*Oncorhynchus kisutch*	T	NLAA	Ranch activities, including livestock grazing, could affect habitat by changing streambank and channel morphology, reducing hiding cover, increasing water temperatures, and impairing water quality. However, cattle are excluded from most riparian areas in the park and continued livestock grazing is unlikely to result in adverse effects on the species (USFWS 2002).
Central California Coast coho salmon critical habitat	N/A	N/A	NDAM	See above under "Central California Coast coho salmon."
Central California Coast steelhead trout	*Oncorhynchus mykiss*	T	LAA	See above under "Central California Coast coho salmon." Continued livestock grazing in the park is unlikely to result in adverse effects on the species (USFWS 2002).
Central California Coast steelhead trout critical habitat	N/A	N/A	NDAM	See above under "Central California Coast steelhead trout."
California coastal Chinook salmon	*Oncorhynchus tshawytscha*	T	LAA	Grazing may alter habitat but is considered low level threat (CDFW 2010).

[a] Status Codes: E – federally listed endangered; T – federally listed threatened.

[b] ESA determinations: NLAA – may affect, not likely to adversely affect; NDAM – no destruction or adverse modification; LAA – likely to adversely affect

10.0 NEED FOR REASSESSMENT BASED ON CHANGED CONDITIONS

This BA and the findings above are based on the best current data and scientific information available. A new analysis and revised BA will be prepared if one or more of the following occurs: (1) new species information (including but not limited to a newly discovered activity area or other species information) reveals effects on threatened, endangered, proposed species, or designated/proposed critical habitat in a manner or to an extent not considered in this assessment; (2) the action is subsequently modified or it is not fully implemented as described herein, which causes an effect that was not considered in this assessment; or (3) a new species is listed or critical habitat is designated that may be affected by the action that was not previously analyzed herein.

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Attachment A: Figures

Figures with the locations of threatened and endangered species within the planning area are for NMFS review only and are not included in the public document.

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