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

AUGUST 2019

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US DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE
GENERAL MANAGEMENT PLAN AMENDMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Lead Agency: National Park Service

This draft environmental impact statement (EIS) for a general management plan amendment (GMP Amendment) for Point Reyes National Seashore and the north district of Golden Gate National Recreation Area was prepared for the National Park Service (NPS) to update management guidance for more than 28,000 acres of national park system lands, including all lands currently leased for beef and dairy ranching. 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 planning area. In this context, the EIS will address the future management of leased ranch lands and tule elk in the planning area.

This draft EIS presents six alternatives. These alternatives address the preservation of natural and cultural resources, the management of infrastructure and visitor use, as well as the future management of leased ranch lands and tule elk in the planning area. The draft EIS analyzes the beneficial and adverse impacts on the human environment (i.e., physical, natural, cultural, and socioeconomic resources) that would result from implementing any of the alternatives considered. NPS has identified alternative B as the preferred alternative in this draft EIS. Upon conclusion of the EIS and decision-making process, one of the alternatives, or a combination of alternative elements will be selected for implementation and will update guidance for preserving natural and cultural resources, managing infrastructure and visitor use, and, as appropriate, directing specific strategies for managing lease/permits and tule elk for lands in the planning area.

The review period for this document will end 45 days after publication of the US Environmental Protection Agency Notice of Availability in the *Federal Register*. Comments will be accepted during the comment period through the NPS Planning, Environment, and Public Comment website at http://parkplanning.nps.gov/POREGMPA or in hard copy delivered by the US Postal Service or other mail delivery service or hand-delivered to the address below. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted. Before including your address, telephone number, electronic mail address, or other personal identifying information in your comments, you should be aware that your entire comment (including your personal identifying information) may be made publicly available at any time. While you can ask us in your comments to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

For more information, visit http://parkplanning.nps.gov/POREGMPA.

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EXECUTIVE SUMMARY

This draft 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 referred to as the park) presents six alternatives for establishing updated management guidance for more than 28,000 acres of National Park Service (NPS) lands, including all lands currently leased for beef and dairy ranching. These alternatives address the preservation of natural and cultural resources, the management of infrastructure and visitor use, as well as the future management of leased ranch lands and tule elk in the planning area. The draft EIS analyzes the beneficial and adverse impacts on the human environment (i.e., physical, natural, cultural, and socioeconomic resources) that would result from implementing any of the alternatives considered. Upon conclusion of the EIS and decision-making process, one of the alternatives, or a combination of alternative elements will be selected for implementation and will update guidance for preserving natural and cultural resources, managing infrastructure and visitor use, and, as appropriate, directing specific strategies for managing lease/permits and tule elk for lands in the planning area.

BACKGROUND AND ISSUES RELATED TO THE PROJECT

Congress passed legislation authorizing the establishment of Point Reyes National Seashore in 1962 and Golden Gate National Recreation Area in 1972. In 1978, Congress enacted legislation for both Point Reyes and Golden Gate providing standardized language for the leasing of land for agricultural purposes (16 United States Code [U.S.C.] §§ 459c-5(a) and (b) and 460bb-2(j)). These amendments allow NPS to lease agricultural lands subject to any restrictive covenants deemed necessary and directed NPS to first offer such leases to the person who owned or leased the land prior to its acquisition by the United States. NPS uses these statutory authorities to issue agricultural lease/special use permits (lease/permits) for ongoing traditional ranching and dairying operations when a rancher's reserved right expires.

In 1980, NPS issued a combined general management plan for Point Reyes and Golden Gate (1980 GMP). The 1980 GMP established management objectives, land management zones, and additional program guidance and direction. Within the land management zoning framework, the 1980 GMP included a pastoral zone that was established to permit the continued use of existing ranchlands for ranching and dairying purposes. In 2014, NPS completed an updated GMP for Golden Gate National Recreation Area and Muir Woods National Monument. However, most of that plan did not address management of the north district of Golden Gate that is included in this planning area and had previously been addressed in the 1980 GMP.

Today, 24 families hold lease/permits or Reservations of Use and Occupancy on approximately 18,000 acres of Point Reyes and 10,000 acres of the north district of Golden Gate. Approximately 2,400 animal units of livestock for beef ranching and 3,315 dairy animals are currently permitted. Eighteen lease/permits include residential uses specific to on-site ranch operations. Most active beef and dairy cattle operations occur in the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District, which are both listed in the National Register of Historic Places (National Register).

Two separate free-ranging tule elk herds occur within the planning area—Drakes Beach herd and the Limantour herd. Tule elk, the smallest subspecies of North American elk, live only in California. Tule elk were extirpated from Point Reyes by the 1860s. Consistent with Congressional direction, 10 tule elk were successfully reintroduced to a 2,600-acre fenced wilderness reserve on Tomales Point in 1978. The 1998 Tule Elk Management Plan/Environmental Assessment established a free-ranging herd near Limantour Beach beginning with 28 animals in 1999 with an interim management limit of 250 to 350 elk and did not contemplate the expansion of tule elk into the ranchlands. At the end of 2018, the Drakes Beach herd consisted of an estimated 124 total animals and the Limantour herd consisted of an estimated 174 total animals (NPS, Press, pers. comm. 2019c).

As a result of litigation and a multi-party Settlement Agreement, NPS agreed to prepare this GMP Amendment and EIS 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. The Settlement Agreement preserves NPS's ability 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.

PURPOSE AND NEED FOR TAKING ACTION

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 planning area. In this context, the EIS addresses the future management of tule elk and leased ranch lands in the planning area. Action is needed at this time to address the management of approximately 28,000 acres of land currently leased for ranching, which is the park's highest priority planning issue. Action is also needed to comply with the terms of the Settlement Agreement approved by the US District Court for the Northern District of California on July 14, 2017, under which NPS agreed to prepare a GMP Amendment addressing the management of lands currently leased for ranching.

DECISIONS TO BE MADE IN THE ENVIRONMENTAL IMPACT STATEMENT

This EIS includes both programmatic and site-specific analyses given the broad range of planning and environmental issues that must be considered as the result of the Settlement Agreement. Decisions regarding the desired conditions and strategies for the preservation of resources and the development of additional visitor amenities, such as trails, day use and overnight accommodations, shuttles, and parking are programmatic in nature. Decisions about management zones illustrate programmatic differences in the management of the planning area from the rest of the park.

The programmatic analysis in this EIS broadly addresses the general environmental issues, impacts, and benefits to establish overall management direction for the planning area. Implementation of some programmatic direction, such as future development to facilitate public use and enjoyment, would require additional project-level planning and compliance to develop and analyze site-specific proposals and cost estimates. Compliance for these projects would tier from the programmatic analysis in this EIS and be consistent with the general direction provided in this EIS.

Actions and strategies that are addressed at a site-specific level include elk management options and certain ranch activities such as maintenance of ranch infrastructure and vegetation management. Specific actions and strategies addressed in the EIS would not need additional compliance and may be implemented when the EIS process concludes.

RANGE OF ALTERNATIVES

The alternatives considered in this EIS include a "no-action" alternative required by the National Environmental Policy Act (NEPA) and five action alternatives. Three of the action alternatives are required by the Settlement Agreement and two additional alternatives were developed through the public scoping process. The five action alternatives under consideration (alternatives B through F) include programmatic guidance that fulfills the statutory requirements for GMPs and more detailed guidance for future management of elk and leased ranch lands in the planning area. The programmatic guidance in the action alternatives establishes future direction for the preservation of natural and cultural resources, the management of infrastructure for public use and enjoyment, and the establishment of visitor capacity in the planning area. Adopting the programmatic guidance in any of the action alternatives would amend the 1980 GMP by establishing new direction for the planning area.

Alternative A – No Action

Alternative A is the no action alternative required by NEPA. Under alternative A, NPS would continue to follow previous plans and established practices in the planning area. Additionally, NPS would continue to apply the management zoning framework outlined in the 1980 GMP, except as noted below, and would implement current management actions and policies related to ranching activities.

Approximately 17,100 acres of land in Point Reyes would remain in the Special Use - Pastoral Lands zone that identified ranching as a compatible use. Approximately 4,100 acres in the north district of Golden Gate would remain in the Pastoral Landscape Management zone that similarly identified ranching as a compatible use. Approximately 7,600 acres of land in the planning area would retain a zoning classification that is inconsistent with its existing land use. The 1980 GMP zoned 2,350 acres of Point Reyes as Natural Environment, Special Use, and Deferred Acquisition zones and 5,250 acres in Golden Gate as part of the Natural Landscape Management zone. Ranching was not identified as a compatible use in those zones. The inconsistency between the 1980 land management zones and current operations would continue under alternative A.

Under alternative A, NPS would issue new lease/permits to the existing ranch families to continue beef and dairy operations on approximately 27,000 acres with terms of 5 or 10 years and updated provisions to reflect current operations and regulatory requirements. A new appraisal would be conducted to determine current fair market value for each operation. In the planning area, approximately 800 acres have been fenced to exclude cattle from sensitive resources. These exclusion areas are not reflected in the text of current authorizations but would be incorporated into new lease/permits. Additionally, 600 acres that are in the planning area are not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd. This acreage would continue to not be included in any ranch lease/permit.

Under alternative A, actions to reduce the impacts of elk presence on ranches would continue to include hazing, habitat enhancements, and fence repairs. Alternative A would not alter or limit the population level or geographic extent of elk in Point Reyes. NPS would recapture and move or lethally remove any elk that leave Point Reyes for Golden Gate lands or non-federal lands, in collaboration with the California Department of Fish and Wildlife (CDFW).

Alternative B – NPS Preferred Alternative

Alternative B was the proposed action put forth during public scoping and has been identified as the preferred alternative. Under alternative B, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the planning 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.

Under alternative B, NPS would apply a new management zone, the Ranchland zone, to the planning area. This 28,700-acre zone would be managed to support the desired conditions for the planning area defined in chapter 1. Ranching activities would only be permitted in the Ranchland zone and would be managed through additional subzoning (Resource Protection, Range, Pasture, and Ranch Core subzones). The new zoning framework would amend the 1980 GMP by replacing the Special Use - Pastoral Lands and Pastoral Landscape Management zones with the Ranchland zone.

Under alternative B, approximately 7,600 acres of land under lease/permit (i.e., 2,350 acres in Point Reyes and 5,250 acres in the north district of Golden Gate) would be included in the Ranchland zone. These lands were not included in the Special Use - Pastoral Lands and Pastoral Landscape Management zones in the 1980 GMP.

NPS would adopt new management strategies to achieve desired conditions related to the preservation of resources in the planning area. Similarly, new opportunities and infrastructure for facilitating public use and enjoyment in the planning area would be implemented. NPS would also establish a new framework for managing visitor capacity that establishes indicators and thresholds for the planning area.

NPS would implement a subzoning framework within the Ranchland zone that would maintain ranching and protect park resources. Each subzone would authorize specific activities based on resource management goals and objectives. 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. NPS estimates authorizations would be similar to existing lease/permits, with approximately 2,400 animal units (AUs) of beef cattle and 3,130 dairy animals authorized under alternative B. Additional diversification activities would be authorized in specific subzones in a manner consistent with this EIS. Each lease would include a ranch operating agreement (ROA) that would identify (1) the types of ranching and diversification activities allowed on the ranch, (2) maintenance requirements, and (3) the mitigation measures that apply to authorized activities. NPS would continue to work closely with local agricultural organizations, state agencies, natural resource conservation experts, and stakeholder groups to share information and discuss issues related to ranching.

Most of the ranch complexes are components of the historic districts and contain contributing buildings and other characteristic features that NPS strives to preserve whenever possible. NPS would preserve the ranch complexes in the planning area collaboratively with complex occupants, the Point Reyes' Historic Preservation Crew, and other NPS programs. Adaptive reuse of complexes and buildings would be used as a maintenance strategy if the complexes and buildings are not being used to support ranch operations.

NPS would actively manage the Drakes Beach herd. Based on estimated forage consumption by elk, forage productivity on ranches, and time that elk spend on ranches, as well as NPS's capacity to manage elk, NPS has set a population threshold of 120 adult elk for this alternative. NPS would manage to the population threshold using lethal removal methods. Elk from the Limantour herd would be monitored closely and managed in consideration of ranch operations. No new elk herds would be allowed to establish in the planning area.

Alternative C

Alternative C would amend the 1980 GMP by adopting the same programmatic guidance and a Ranchland zone as presented in alternative B. Ranching operations, including measures to protect resources and opportunities for diversification, would be authorized in the same manner as described for alternative B. The Drakes Beach tule elk herd would be removed.

Application of the Ranchland zone would be the same as alternative B. NPS would issue lease/permits with up to 20-year terms to the existing ranch families to continue beef and dairy operations on 26,100 acres and would implement the subzoning framework described for alternative B. Ranch management and strategies for the management of historic structures and reuse of vacant structures would be the same as those described for alternative B. Authorizations for AUs would be the same as alternative B.

Under alternative C, NPS would remove the Drakes Beach tule elk herd, totaling approximately 124 individual elk, using agency-managed, contractor-led lethal removal methods. Elk from the Limantour herd would be monitored closely and managed in consideration of ranch operations. No new elk herds would be allowed to establish in the planning area.

Alternative D

Like alternative B, under alternative D, NPS would adopt new programmatic guidance and a zoning framework that would amend the 1980 GMP. Under alternative D, ranching would be reduced by phasing out grazing-only leases and ranches that have minimal infrastructure over a one-year period. Grazing operations in areas that are outside the two historic districts would also be removed. NPS would authorize the continuation of beef and dairy cattle ranching operations under 20-year lease/permits for the remaining ranches, as described for alternative B. Under alternative D, tule elk in the planning area would be managed as described for alternative B.

Application of the Ranchland zone would be the same as alternative B; however, the subzoning, described below, would vary. Under alternative D, ranching operations would be phased out over a one-year period

on approximately 7,500 acres, leaving 19,000 acres in active ranching. These areas include grazing-only leases and have minimal infrastructure. The two remaining life estates are part of the 7,500 acres, and after the life estate expires, ranching would be discontinued consistent with the Reservation of Use and Occupancy (RUO). For the remaining 19,000 acres in the planning area, NPS would authorize the continuation of beef and dairy cattle ranching operations under the agricultural lease permit requirements as described for alternative B.

For areas where ranching continues, AUs would be authorized consistent with those described in alternative B. With the removal of 7,500 acres of ranching, beef cattle animal unit authorizations would be reduced by approximately 700 AUs. The number of authorized dairy animals would be the same as alternative B. For areas remaining in ranching, NPS would authorize the operations with lease/permits under a subzoning framework like the one described for alternative B. Pastures removed from grazing would be included in the Resource Protection subzone.

Alternative E

Like alternative B, under alternative E, NPS would adopt new programmatic guidance and a zoning framework that would amend the 1980 GMP. Under alternative E, the six active dairy ranches in the planning area would cease operations. NPS would take no action to limit the population growth or geographic extent of free-range elk in Point Reyes.

Application of the Ranchland zone would be the same as alternative B. Dairies would be phased out over a period of up to five years, and ranchers would be eligible to convert dairy operations to beef cattle grazing. Like alternative B, 26,100 acres would be available for ranching. For areas remaining in beef cattle ranching, NPS would authorize the operations with lease/permits under a subzoning framework like the one described for alternative B. Adaptive reuse of historic buildings on dairy ranches would be considered to support a change in operational activities to either beef ranching or as an inactive ranch.

AUs would be authorized based on the current conditions, as described for alternative B. Assuming all dairy ranches convert to beef ranches, approximately 3,130 dairy animals would be replaced with approximately 750 AU of beef cattle on the six current dairies. Under alternative E, approximately 3,150 AUs of livestock would be authorized in the Ranchland zone. If an existing dairy rancher does not want to convert to beef ranching, NPS would seek use of the ranch that is consistent with maintaining multi-generational ranching in the planning area.

NPS management of elk would occur only to support other resource protection needs and management goals. New herds would be allowed to continue, regardless of geographic location if they do not move outside Point Reyes. Authorized AUs for each ranch would be adjusted as needed to meet RDM goals.

Alternative F

Under alternative F, ranching operations would be discontinued, and visitor opportunities would be expanded. The free-range elk populations could expand across the planning area. Under alternative F, NPS would adopt new programmatic guidance that would amend the 1980 GMP. NPS would apply a new management zone to the planning area called the Point Reyes Peninsula/Olema Valley zone, which would replace the zones from the 1980 GMP. This 28,700-acre zone would be managed to support the desired conditions for the planning area defined in chapter 1. NPS would also apply a Historic Ranch Preservation subzone that would be managed for the adaptive reuse of historic ranch complexes in the planning area.

Under Alternative F, the 18 historic ranch complexes would be included in the Historic Ranch Preservation subzone. Maintenance and adaptive reuse of the developed ranch core would be prioritized based on the condition and integrity of the existing infrastructure. NPS may use prescribed grazing on lands in the planning area to meet resource management goals and objectives (e.g., maintenance of disturbance regimes in grasslands).

Under alternative F, there could be additional opportunities for use of some of the vacant ranch complexes to support a higher level of visitation such as a car-camping campground, larger trailhead, and other visitor facilities. Under alternative F, with the removal of ranching operations, NPS would have additional buildings to consider using for park maintenance operations as well as additional structures that could be considered for removal if no appropriate use could be found. Once ranching has been removed, additional implementation planning for visitor use that comprehensively addresses and evaluates trail-based recreation, day use, and overnight opportunities in the park could be needed to reconsider the distribution of visitor opportunities.

Under alternative F, NPS would not limit the population growth or geographic extent of free-range elk in Point Reyes. NPS management of elk would occur only to support other resource protection needs and management goals. Until cessation of ranching operations, NPS would consider limited, non-lethal management measures for elk. Once ranching operations cease, development of new herds in Point Reyes would be allowed to establish. Following the cessation of ranching operations, the elk fence at Tomales Point would be removed, consistent with the removal of other boundary fences in the planning area.

ENVIRONMENTAL CONSEQUENCES

This EIS evaluates the impacts on the human environment (i.e., physical, natural, cultural, and socioeconomic resources) that could result from the alternatives under consideration. The analysis used methods and assumptions that follow Council on Environmental Quality and the US Department of the Interior regulations and guidance found in the 2015 NPS National Environmental Policy Act Handbook. The following section provides a general summary of the potential impacts of the alternatives under consideration in this EIS. Detailed analysis is provided in "Chapter 4: Environmental Consequences."

Soils

Under alternatives A, B, C, and D, activities associated with beef and dairy ranching would continue to affect soils because of erosion, compaction, and alteration of soil fertility, primarily from livestock grazing, forage production, high intensity use areas, and manure spreading. Under alternatives B, C, D, and E, impacts on soils would be reduced compared to existing conditions by establishing management activity standards and mitigation measures, and implementing a zoning framework that would ensure more intense land uses occur in areas without sensitive resources, such as soils with high erosion potential, throughout the planning area. Under alternative E, noticeable beneficial impacts would occur compared to existing conditions from the conversion of the six dairy ranches to beef operations, elimination of manure management practices, seeding, forage production, and diversification activities. Under alternative F, cessation of ranching would eliminate all impacts on soils associated with ranching activities. Impacts from public use and enjoyment and elk management under all the alternatives would be minimal in intensity and limited in scale.

Water Quality

Under alternatives A, B, C, and D, activities associated with beef and dairy cattle ranching would continue to affect watersheds in the planning area, primarily as a result of livestock grazing, and dairy operations (where livestock congregate in high use areas and manure management). The implementation of a zoning framework under alternatives B, C, D, and E, and specifically the Resource Protection subzone would reduce impacts on water resources compared to existing conditions by discontinuing and/or limiting ranching activities to prescribed grazing in areas containing sensitive resources. More intensive ranching activities, including diversification and pasture management, would be authorized in the Pasture and Ranch Core subzones that contain previously disturbed lands and little to no water resources. Through application of the zoning framework and the implementation of management activity standards and mitigation measures, water quality is expected to improve compared to existing conditions. The removal of dairy operations under alternative E would eliminate adverse impacts on surface water quality associated with livestock congregation and concentrated manure storage near milking barns and would eliminate potential impacts from spreading manure in the Pasture subzone. Alternatives D, E, and

F would also have beneficial impacts on water quantity from the reduction or elimination of authorized livestock numbers. Under alternative F, impacts on water quality would be noticeable, long term, and beneficial because ranching activities would be phased out across the entire planning area. Under all alternatives, public use and enjoyment and elk management actions could have short-term, adverse impacts on water quality in localized areas in the planning area.

Vegetation, including Federally Listed Species

Under alternatives A, B, C, D, and E, activities associated with ranching would have adverse impacts on some plant species and beneficial impacts on others. Grazing would continue to perpetuate altered vegetation structure, species composition, and biomass production. Overall, the general condition of vegetation would remain consistent with existing conditions. However, the implementation of a zoning framework under alternatives B, C, D, and E, specifically the Resource Protection subzone, would result in beneficial impacts compared to existing conditions for riparian vegetation and other sensitive species. Under alternatives D and F, vegetation composition would likely change in areas where ranching is removed. In these areas, while the cessation of grazing would eliminate adverse impacts such as high-intensity-use areas, it may also result in an increase in invasive annual and perennial species such as thistles and grasses; a likely decrease in native forb species abundance and richness; shrub encroachment into areas currently characterized as coastal prairie; and an increase in vegetative fuels. Eliminating livestock grazing could also adversely affect several federally listed plants that occur in coastal grassland because grazing is the most effective tool for promoting their persistence with respect to competition with other non-native grassland species. On the other hand, impacts on other federally listed plants that occur in certain habitat, such as dune or serpentine habitat, may be beneficial because the potential for cattle to trample individual plants would be reduced. Under all action alternatives, actions related to public use and enjoyment would result in minimal disturbance to vegetation but could increase the potential for the introduction and spread of invasive species. Elk management actions under alternatives B, C, and D could result in highly localized impacts because of trampling.

Wildlife, including Federally Listed Species

Under alternative A, impacts from disturbance associated with ranching activities and altered habitat conditions would be adverse while impacts related to maintaining key habitats such as grasslands and stock ponds would continue to be beneficial. The implementation of a zoning framework under alternatives B, C, and D would limit impacts on wildlife from authorized activities such as ranch diversification and remove grazing from sensitive resources such as riparian areas, surface waters, and federally listed wildlife species habitat. Impacts on wildlife would also continue to be avoided, minimized, or mitigated through the implementation of mitigation measures for authorized activities on ranches. Impacts on wildlife would remain beneficial or adverse, depending on the species. Where cessation of grazing occurs on lands under alternatives D and F, impacts on wildlife related to dairy and beef ranching would cease, including disturbance, trampling, erosion, and nutrient inputs. Ecological succession would occur as grassland habitats transition into shrubland or forested habitats, which would increase habitat for some wildlife but decrease it for others. Alternatives E and F would eliminate impacts of forage production, manure spreading, and diversification and would reduce high-intensity-use areas compared to existing conditions. Public use and enjoyment actions under all the action alternatives would generally result in temporary impacts from disturbance and displacement; however, impacts would be limited because development and trails would use existing routes or already disturbed areas.

Tule Elk

Alternatives A, B, D, and E would continue to have beneficial impacts on the elk herd from habitat modifications and adverse impacts from fencing and hazing, consistent with existing conditions. Alternative B would maintain the free-range elk herds, while limiting the size of the Drakes Beach herd to 120 individuals through lethal removal. Under alternative C, NPS would lethally remove the Drakes Beach herd, totaling approximately 124 individual elk. Lethally removing the Drakes Beach herd would

result in an approximately 40% reduction of free-range elk in the planning area and a 2% reduction in the estimated California state-wide elk population (CDFW 2017) compared to existing conditions and would eliminate one of two free-range tule elk herds in the national park system. Impacts on the Drakes Beach herd would be significant because it would no longer exist. Overall viability of the tule elk population in Point Reyes or in California would not be affected; however, removal of a native species for ranching considerations would be unprecedented in the national park system and would be inconsistent with state management of elk on ranchlands outside the park. Under alternative D, cessation of ranching on 7,500 acres would have beneficial impacts on elk by removing existing fencing, reducing hazing, and providing additional grazing opportunities compared to existing conditions. Alternative E would reduce impacts from hazing. Alternative F would eliminate impacts on elk related to hazing and fencing and would allow for the free-range population to expand across the planning area.

Visitor Use, Experience, and Access

Alternative A would contribute noticeable impacts, either adverse or beneficial, depending on the opportunities that visitors are seeking in the planning area. Alternatives B, C, D, and E would contribute noticeable beneficial impacts by providing a wider range of recreational and educational opportunities in the planning area. Adverse impacts on visitor use and experience could occur as a result of the removal of the Drakes Beach herd in alternative C, and impacts from possible closures during elk management activities in alternatives B, D, and E would be temporary and localized. Alternatives D and E would have some beneficial impacts related to experiencing natural sights and sounds by reducing ranching and closing dairy operations, respectively. However, discontinuing dairy operations in alternative E would result in an adverse impact by removing the opportunity for visitors to observe and experience active dairy ranching in a historic district. Under alternative F, removing ranching operations would eliminate a unique experience for visitors to experience the role of coastal prairie ranching in California and in the historic districts, resulting in an adverse effect for visitors seeking those opportunities. However, other visitor opportunities related to experiencing natural sights and sounds would be expanded, and there could be additional recreational trail linkages and public opportunities through the adaptive reuse of ranch complexes no longer used for active ranching, resulting in beneficial impacts for visitors seeking these experiences. Similarly, the potential expansion of the elk population under alternative F would result in long-term, beneficial impacts for visitor use and experience related to observing elk in their native habitat.

Cultural Landscapes, Historic Districts, and Historic Structures

Alternatives A, B, C, D, and E would continue to contribute beneficial impacts to the Point Reyes Peninsula Dairy Ranching Historic District and Olema Valley Dairy Ranches Historic District cultural landscapes through ongoing grazing and to the ranch structures that remained occupied. Under alternative A, impacts on historic buildings may also be adverse, depending on the level of funding available for deferred maintenance. Alternatives B, C, D, and E would provide revised and clarified cyclic maintenance tasks that are the responsibility of each rancher and better coordination with the park to identify and treat priority needs, thereby reducing deferred maintenance. A formal process for addressing vacant structures, continued occupation of active ranches, and management of the pastoral landscape would also be developed. While alternative E would maintain the pastoral landscape across all 24 ranches, it is anticipated that some dairy infrastructure may become vacant on the six dairies, resulting in potentially adverse impacts on historic structures. Under alternative F, no commercial agricultural activities would be permitted in the planning area. Adaptive reuse is proposed for as many historic structures as feasible; prioritizing ranches that contain the representative buildings and structures typical of the historic ranches. Low-priority structures may deteriorate or be demolished if in poor condition, potentially resulting in long-term, adverse impacts on those properties and the National Register districts to which they contribute. Loss of pastures that are considered contributing sites could cause them to lose the integrity necessary to retain eligibility for listing in the National Register, possibly resulting in significant, adverse impacts.

Socioeconomics

Alternatives A, B, C, D, and E would continue to contribute to regional employment and gross regional product in Marin and Sonoma Counties from continued support of employment, incomes, sales, and taxes by ranchers, park spending and projects, and visitation to the park. Ranching under alternatives A, B, and C contributes 0.03% of total regional employment and 0.01% of the gross regional product in the study area. Under alternative D, cessation of ranching on 7,500 acres would result in the loss of $500,000 in beef cattle sales and the corresponding loss of 19 jobs in the study area. Under alternative E, conversion from dairy to beef operations would result in the loss of $14.4 million in annual revenue and 27 jobs at ranches in the planning area. The cessation of ranching under alternative F would contribute to the loss of approximately $16 million in annual revenue, which constitutes 0.01% of the study area's gross regional product. In addition, 63 direct jobs at ranches in the planning area would be lost, representing less than 0.03% of regional employment. Under all alternatives, visitation levels are not expected to change compared to existing conditions. Therefore, no change to jobs, income, sales, and taxes in the study area are anticipated in the short or long term related to public use and enjoyment.

Air Quality

Under alternatives A, B, C, and D, activities associated with ranching would continue to emit criteria pollutants and greenhouse gases associated with cattle grazing, manure management on dairies, fugitive dust, and mobile source emissions. Implementation of management activity standards and associated mitigation measures would likely reduce emissions compared to existing conditions. Dairy operations are the primary contributors for ammonia (NH_3), volatile organic compounds (VOC), and carbon dioxide-equivalent (CO_2e) emissions in the park, while beef cattle are the primary contributors to fugitive dust and particulate matter ($PM_{2.5}$) emission rates. Alternatives B and C would contribute similar levels of pollutant emissions as alternative A. Under alternative D, the reduction in the number of beef cattle would have the biggest reduction in $PM_{2.5}$ emission rates relative to existing conditions. Under alternative E, the elimination of dairy cattle would result in a reduction of NH_3, VOCs, and CO_2e emissions relative to existing conditions. Alternative F would phase out ranching, ending ranching-related emissions of criteria pollutants. Under all alternatives, mobile source emissions would be similar to existing conditions because a change in visitor use levels is not anticipated. While emissions of criteria pollutants and greenhouse gases would vary among the alternatives, these emissions would continue to be a small contributor to overall impacts when compared to emission sources and transport of emissions from outside the planning area.

CONSULTATION AND COORDINATION

Scoping is an essential component of the NEPA planning process. The formal scoping process for this draft EIS consisted of public scoping and consultation with federal and state agencies and tribal governments. The formal NEPA process and 30-day public scoping period was initiated on October 31, 2018, with the publication of a Notice of Intent in the *Federal Register* (83 FR 54775). In addition to the Notice of Intent, preliminary information regarding the EIS was provided to the public and other interested parties through a press release and a public scoping newsletter. During the public scoping period, NPS hosted two open house meetings and received more than 1,350 pieces of correspondence. A public comment summary report is available on the park website at www.nps.gov/pore.

Agency consultation is the early involvement of federal and state agencies and tribal governments that may be affected by the federal action. Similar to the public scoping process, this allows affected agencies or tribal governments to comment and contribute early in the decision-making process and helps NPS to identify key issues or requirements to be considered in the NEPA process. During development of the draft EIS, NPS had discussions with the regulatory and consulting agencies listed below regarding their recommendations for streamlining regulatory requirements related to the actions being considered in this EIS. The following permits/consultations must be completed prior to implementation of the selected action:

- Clean Water Act Section 404 permit—US Army Corps of Engineers
- Clean Water Act Section 401 permit—San Francisco Regional Water Quality Control Board
- Endangered Species Act Section 7, Biological Opinion—US Fish and Wildlife Service
- Endangered Species Act Section 7, Biological Opinion—National Marine Fisheries Service
- Coastal Zone Management Act Federal Consistency Review—California Coastal Commission
- National Historic Preservation Act Section 106 Consultation—California State Historic Preservation Officer
- National Historic Preservation Act Section 106 Consultation—Tribal Heritage Preservation Officer, Federated Indians of Graton Rancheria

NEXT STEPS

The public review and comment period for this draft EIS will be 45 days. Written comments on the draft EIS will be fully considered and evaluated when preparing the final EIS. The final EIS will be issued and will include responses to all substantive comments. The publication of the final EIS will initiate a 30-day waiting period. Following the 30-day waiting period, one of the alternatives, or a combination of alternative elements, will be documented in a Record of Decision signed by the Pacific West Regional Director. Upon signing the Record of Decision, the GMP will be amended to include this updated guidance.

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

This draft 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 referred to as the park) analyzes the impacts that could result from implementing updated management guidance on more than 28,000 acres of National Park Service (NPS) lands.

This chapter describes the reasons NPS is proposing to take action at this time. The planning area for the GMP Amendment includes all lands currently leased for ranching in the park as well as adjacent lands in Point Reyes where the Drakes Beach tule elk herd currently occurs. Resources outside the planning area may be described if any of the proposed alternatives could potentially affect them.

PURPOSE OF TAKING ACTION

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 planning area. In this context, the EIS addresses the future management of tule elk and leased ranch lands in the planning area.

NEED FOR ACTION

Action is needed at this time to address the management of approximately 28,000 acres of land currently leased for ranching, which is the park's highest priority planning issue. Action is also needed to comply with the terms of the Settlement Agreement approved by the US District Court for the Northern District of California on July 14, 2017, under which NPS agreed to prepare a GMP Amendment addressing the management of lands currently leased for ranching.

PARK BACKGROUND

Point Reyes is located in western Marin County in northern California, 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. Point Reyes encompasses more than 71,000 acres of beaches, coastal cliffs and headlands, marine terraces, coastal uplands, and forests, and includes all tide and submerged lands to 0.25 mile offshore. Western Marin County is primarily rural with scattered, small, unincorporated towns that serve tourism, agriculture, and residents. In addition, Point Reyes administers a portion of the north district of Golden Gate, which is adjacent to Point Reyes, for a combined management area and legislated boundary of more than 86,000 acres (see figure 1 in appendix A).

Point Reyes is bounded to the north, west, and southwest by the Pacific Ocean and to the east by Tomales Bay and the residential communities of Inverness, Inverness Park, Point Reyes Station, Olema, and Dogtown. The town of Bolinas is located south of Point Reyes at the southern tip of the peninsula.

Park Purpose

The general management planning process typically begins with the development of a foundation statement or document that provides basic guidance for planning and management decisions. A foundation document is based on a park's enabling legislation, and core components include a park's purpose, significance, fundamental resources and values, and primary interpretive themes.

The purpose statement identifies the specific reason(s) why Point Reyes was established and lays the foundation for understanding what is most important about Point Reyes. The purpose statement for Point Reyes is as follows:

Established for public benefit and inspiration, the Point Reyes National Seashore protects a rugged and wild coastal peninsula and surrounding waters, connecting native ecosystems, enduring human history and recreational, scientific, and educational opportunities.

The purpose statement for Golden Gate is (NPS 2014a):

The purpose of Golden Gate National Recreation Area is to offer national park experiences to all, including a large and diverse urban population, while preserving and interpreting the outstanding natural, historic, scenic, and recreational values of the park lands.

Consistent with NPS *Management Policies 2006*, NPS prepared a stand-alone foundation document for Point Reyes that addresses the entire Point Reyes National Seashore. Because the foundation document includes lands outside the planning area for this GMP Amendment, it was developed as a separate but parallel planning effort. The draft foundation document for Point Reyes is also available for public review on the Point Reyes website (www.nps.gov/pore). Foundation statements for Golden Gate were developed as part of the Golden Gate GMP process and finalized in 2014. A stand-alone foundation document for Golden Gate was subsequently published in 2017.

DESIRED CONDITIONS

Consistent with NPS *Management Policies 2006*, a GMP articulates desired conditions for natural and cultural resource conditions and visitor experiences to be achieved and maintained over time. Desired conditions provide the broadest level of programmatic direction for management and help fulfill the statutory requirements of GMPs. The desired conditions presented below are based on service-wide laws and policies that guide management of the national park system as well as the park's enabling legislation. A list of relevant laws, regulations and policies that guide development of desired conditions can be found at www.nps.gov/policy. Desired conditions provide context that informs the development of actions described in the alternatives.

The desired conditions to be adopted for the planning area are organized around five key areas: preservation of ecological function; preservation of native species, including threatened and endangered species; management of invasive/non-native species; preservation of cultural resources; and public use and enjoyment/visitor experience.

Desired conditions for preservation of ecological function:

- Ecological function, connectivity, and processes persist and thrive in communities, including wetland, grassland, forest, scrub, and dunes.
- Sources of air, water, noise, and light pollution are limited.

Desired conditions for preservation of native species, including threatened and endangered species:

- Habitats and populations of threatened and endangered species, special-status, and rare species persist and are improved.
- Native plant and animal communities persist and thrive.

Desired conditions for management of invasive, non-native species:

- Populations and extent of invasive, non-native species are limited such that they do not, or only minimally, affect ecosystem processes and/or functions.

Desired conditions for preservation of cultural resources:

- National Register of Historic Places (National Register) historic districts, including contributing landscapes and structures, are preserved in a manner that maintains their integrity.
- Historic and prehistoric archeological sites and ethnographic resources are preserved and maintained.

Desired conditions for public use and enjoyment/visitor experience:

- Visitors have opportunities for diverse educational and learning experiences.
- Visitors have opportunities to enjoy expanded connections and greater access to diverse recreation including, but not limited to, hiking and wildlife viewing.

In 1980, NPS issued a combined GMP for Point Reyes and Golden Gate (1980 GMP) (NPS 1980). NPS would amend the 1980 GMP and replace the management objectives with the above desired conditions for the planning area. The desired conditions would apply to both the lands within Point Reyes and the north district of Golden Gate that are included in the planning area.

ENABLING LEGISLATION

Legislation authorizing the establishment of Point Reyes was enacted in 1962 to preserve "a portion of the diminishing seashore of the United States that remains undeveloped" (16 United States Code [U.S.C.] § 459c et. seq.). Congress established Golden Gate in 1972. Golden Gate's enabling legislation directs NPS "to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California, possessing outstanding natural, historic, scenic, and recreational values . . . ." and to "preserve the recreation area, as far as possible, in its natural setting, and protect it from development and uses which would destroy the scenic beauty and natural character of the area" (16 U.S.C. § 460bb *et. seq*.).

In 1976, Congress amended Point Reyes' legislation to address resource management. The amendment directed that, "[E]xcept as otherwise provided" NPS shall administer Point Reyes without "impairment of its natural values, in a manner which provides for such recreational, educational, historic preservation, interpretation, and scientific research opportunities as are consistent with, and based upon, and supportive of the maximum protection, restoration, and preservation of the natural environment within the area" (16 U.S.C. § 459c-6).

In 1978, Congress enacted legislation for both Point Reyes and Golden Gate providing standardized language for the leasing of land for agricultural purposes (16 U.S.C. §§ 459c-5(a) and (b) and 16 U.S.C. §§ 460bb-2(j)). These amendments allow NPS to lease agricultural lands subject to any restrictive covenants deemed necessary and directed NPS to first offer such leases to the person who owned or leased the land prior to its acquisition by the United States. NPS uses these statutory authorities to issue agricultural lease/special use permits (lease/permits) for ongoing traditional ranching and dairying operations when a rancher's reserved right expires.

In early 2019, Congress addressed ranching in a Joint Explanatory Statement regarding House Joint Resolution 31 (the Consolidated Appropriations Act, 2019). The Congressional statement noted that "multi-generational ranching and dairying is important both ecologically and economically" and is "fully consistent with Congress's intent for the management of Point Reyes National Seashore." The statement further noted the conferees "strong support" for NPS's Initial Proposal (presented in the October 2017 initial comment period newsletter) to authorize continued ranching and dairying operations under lease/permits with 20-year terms (House Rep. 116-9 at 720-21 (Feb. 13, 2019)).

HISTORY OF RANCHING

Beef and dairy ranching began in the Point Reyes area 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.

As these lands were purchased, sellers could continue beef or dairy operations under one of two arrangements. They could retain a Reservation of Use and Occupancy (RUO), under which they would forego a portion of the purchase amount in exchange for the right to continue ranching activities for up to

25 years or as part of a life estate. Alternatively, they could sell their ranches in fee and be issued agricultural special-use permits at five-year intervals. Some sellers retained a RUO on part of their land and entered into lease/permits for the rest, while others entered into more than one lease/permit with NPS. Ranch lands in the north district of Golden Gate were acquired, leased, and managed in a similar manner. Congress expanded NPS's ability to lease agricultural lands in both parks in 1978. These amendments established that NPS should first offer such leases to the person who owned or leased the land prior to its acquisition by the United States.

NPS has used the statutory authorities found in Sections 459c-5 and 460bb-2(j) of Title 16 of the US Code to issue lease/permits for ongoing traditional ranching and dairying operations. Consistent with these authorities, NPS has offered initial opportunities to operate under a lease/permit to the person who owned the land or was a rancher on the land immediately prior to its acquisition by the United States. Where these offers have been accepted and lease/permits issued to the individuals described, subsequent lease/permits to continue leasing the same lands have been provided to these same individuals and/or their immediate family members. In the rare instances where a ranch family has relinquished a permit, NPS has offered additional acreage to neighboring ranchers, taken portions of the lease out of ranching for natural resource protection, or in the case of RUO expiration, initiated a lease/permit with the long-standing grazing operator. In an effort to support multi-generational ranching, NPS has issued lease/permits to individuals not business entities. Except for two remaining life estates, all RUOs established on the ranch lands have expired.

Until 2009, the term of lease/permits was limited to five years, consistent with guidance provided in Director's Order 53. The option of a 10-year term for lease/permits was established in a 2009 Delegation of Authority from the NPS Director. Between 2009 and 2012, NPS entered into five lease/permits with 10-year terms. In 2013, at the direction of the Secretary of the Interior, the NPS Director issued a Delegation of Authority authorizing lease/permit terms for up to 20 years and directing NPS to initiate a National Environmental Policy Act (NEPA) process to evaluate the issuance of long-term leases. One of the issues analyzed in this GMP Amendment is the possible issuance of 20-year leases. Until a decision is made through the GMP Amendment process on the future of ranching, the Settlement Agreement (described below) allows NPS to issue interim leases to ranchers who were party to the Settlement Agreement. Currently, 17 interim lease/permits are in place that expire on July 14, 2022, and five, 10-year lease/permits remain in effect. NPS has also issued one-year letters of authorization to operators who do not have a longer-term permit in place and are not signatories to the Settlement Agreement. The two life estates also hold separate lease/permits for areas outside their reserved lands; one holds an interim permit and the other holds a 10-year permit.

In total, 24 families hold lease/permits or RUOs on approximately 18,000 acres of Point Reyes and 10,000 acres of the north district of Golden Gate. Eighteen lease/permits include residential uses specific to on-site ranch operations. All active beef and dairy cattle operations occur in the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District, which are both listed in the National Register.

TULE ELK

Tule elk, the smallest subspecies of North American elk, live only in California. Tule elk were extirpated from Point Reyes by the 1860s. Consistent with Congressional direction, 10 tule elk were successfully reintroduced to a 2,600-acre fenced wilderness reserve on Tomales Point in 1978 (Public Law 94-389, 90 Stat. 1189, August 14, 1976). This enclosed herd has grown to one of the largest in California, currently comprising more than 400 animals. In 1998, NPS completed the *Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment* (Tule Elk Management Plan/Environmental Assessment [EA]). The Tule Elk Management Plan/EA established a free-ranging herd outside the reserve beginning with 28 animals in 1999 with an interim management limit of 250 to 350 elk.

There are now two independent free-ranging herds, one near Drakes Beach and one near Limantour. The geographic extent of both herds includes ranch lands. The 1998 Tule Elk Management Plan/EA did not contemplate the expansion of elk into the ranchlands. Point Reyes is the only unit of the national park system where tule elk reside. The California Department of Fish and Wildlife (CDFW) manages all other tule elk herds in the state. The current geographic extent of free-range elk herds in the planning area is provided in figure 2 of appendix A.

PLANNING HISTORY, INCLUDING THE SETTLEMENT AGREEMENT

Point Reyes and Golden Gate General Management Plan (1980)

In 1980, NPS issued a combined GMP for Point Reyes and Golden Gate, which established management objectives, land management zones, and additional program guidance and direction. The GMP guidance for Point Reyes was also duplicated in a separate stand-alone document in 1980. Management objectives for Point Reyes were established for natural resource management, cultural resource preservation, interpretation, visitor activities, development, and access and circulation. Management objectives for Golden Gate were established for preservation and restoration of natural resources, preservation and restoration of cultural resources, making the recreation area readily available to the broadest variety of park users, provision of a broad variety of park experiences, and consideration of park neighbors.

The 1980 GMP also established management zones to illustrate how the park would be managed and developed in different areas based on management objectives, resource values, and public expectations. The zones for both Point Reyes and Golden Gate included natural zones, historic zones, and special use zones. Within this zoning framework, the 1980 GMP also included a pastoral zone that was established to permit the continued use of existing ranchlands for ranching and dairying purposes. The 1980 GMP also provided broad management direction and strategies for natural resource management, cultural resource management, visitor use and development, interpretation, and park operations. The GMP Amendment will provide updated management guidance for the portions of Point Reyes and the north district of Golden Gate in the planning area.

Golden Gate National Recreation Area General Management Plan

In 2014, NPS completed a GMP for the Golden Gate National Recreation Area and Muir Woods National Monument (2014 GMP). The 2014 GMP provided updated direction for Golden Gate and included core components of a foundation document, referred to as foundation statements, including park purpose, significance, fundamental resources, and primary interpretive themes. The relevance of the 2014 GMP to this planning effort lies in the park's purpose statement that articulates the purpose of all lands in Golden Gate, including lands in the north district. The remaining direction in the 2014 GMP does not pertain to the north district of Golden Gate that is part of planning area for this proposed action. The 1980 GMP included the north district of Golden Gate and therefore will be updated by this planning effort.

Ranch Comprehensive Management Plan and Settlement Agreement

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.

DECISIONS TO BE MADE IN THE ENVIRONMENTAL IMPACT STATEMENT

GMPs are required to include: (1) measures for the preservation of the area's resources; (2) indications of types and general intensities of development (including visitor circulation and transportation patterns, systems, and modes) associated with public enjoyment and use of the area, including general locations, timing of implementation, and anticipated costs; (3) identification of and implementation commitments for visitor carrying capacities for all areas of the national park system unit; and (4) indications of potential modifications to the external boundaries of the national park system unit and the reasons for the modifications (54 U.S.C. 100502). NPS has already conducted an initial boundary analysis and is not proposing any external boundary modifications. This GMP Amendment and EIS address the remaining three elements and will amend the 1980 GMP for the planning area. NPS policies allow for amending an existing GMP, rather than preparing a new one, to address particular park locations or issues, which is the case here.

This EIS includes both programmatic and site-specific analyses given the broad range of planning and environmental issues that must be considered as the result of the Settlement Agreement. Decisions regarding the desired conditions and strategies for the preservation of resources and the development of additional visitor amenities, such as trails, day use and overnight accommodations, shuttles, and parking are programmatic in nature. Decisions about management zones illustrate programmatic differences in the management of the planning area from the rest of the park.

The programmatic analysis in this EIS broadly addresses the general environmental issues, impacts, and benefits to establish overall management direction for the planning area. Implementation of some programmatic direction, such as future development to facilitate public use and enjoyment, would require additional project-level planning and compliance to develop and analyze site-specific proposals and cost estimates. Compliance for these projects would tier from the programmatic analysis in this EIS and be consistent with the general direction provided in this EIS. Additionally, future 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 this EIS, additional environmental review would be necessary.

Actions and strategies that are addressed at a site-specific level include elk management options and certain ranch activities such as maintenance of ranch infrastructure and vegetation management. Specific actions and strategies addressed in the EIS would not need additional compliance and may be implemented when the EIS process concludes.

ISSUES AND IMPACT TOPICS

NPS identified a range of issues and impact topics to evaluate in this EIS for the GMP Amendment. Several issues were also eliminated from further consideration. Issues and impact topics dismissed from detailed analysis, including full dismissal rationale, are provided in appendix C. Issues carried forward for detailed analysis fall under the following impact topics:

- Soils
- Water Resources

- Vegetation, including Federally Listed Species
- Wildlife, including Federally Listed Species
- Tule Elk
- Visitor Use, Experience, and Access
- Cultural Landscapes, Historic Districts, and Historic Structures
- Socioeconomics
- Air Quality

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CHAPTER 2: ALTERNATIVES

INTRODUCTION

NEPA requires federal agencies to develop a range of alternatives and analyze impacts that those alternatives could have on the human environment. This chapter describes the various alternatives that were considered when developing the EIS for the GMP Amendment.

As prescribed by NEPA's implementing regulations, this EIS includes the alternative of no action (40 Code of Federal Regulations [CFR] §1502.14). The Council on Environmental Quality (CEQ) defines two options for the no-action alternative: (1) continuation of current management and (2) situations where a proposed activity would not take place, such as construction of a new facility. CEQ specifically notes that continuing current management applies to updating a land management plan initiated under existing legislation and regulations where an action will continue, even as new plans are developed. In these cases, the no-action alternative represents no change from current management or level of management activity, and the analysis provides a baseline of continuing with the present course of actions (CEQ 1981). Alternative A is identified as the no-action alternative and represents the continuation of current management.

The five other alternatives under consideration (alternatives B through F) include programmatic guidance that fulfills the statutory requirements for GMPs and more detailed guidance for future management of elk and leased ranch lands in the planning area. The programmatic guidance in the action alternatives establishes future direction for the preservation of natural and cultural resources, the management of infrastructure for public use and enjoyment, and the establishment of visitor capacity in the planning area. Adopting the programmatic guidance in any of the action alternatives would amend the 1980 GMP by establishing new direction for the planning area.

Management zoning is a programmatic planning tool used during the general management planning process to delineate areas of a park that correspond to specific desired resource and visitor experience conditions. Consistent with *NPS Management Policies 2006*, each area of the park is typically assigned a management zone as part of an approved management plan. Thus, management zoning also helps fulfill the statutory requirements for GMPs related to preservation of park resources as well as public use and enjoyment. Management zones, which can be common across multiple action alternatives, may be applied differently to the action alternatives to highlight different ways NPS is achieving the objectives of each alternative. The application of management zones forms the basis of the programmatic direction in the GMP alternatives.

This GMP Amendment introduces a new general management planning zoning framework for the planning area. This framework includes new management zones that would be managed to support the desired conditions for the planning area defined in chapter 1. Ranching activities (in alternatives B through E) would only be permitted in a new Ranchland zone, and those activities would be managed through additional subzoning described in the "Ranch Management" sections for the action alternatives below. The subzoning would provide for resource protection areas that would generally exclude ranching activities. Adopting this new zoning framework would amend the 1980 GMP by replacing the Special Use-Pastoral Lands and Pastoral Landscape Management zones with new management zones identified in this GMP Amendment.

The detailed and site-specific guidance for future management of ranch lands under lease/permits and elk in the planning area, including subzones of the Ranchland zone, was developed to be consistent with the programmatic GMP direction.

Action alternatives carried forward for detailed analysis must (1) meet the purpose of and need for taking action to a large degree, (2) be technically and economically feasible, and (3) show evidence of common sense (CEQ 1981). Alternatives considered but dismissed from detailed consideration are discussed at the

end of this chapter. Table 3 (provided at the end of this chapter) compares the alternatives. “Chapter 4: Environmental Consequences” of this EIS presents the results of the impact analysis for each alternative.

RANCHING OVERVIEW

This brief overview is provided to assist the reader in understanding the differences between dairy and beef ranching operations as well as existing guidance for range management. Figure 3 in appendix A displays the existing ranches in the planning area. Six dairy operations are authorized to operate on approximately 6,300 acres. Over the last 15 years, all 6 dairies have converted to organic operations. The US Department of Agriculture (USDA) certifies dairy livestock as organic based on the USDA organic regulations under 7 CFR Part 205. Another 18 conventional and organic beef operations operate on approximately 21,700 acres. Organic dairies differ from beef grazing operations in numerous ways, as described below.

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. Ranchers in the park typically provide fall/winter feed to cattle in upland areas because of winter access constraints and limited forage growth during those seasons. Mineral supplements such as salt licks or molasses 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. Typical beef operations do not require manure management systems because cattle are regularly distributed across the landscape. Beef cattle typically consume between 12 to 20 gallons of water per day (Rayburn 2007). Beef ranchers in the park employ various types of grazing practices that vary by duration, location and intensity.

Dairy Operations

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 (US Census of Agriculture 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 areas 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.

Range Management

NPS manages ranching in the planning area pursuant to various guidelines and standards. 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. NPS park RDM monitoring has been updated to reflect recommendations by the UC Berkeley Range Ecology Lab: Bartolome et al. (2015) analyzed 25 years of NPS 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.

Other Routine Activities

Ranchers drive vehicles and small equipment across pastures for routine ranch operations. Such operations include checking on and moving cattle, repairing fences, and distributing hay as supplemental cattle feed. In areas where silage production is authorized, tilling or discing and seeding may be conducted in the late summer, and silage harvest with mowers and harvest equipment is conducted in the late spring while the cut silage is still green.

ALTERNATIVE A – NO ACTION

General Description and Management Zoning

Alternative A is the no action alternative required by NEPA and assumes continuation of current management for the planning area. Under alternative A, NPS would continue to follow previous plans and established practices in the planning area. Additionally, NPS would continue to apply the management zoning framework outlined in the 1980 GMP, except as noted below, and would implement current management actions and policies related to ranching activities.

Approximately 17,100 acres of land in Point Reyes would remain in the Special Use - Pastoral Lands zone that identified ranching as a compatible use (figure 4 in appendix A). Approximately 4,100 acres in the north district of Golden Gate would remain in the Pastoral Landscape Management zone that similarly identified ranching as a compatible use. Approximately 7,600 acres of land in the planning area would retain a zoning classification that is inconsistent with its existing land use. The 1980 GMP zoned 2,350 acres of Point Reyes as Natural Environment, Special Use, and Deferred Acquisition zones and 5,250 acres in Golden Gate as part of the Natural Landscape Management zone. Ranching was not identified as a compatible use in those zones. The inconsistency between the 1980 land management zones and current operations would continue under alternative A.

Under alternative A, NPS would issue new lease/permits to the existing ranch families to continue beef and dairy operations on approximately 27,000 acres with terms of 5 or 10 years and updated provisions to reflect current operations and regulatory requirements. Figure 5 in appendix A displays a map of continued ranching under alternative A. In the planning area, approximately 800 acres have been fenced to exclude cattle from sensitive resources. These exclusion areas are not reflected in the text of current authorizations but would be incorporated into new lease/permits. Additionally, 600 acres in the planning area that are not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd, would continue to not be included in any ranch lease/permit. A new appraisal would be conducted to determine current fair market value (FMV) for each operation.

Preservation of Area Resources

Under alternative A, NPS would continue to follow previous planning guidance, including the 1980 GMP, for programmatic guidance related to the preservation of area resources. The 1980 GMP includes management strategies and objectives for natural and cultural resources. Much of the planning area would continue to fall in the Special Use - Pastoral Lands zone that was established to permit the continued use of existing ranch lands for ranching and dairying purposes on NPS-owned land. Under alternative A, NPS would continue to manage lands outside the Special Use - Pastoral Lands and Pastoral Landscape Management zones as if they were in those zones.

Public Use and Enjoyment

NPS would continue to follow previous planning guidance, including the 1980 GMP, for programmatic guidance related to facilitating public use and enjoyment of the area. The 1980 GMP includes management objectives for interpretation, visitor activities, development and access, and circulation. Within the Special Use - Pastoral Lands and Pastoral Landscape Management zones identified in the 1980 GMP, NPS can establish trails, roads, and other improvements on ranches, and all trails and roads are open for use by park visitors. Existing lease/permits also include provisions that allow public use of trails on ranch lands. While park visitors are authorized to walk or hike through the various pastures and fields of the ranches, signs are posted near ranch residences encouraging visitors to respect the privacy of occupants.

Visitor Carrying Capacity

Under alternative A, NPS would continue to manage for visitor capacity as part of regular park operations. NPS would respond to individual situations or issues, such as informal parking on road

shoulders or trash, on a case-by-case basis but would not have a documented framework for programmatic decision-making related to visitor capacity.

Ranch Management

Agricultural Lease/Special Use Permits

Under alternative A, NPS would issue future lease/permits with terms of 5 or 10 years. When the two remaining life estates expire, other members of the family would be offered a 5- or 10-year lease/permit, consistent with other ranches in the planning area.

Table 1 presents a summary of the current ranch authorizations. Some permitted areas within the total acreage of an individual ranch include areas that are not used extensively by cattle because of topography and vegetation cover, such as forest and dunes and acres that have been removed from grazing for resource protection. During renewal of lease/permits, ranching operations may be modified to mitigate or eliminate impacts on park resources as part of ongoing management. NPS would continue to renew lease/permits, subject to provisions ensuring that each operation meets relevant water quality standards. During the permit renewal review period, NPS may alter terms to address resource issues and regulatory requirements, if needed.

Animal Units. The lease/permits would continue to identify the total number of authorized animal units (beef operations) or dairy animals, as well as a maximum number of animal units (AUs) that are allowed to graze at any one time. In most permits, AUs are quantified as one mature (1,000 pound) cow with or without a calf up to 1 year old or the equivalent based on the average daily forage consumption of 26 pounds of dry matter per day with an animal unit month (AUM) (defined as one AU for a period of one month). The AU standard, and the AUM calculated from it, are administrative necessities for communication, billing, and management of rangelands in the United States and Canada (SRM 2017). Because the nutritional requirements vary for different classes of livestock, the AU equivalents from the 1990 *Range Management Guidelines* were used to calculate stocking levels for current permit authorizations (NPS 1990a). All beef cattle ranches and one dairy ranch have authorized AUs. The remaining five dairies have per head cattle limits in their permits. The AU, AUM, and equivalents are starting points from which stocking rates may be adjusted based on management goals and objectives. NPS may update AU equivalents based on best available data and would adopt any changes in industry standards, as appropriate to meet management goals and objectives.

Several lease/permits also allow between 5 and 13 AUs of livestock other than cattle for personal, non-commercial use. One of the two remaining life estates authorizes additional livestock (e.g., horses and sheep).

In total, approximately 2,400 AUs of livestock for beef and 3,315 dairy animals are currently authorized. These numbers would be adjusted to reflect current operations when reissuing 5- or 10-year lease/permits under alternative A.

Succession. In the rare instances where a ranch family has relinquished a lease/permit, NPS has offered the relinquished land to neighboring ranchers, removed portions of the lease from ranching for natural resource purposes, or in the case of RUO expiration, initiated a lease/permit with the longstanding grazing operator. This approach would continue under alternative A.

TABLE 1: PERMITTED ACREAGE AND USE ON RANCHES

Map ID[a]	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

Map ID[a]	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
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
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

Map ID[a]	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
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
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

Map ID[a]	Ranch	Permitted Acres	Permitted AU or Number of Cattle	Permitted Use	Actual Number of Cattle	Current Authorization	Park Unit
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[a]	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

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

[a] Map ID refers to figure 3 in appendix A

[b] 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.

Appraisal Process. Appraisals on individual ranches were last conducted between 2002 and 2010. Under alternative A, the US Department of the Interior Appraisal and Valuation Services Office (AVSO) would continue to conduct new appraisals in accordance with the Uniform Appraisal Standards for Federal Land Acquisitions (version dated 1992) to establish annual rent rates. The appraiser makes an FMV determination, and AVSO approves it. In general, appraisals include a building complex and land component and reductions based on maintenance assumptions and other permit conditions. For the land component, these appraisals determined beef cattle grazing based on AUM. All dairy appraisals were conducted prior to the operations converting to organic, and the land appraisal at that time identified excess land with a per acre value.

Diversification

Diversification of ranching activities allows ranchers to react to poor forage production years 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 present on ranches under personal use, including poultry, pigs, sheep, and horses. Separate from the grazing authorization, current permits authorize a total of 111 AUs for non-commercial non-cattle livestock grazing on 14 ranches. One authorized chicken operation allows up to 2,900 birds on pasture seasonally outside the rainy season and up to 1,500 birds on pasture during the rainy season. Horse boarding for approximately 15 to 20 horses currently occurs on two ranches.

Under alternative A, NPS would continue to authorize one commercial free-range chicken egg and meat production operation. Authorizations for diversification activities would continue to be subject to NPS discretion, lease terms, and in accordance with overall resource goals.

Range Management and Monitoring

NPS would continue to administer and monitor use of grazing lands as described under the "Ranching Overview" section, above. Range management guidelines would be revised and updated based on new science and adaptive management of ranching activities. Under alternative A, NPS would continue to calculate stocking rates based on maintaining a minimum of 1,200 pounds/acre of RDM remaining at the end of the grazing season.

Prior NPS authorizations would continue to be required for ranchers to implement any range improvements beyond routine maintenance. Typical projects include updates to cattle management infrastructure (e.g., fencing, watering systems, roads), erosion control, and land treatments to manage vegetation. Many of these projects would also require regulatory review by other agencies, including the San Francisco Bay Regional Water Quality Control Board (San Francisco RWQCB), US Army Corps of Engineers, US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the California Coastal Commission. Projects may also require consultation with the State Historic Preservation Officer (SHPO) and the Federated Indians of Graton Rancheria. Regulatory review would be conducted as needed. NPS currently manages project compliance and permit coordination on approximately 5 to 10 ranch projects per year.

Ranch Infrastructure

Ranch infrastructure activities, including road upgrade and decommissioning, stream crossings, infrastructure management, fencing, livestock water supply, pond restoration, and waterway stabilization are part of the regular management and maintenance of ranch operations. For a full description of these activities and associated Natural Resources Conservation Service (NRCS) practices, see appendix D.

Road Upgrade and Decommissioning. The purpose of this activity is to prevent erosion and protect water quality by making improvements to an existing road network. This may include activities such as re-grading surfaces, installing or repairing culverts, or constructing cross-road drains. In areas where roads have been identified as no longer necessary for ranch or park operations, they may be decommissioned to restore more natural drainage and habitat conditions. NPS has worked with ranchers

to implement a number of road upgrades and decommissioning projects in the planning area; however, several roads still have erosion issues and/or are no longer actively used or maintained.

Stream Crossings. The purpose of this activity 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 by reducing potential for delivery of sediment and other pollutants into the water. Stream crossings include stabilized areas, such as fords, and structures (e.g., bridges and culverts). Many stream crossings in the planning area have involved slightly shaping and hardening previously used tributary banks with rock and installing cross-stream fencing to direct cattle movement across the waterway.

Infrastructure Management. The purpose of this activity is to protect areas that are heavily used by ranch operations to prevent erosion or degradation of critical infrastructure and to separate clean runoff from potential pollutant sources and prevent flooding in ranch core areas. Activities could include establishing suitable vegetation to convey surface water at a non-erosive velocity using a broad and shallow cross section to a stable outlet, planting strips of vegetation to filter pollutants, installing roof and covers and roof runoff infrastructure, and placing materials to stabilize a ground surface. NPS has worked with ranchers to install gutters, inlets, culverts, and vegetated/rock-lined waterways around heavy use areas such as corrals in the ranch complex to direct clean rainwater away from these areas.

Fencing. The purpose of this activity is to help accomplish management goals and objectives by controlling the movement of animals and people, including vehicles. Fencing is used for multiple purposes including managing cattle and creating pastures for better control over the timing and duration of grazing. Specific fences have been installed for purposes such as archeological resource and riparian habitat protection. Existing fencing types authorized in the planning area include barbed wire livestock fencing, electric fencing, and rail fencing.

Livestock Water Supply. The purpose of developing alternative water sources is to help address potential impacts of unrestricted livestock access to streams and wetlands. Most ranches have water developments for cattle consumption, including developed springs, wells, and associated storage tanks and troughs. Many ranches also have aging or abandoned infrastructure. NPS has worked with ranchers to redevelop sources and provide off-stream water to cattle distributed throughout pastures. More recent trough installations have generally required wildlife escape ramps.

Pond Restoration. The purpose of this activity is to improve water availability for livestock, fish, and wildlife and to maintain or improve water quality. Restoration actions include repairs of emergency spillways, alternative pipe outlets for water flow, and removal of build-up silt to restore a pond's original storage capacity. This activity does not include new instream ponds or activities that would increase the storage capacity of a pond. NPS has worked with ranchers in the planning area to maintain functioning stock ponds and the habitat they provide for wildlife such as the California red-legged frog (*Rana aurora draytonii*).

Waterway Stabilization. The purpose of this activity is to stabilize a gully or downcutting channel by installing a structure to control the grade and/or stabilize the slope. NPS has typically installed these structures in the planning area in coordination with ranchers to prevent erosion and protect resources.

Under alternative A, in-kind and in-place repair and maintenance of existing fences, water systems, and ranch roads would continue to be the ranchers' responsibility. Any maintenance projects or new improvements involving ground disturbance or alteration of hydrological regimes would continue to require NPS review and approval, including a review of potential impacts on sensitive species. Responsibility for new water systems and fencing would be defined in the lease/permit. Removal of abandoned fencing to enhance visitor and wildlife safety would continue to occur on ranch lands. New fencing would continue to require NPS authorization. NPS would work with ranchers to ensure that new fence installations and replacements consider wildlife-friendly design.

Vegetation Management

Under alternative A, vegetation management practices would continue to be authorized in individual lease/permits as described below, and new practices would be evaluated and incorporated into the lease/permit on a case-by-case basis.

Upland and Riparian Vegetation Management and Planting. This activity supports establishment of perennial or self-sustaining vegetation (e.g., grasses, forbs, legumes, shrubs, and trees). Seeding with various native and non-native species has been conducted in approved locations for the purposes of pasture improvement, erosion control, weed management, and restoration. Seeding techniques include broadcast spread of seed by hand or use of a seed drill. Seeding would also continue to be authorized for forage production in designated areas (see below). Seedbed preparation would continue to follow an approved NRCS or NPS compliance plan.

Mowing and Integrated Pest Management. 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, see chapter 3). 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 Integrated Pest Management (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.

Under alternative A, ranchers would continue to request prior approval and receive written authorization from NPS to conduct mowing or IPM activities, except for mowing non-native thistles, which is currently authorized in lease/permits. NPS has approved shrub mowing in specific cases, but mowing is generally only conducted for fence or infrastructure maintenance activities.

Prescribed Grazing. This activity manages the harvest of vegetation with grazing and/or browsing animals to achieve resource management goals and objectives. Prescribed grazing can be used to improve or maintain the condition of natural resources such as: desired species composition, structure, and/or vigor of plant communities; riparian and/or watershed function; and soil erosion and soil health. NPS, in coordination with ranchers has implemented prescribed grazing to maintain and enhance rare plant species populations, ensure adequate vegetative cover in riparian areas, and control weeds. Under alternative A, NPS would continue to coordinate with ranchers to meet specific management goals and objectives.

Other Activities

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 (*Festuca* 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.

Under alternative A, 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 erodibl*e; and prohibit cultivating sensitive 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 1). Under alternative A, 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 planning 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.

Manure and Nutrient Management. The purpose of manure management activities is to protect water and air quality and to improve soil conditions. These practices apply specifically to dairies because they must manage the waste generated from operations. As described above, dairies manage animal manure by accumulating it in storage ponds and then spreading the liquid or slurry on fields by means of trucks or pumping through pipes that drain waste out onto fields. Solids may also be separated and stored or composted and then spread on fields by truck or tractor. While current lease/permits do not specifically identify where manure spreading can or does take place, in general, these fields are either authorized silage areas or uplands. Small-scale collection of manure and other organic material into managed compost piles for use as a soil amendment is also conducted on some beef cattle ranches. The State of California considers all confined animal facilities other than concentrated animal feeding operations as nonpoint sources of pollution. These nonpoint sources must comply with animal waste discharge standards found at sections 22560 through 22565 of Title 27 of the California Code of Regulations and with applicable waste discharge requirements or waivers, which include specific requirements intended to protect water quality. These requirements for the park's dairies include compliance with a monitoring and reporting program, and development and implementation of site-specific management plans.

Under alternative A, stored manure or compost generated on ranches would continue to be spread across approximately 2,500 acres within lease/permit areas during dry conditions in compliance with state and federal regulations. Not every field is expected to be treated every year. NPS would consider other projects such as methane (CH_4) capture systems, aerobic digesters, and new composting activities on beef ranches if requested by an individual rancher. Minimal use of commercial fertilizer would occur under alternative A, and the use of commercial fertilizer would not be authorized on certified organic lands and natural pastures in the park, consistent with current practices.

Ranch Complex Management

Most of the ranches in the planning area are components of the Point Reyes Peninsula Dairy Ranches or Olema Valley Dairy Ranches Historic Districts. Of the 200 contributing structures located in the historic districts, more than 125 contributing structures, including residential units, barns, Grade A dairies, sheds, and other out-buildings are located in the planning area, along with additional non-contributing structures. Immediate ranch family members and employees and their immediate family members use the residential units. The building compounds of most dairies also include more modern agricultural structures built to support dairy cattle operations, including milking barns, free-stall or loafing barns, and associated waste management systems. Most beef operations include outbuildings such as storage barns or sheds and corrals. Ranchers are responsible for maintenance of all ranch infrastructure, including ranch roads. Over time, some nonpublic ranch roads have been abandoned or neglected.

Local gas, power, and telephone providers supply ranch utility services, including electricity and telephone service. Residences are heated by wood or propane. On-site septic systems include holding

tanks, and leach lines are used for sewage disposal for the residential structures. Water for domestic use is supplied primarily by springs and wells on individual ranches and from other sources, including the NPS water system or the local municipal system.

Under alternative A, under the lease/permit, ranchers would continue to maintain ranch complex infrastructure, including all water, sewer, and electrical systems, as well as ranch roads used regularly by NPS, the public, and ranchers. Based on analysis of the overall conditions and historic structures, the estimated average annual maintenance investment need on dairies ranges between $100,000 and $200,000 per year (including $75,000 to $150,000 for capital repairs), while for beef operations, the estimated average investment need ranges from $35,000 to $70,000 per year (including $25,000 to $40,000 for capital repairs) to maintain the current infrastructure.

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.

New Development, Infrastructure Improvements, and Alterations. Ranchers, at their own cost, would continue to submit design plans and any other relevant information to NPS for approval prior to undertaking any improvement or alteration of non-historic structures or for new development/infrastructure, including worker housing. All improvements or alterations to buildings, fences, and corrals would continue to be the responsibility of the rancher with prior written approval from NPS. These improvements must be performed in a good, professional manner with materials of a quality and standard acceptable to NPS. No new roads or truck trails would be established without prior written permission of NPS. Improvements and alterations must be performed in accordance with applicable laws, including but not limited to general planning and building codes, and environmental laws.

Improvements or alterations of historic structures would continue to be performed in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. Lease/permits would continue to clearly identify which structures are historic. Ranchers, at their own cost, would continue to submit design plans and any other relevant information to NPS for approval prior to undertaking any improvement or alteration.

Elk Management

Under alternative A, actions to reduce the impacts of elk on ranches would continue to include hazing, habitat enhancements, and fence repairs. Alternative A would not alter or limit the population level or geographic extent of elk in Point Reyes. In collaboration with CDFW, NPS would recapture and move or lethally remove any elk that leave Point Reyes for Golden Gate or non-federal lands.

Under alternative A, the elk population would continue to grow. Elk population forecasts developed by the NPS Biological Resources Division for the Drakes Beach and Limantour herds consider demographic counts since free-ranging elk were established and estimated vital rates, such as recruitment and juvenile and adult survival. Population projections indicate that at some point, population management would be necessary, and NPS would need to undertake a separate planning process to determine how to manage elk at Point Reyes. NPS would continue to work with CDFW and 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:

- Repairing fences and constructing elk crossings, including repairing fences damaged by elk and building elk crossings to allow elk to cross fences without damaging them
- Providing fencing materials to ranchers for repairs, assuming materials are accepted by the rancher
- Installing alternative fence designs, particularly around seasonal pastures that would better allow elk movement across fence lines without damage to the fences
- Enhancing habitat, including water enhancements, weed control, or pasture mowing, and prescribed grazing to increase herbaceous habitat

- Providing 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

Elk Monitoring and Research

Current monitoring of the elk herds in Point Reyes would continue and would be modified as necessary to better understand herd population dynamics. Elk monitoring includes counts and observations of herd composition (e.g., sex and age class). Weekly location data and global positioning system (GPS) collar monitoring data are currently provided for three cows and one bull in the Drakes Beach herd. On all collars, GPS points are collected every 3 hours. GPS collars would be replaced, as needed. Similar location and group composition data has been collected for animals from the Limantour herd on ranch lands, but GPS collars have not yet been deployed on any animals in this herd.

NPS would continue to keep up-to-date with elk management research and activities conducted by other jurisdictions and CDFW, including research regarding reproductive control. Additionally, NPS would continue to collaborate with outside partners to better understand elk activity. Most recently, NPS staff have worked with USFWS and the US Geological Survey (USGS) to analyze long-term population data for all three elk herds at Point Reyes and with Sonoma State University and the University of Nevada at Reno on a comprehensive analysis of the elk observation and GPS collar data collected at Drakes Beach (Hughey et al. 2019). Under alternative A, NPS would continue to have the authority to take action on individual elk that become overly habituated to cattle feed, are repeatedly aggressive toward cattle, or pose a safety risk to ranchers or the visiting public. Actions could include hazing, capture and relocation, or lethal removal.

Disease Testing and Reporting

NPS would continue to perform testing for Johne's disease and chronic wasting disease (CWD) on suspect animals and on fresh, available carcasses. NPS would continue to coordinate with CDFW and the NPS Biological Resource Division regarding testing methods and results.

ALTERNATIVE B – NPS PREFERRED ALTERNATIVE

General Description and Management Zoning

Alternative B was identified as the proposed action during public scoping and is now the NPS preferred alternative. Under alternative B, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the planning area. NPS would allow for continued ranching and establish a population threshold for management of the Drakes Beach herd.

Under alternative B, NPS would apply a new management zone, the Ranchland zone, to the planning area. This 28,700-acre zone would be managed to support the desired conditions for the planning area defined in chapter 1. Ranching activities would only be permitted in the Ranchland zone and would be managed through additional subzoning described in the "Ranch Management" section below. This new zoning would amend the 1980 GMP by replacing the Special Use - Pastoral Lands and Pastoral Landscape Management zones with the Ranchland zone. See figure 6 in appendix A. Of this 28,700 acres, the Ranchland zone would include approximately 7,600 acres of land under lease/permit (i.e., 2,350 acres in Point Reyes and 5,250 acres in the north district of Golden Gate) that were not included in the Special Use - Pastoral Lands and Pastoral Landscape Management zones in the 1980 GMP.

NPS would adopt new management strategies to achieve desired conditions related to the preservation of resources in the planning area. Similarly, new opportunities and infrastructure for facilitating public use and enjoyment in the planning area would be implemented. NPS would also establish a new framework for managing visitor capacity that establishes indicators and thresholds for the planning area.

Beef and dairy cattle operations would continue to operate as described in the "Ranching Overview" section (e.g., beef cattle generally would be allowed to graze 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 (see figure 7 in appendix A). NPS would implement a subzoning framework within the Ranchland zone that would maintain ranching and protect park resources. Each subzone would authorize specific activities based on resource management goals and objectives. Additional diversification activities would be authorized in specific subzones in a manner consistent with this EIS. Each ranch would be managed pursuant to a ranch operating agreement (ROA) that would identify (1) the types of ranching and diversification activities allowed on the ranch, (2) maintenance requirements, and (3) the mitigation measures that apply to authorized activities. A list of potential mitigation measures is provided in appendix D.

NPS would continue to work closely with local agricultural organizations, state agencies, natural resource conservation experts, and stakeholder groups to share information and discuss issues related to ranching. Alternative B would also provide a population threshold for management of the Drakes Beach herd. Alternative elements specific to alternative B are described below.

Preservation of Area Resources

GMPs are required to articulate measures for the preservation of an area's resources. Table 2 outlines the detailed management strategies that NPS would adopt to achieve the desired conditions related to the preservation of park resources in the planning area. For each desired condition, the table outlines management strategies that NPS would adopt on three different types of land in the planning area: management strategies on all lands in the planning area; additional management strategies taken on lands with active ranching; and additional management strategies taken on lands where use has changed. Some of these strategies could require additional site-specific planning and environmental documentation, including NEPA and National Historic Preservation Act (NHPA) compliance, before individual projects could be implemented. Adopting these management strategies would amend the 1980 GMP by providing revised natural and cultural resource management direction for the planning area.

TABLE 2: STRATEGIES FOR THE PRESERVATION OF AREA RESOURCES

Management Strategies on All Lands	Additional Management Strategies on Lands with Active Ranching	Additional Management Strategies on Lands where Use has Changed
Preservation strategies for ecological function		
Desired Condition: Ecological function, connectivity, and processes persist and thrive in communities, including wetlands, grassland, forest, scrub, and dune communities.		
▪ Identify community types, ecological sites, their extent and distribution. Periodically evaluate for large-scale changes. ▪ Research and evaluate connectivity of ecosystems and flexibility of species niches. ▪ Conduct management actions that promote habitat heterogeneity, connectivity, and species considered ecosystem engineers. ▪ Identify previously damaged or degraded natural systems and restore where possible. ▪ Identify and implement practices that protect soil health and minimize soil erosion. ▪ Continue to seek funding and partnerships to restore structure and process to habitat types such as creeks, wetlands, and coastal dunes. ▪ Implement the Point Reyes National Seashore *Fire Management Plan*, and update the plan as necessary, consistent with federal law and departmental management policies. ▪ Locate and design visitor use improvements to minimize impacts to ecological function.	▪ Incorporate applicable mitigation measures from appendix D into ROAs. Monitor and enforce rancher compliance with permit requirements, including authorized activities by area, establishment and maintenance of buffer areas, cattle stocking rates, and timing and location of grazing. o Monitoring data would facilitate adaptive management to protect valued resources. ▪ Incorporate management actions that promote habitat heterogeneity, connectivity, and species considered ecosystem engineers into individual ROAs as appropriate.	▪ Prioritize restoration activities, such as removal of fencing, water developments, roads/crossings, and wildlife barriers/attractants. Conduct habitat restoration in identified areas such as wetlands. ▪ Identify disturbance regimes that may need to be maintained by management. o Prescriptive grazing could be used to maintain rare and endangered habitat and species. Future implementation planning may be needed to determine specific locations. ▪ Expand NPS early detection for invasive species and likely different IPM strategies for many areas.
Desired Condition: Sources of air, water, noise, and light pollution are limited.		
▪ Follow US Environmental Protection Agency (USEPA), state, and Regional Water Quality Control Board Guidelines and Regulations to protect water quality. ▪ Continue to monitor and evaluate water quality in the planning area. Use monitoring data to target areas for improvement. Implement practices to reduce impacts to water quality consistent with guidelines and regulations above. ▪ Follow strategies and practices established by NPS Night Sky and Natural Sounds and Air Quality program guidance. o Reduce and shield artificial light sources to protect natural night skies and minimize human-caused intrusions to natural soundscapes. o Locate and design visitor use improvements to minimize contributions to air, water, and noise pollution. o Monitor and minimize noise/unnatural sounds that adversely affect planning area resources or values or visitors' enjoyment of them. o Consider noise pollution in the procurement and use of equipment. ▪ Conduct operations in compliance with federal, state, and local air quality regulations and minimize air quality pollution emissions associated with operations in the planning area.	▪ Incorporate USEPA, State, and Regional Water Quality Control Board requirements into individual ROAs, including implementation of water quality improvement practices, monitoring, manure management, and grazing management. Regulations include total maximum daily loads and associated grazing waivers in the Tomales Bay watershed, as well as waivers of discharge requirements for confined animal facilities. ▪ Evaluate lighting on all ranch buildings and noise from farm machinery and equipment to determine best practices and incorporate relevant mitigation measures from appendix D into individual ROAs. ▪ Include authorized ranching activities in ROAs and monitor and enforce rancher compliance with permit requirements. Set and monitor relevant metrics in individual ROAs, such as authorized activities by area, establishment and maintenance of buffer areas, cattle stocking rates and timing and location of grazing. o Monitoring data would facilitate adaptive management to protect valued resources. o RDM monitoring would be used to ensure a vegetation cover necessary to minimize soil erosion. ▪ Continue to seek funding and partnerships to implement water quality improvement projects on grazing lands. Ranchers and NPS have partnered with the Marin Resource Conservation District, USDA, NRCS, and others to implement over 80 mitigation measures in the last 10 years and would continue to do so as funding permits.	▪ Prioritize implementation of water quality improvement practices, water monitoring, and restoration to mitigate for persisting water quality impacts following removal of cattle from certain areas.

Management Strategies on All Lands	Additional Management Strategies on Lands with Active Ranching	Additional Management Strategies on Lands where Use has Changed
Preservation Strategies for Native Species, Including Threatened and Endangered Species		
Desired Condition: Habitats and populations of threatened and endangered species, special-status, and rare species persist and are improved.		
▪ To protect threatened and endangered species and their habitats, all activities in the planning area—whether undertaken by ranchers and their employees or by NPS—would conform to conditions outlined in Biological Opinions by USFWS and the National Oceanic and Atmospheric Administration. ▪ Prioritize inventory and monitoring of rare and special concern species based on species rankings and/or perceived level of threat based on existing data. Inventory and monitoring could help identify population trends, distributions, associations and ecological functions/connectivity. Targeted monitoring related to proposed activities would also occur to determine effects of proposed actions. ▪ Conduct habitat restoration and management, including the removal of non-native plant species where appropriate as defined by the strategies above. If monitoring data indicate threats to sensitive species by invasive plant species encroachment, visitor use, barriers to dispersal or other means, take appropriate actions to protect these species. Non-native species management is addressed further below under the desired conditions of maintaining and enhancing native plant and animal communities and limiting invasive, non-native species. ▪ Continue to seek funding and partnerships to monitor these species and restore habitats.	▪ Identify authorized ranching activities and monitor and enforce rancher compliance with permit requirements. ▪ Set relevant metrics in individual ROAs, such as authorized activities by area, establishment and maintenance of buffer areas, cattle stocking rates, and timing and location of grazing. ▪ Monitor relevant metrics to facilitate adaptive management and protect valued resources.	▪ Implement management actions such as prescriptive grazing and stock pond maintenance, which benefit species in the absence of ranching.
Desired Condition: Native plant and animal communities persist and thrive.		
▪ Prioritize inventory and monitoring of animal and plant communities or populations based on achieving desired conditions. Monitoring could help identify species diversity, changes in native species populations or community structure, and to develop ecological models to inform management. Long-term declines in native animal and plant communities or populations could trigger management action. ▪ Prioritize monitoring tule elk as a species of management concern to identify population trends, movement patterns, and habitat utilization. Monitoring data would be used to determine population thresholds and identify management actions such as habitat improvement. ▪ Restore native species populations that have been severely reduced or extirpated where feasible. ▪ Continue to provide interpretive and educational programs to promote preservation of native species.	▪ Identify authorized ranching activities and monitor and enforce rancher compliance with permit requirements. ▪ Set relevant metrics in individual ROAs, such as authorized activities by area, establishment and maintenance of buffer areas, cattle stocking rates, and timing and location of grazing. ▪ Monitor relevant metrics to facilitate adaptive management and protect valued resources. For example, RDM monitoring would be used to ensure a vegetation cover necessary to promote plant growth remains at the onset of germinating rains.	▪ Not applicable.

Management Strategies on All Lands	Additional Management Strategies on Lands with Active Ranching	Additional Management Strategies on Lands where Use has Changed
Management Strategies for Invasive/Non-Native Species		
Desired Condition: Populations and extent of invasive, non-native species are limited such that they do not, or only minimally, affect ecosystem processes and/or function.		
▪ Utilize Early Detection Rapid Response to prevent introductions of non-native species. Monitoring by ranch operators and NPS staff would be used to detect and eradicate new infestations of non-native species before they become widespread. ▪ Prioritize non-native species for management based on level of threat to park resources and ability to control. ▪ Utilize IPM to control invasive species and promote long-term prevention through a combination of monitoring and control methods. o Chemical control would generally be used only in combination with other control methods, selected and applied in a manner that minimizes risks to human health, non-target organisms, and the environment. o Monitoring would be conducted to identify damage and pests and determine what, if any, management is needed. Monitoring would also be used to determine effectiveness and inform adaptive management. o Ranchers, their employees, and NPS would not intentionally introduce invasive non-native species to the planning area.	▪ Ranchers and their employees would comply with individual ROAs to prevent accidental introductions and manage non-native species of concern.	▪ NPS would expect increased effort in management, early detection, and likely different IPM strategies for many areas where ranching is no longer occurring.
Preservation Strategies for Cultural Resources		
Desired Condition: National Register historic districts, including contributing landscapes and structures, are preserved in a manner that maintains their integrity.		
▪ Conform to the Secretary of the Interior's *Standards for Historic Preservation* for work done by NPS, ranchers, or ranch employees. ▪ Consider adaptive use of historic structures to support visitor activities, rancher use, or park/partner operations. ▪ Non-contributing buildings, structures, and landscape features not needed for ranching or park purposes would be removed or allowed to deteriorate naturally. ▪ Explore interpretation and educational opportunities that foster an appreciation of the historic districts and help build long-term support for their preservation. ▪ Telecommunications and utility infrastructure, commercial windmills and other energy infrastructure would not be permitted in the planning area whenever possible because they are inconsistent with the historic district.	▪ NPS would ensure that ranchers maintain historic structures and cultural landscapes consistent with the Secretary of the Interior's *Standards for Historic Preservation* and guidelines and standards for rehabilitation. o Ranchers would be responsible for routine maintenance such as roofing and painting. NPS would work with ranchers to identify strategies to rehabilitate structures according to the Secretary of the Interior's *Standards for Historic Preservation*. ▪ Continued grazing would be used as a tool to maintain the characteristics of the historic pasture lands. ▪ NPS staff would collaborate with ranchers to interpret traditional land use and current agricultural practices. ▪ Small-scale telecommunications and utility installations for personal use on ranches would be allowed, with NPS approval and appropriate precautions taken to protect the historic scene such as locating underground or sited close to existing development.	▪ Apply a prioritization process to preserve historic buildings to minimize impacts on historic districts. ▪ Search for and identify adaptive uses of the built environment and management strategies for the landscape to preserve the historic districts. o Prescriptive grazing and other tools could be used to maintain the characteristics of the historic pasture lands.

Management Strategies on All Lands	Additional Management Strategies on Lands with Active Ranching	Additional Management Strategies on Lands where Use has Changed
Desired Condition: Historic and prehistoric archaeological sites, and ethnographic resources are preserved and maintained.		
▪ NPS would protect identified archeological resources. Except for professional archeologists working under an approved NPS research permit, NPS and partners working in the planning area would refrain from disturbing archeological sites or collecting artifacts. o Any discoveries of artifacts or unknown archeological sites would be left undisturbed and reported to NPS cultural resource management personnel. ▪ Continue to preserve archeological sites through active monitoring, stabilization, and maintenance of resource protection infrastructure. ▪ Work collaboratively with Federated Indians of Graton Rancheria to preserve and interpret the Coast Miwok heritage at Point Reyes. o NPS would consult with the tribe on issues related to the preservation of related archaeological sites and burials under the Native American Graves Protection and Repatriation Act of 1990. ▪ Explore interpretation and education opportunities that foster an appreciation of historic and prehistoric archeological sites and ethnographic resources and help build long-term support for their preservation.	▪ NPS would take measures to stabilize and exclude cattle from archeological sites. ▪ NPS would monitor the condition of known archeological sites and conduct inventories to locate and describe currently unknown sites.	▪ NPS could remove resource protection infrastructure if no longer necessary to protect sites from agricultural activities such as grazing.

Public Use and Enjoyment

GMPs indicate the types and general intensities of development associated with facilitating public use and enjoyment of an area. NPS would adopt the strategies and actions described in this section to achieve the desired conditions for facilitating public use and enjoyment and visitor experience in the planning area. These strategies are organized around the following key areas: development of trails and trail-based recreation; development to support day use and overnight accommodations; development to support/enhance interpretation and education; development related to shuttles and parking; and potential use of unoccupied ranch complexes and historic structures. Adopting these strategies and actions would amend the 1980 GMP by providing revised guidance and management direction for visitor use for the planning area.

Many of the specific strategies and project recommendations described below would be accomplished over time. Development proposals, including, but not limited to, new trail connections and parking improvements would most likely require additional site-specific planning and environmental documentation, including NEPA and NHPA compliance, and cost estimates before project implementation could occur. Similarly, implementation of the actions and developments proposed in this EIS depend on funding available at the time of need. The approval of this EIS does not guarantee that the funding and staffing needed to implement the plan would be immediately forthcoming. Instead, the plan establishes a long-range vision to guide future management of the planning area.

Development of Trails and Trail-Based Recreation

NPS would strive to improve hiking, biking, and equestrian access in the planning area through enhanced trail connections. Lands in the planning area are generally open to public access, including active grazing areas, but additional route designation and guidance for visitors about trail-based opportunities would facilitate more visitor enjoyment opportunities. Trail opportunities would focus on loop routes, improve connectivity with adjacent public lands, and facilitate north-south connectivity across the landscape.

Most new routes would use existing administrative roads (including ranch roads); new trail construction would be limited. Maintaining these roads to support a multi-use trail network would facilitate increased recreational opportunities for pedestrians, equestrians, and bicyclists. The focus of the trail network in the planning area is on expanding access for multiple-use trails. Trail-based recreation opportunities offering more solitude exist outside the planning area in wilderness areas of the park. However, individual trails in the planning area could still be designated for specific uses (e.g., hike only, equestrian and hike only, bike and hike only.).

Most routes would be minimally maintained for general recreational access and would have a rural, backcountry character. When an existing administrative or ranch road is identified as part of the trail network, the level of service and maintenance would generally be the minimum needed to maintain vehicle access and protect resources. In addition to designated routes, NPS would also consider installing pedestrian crossings (i.e., gates/step overs) through ranch fences to accommodate visitor access to ranch lands. NPS would collaborate with ranchers on the location and/or form of the step-overs or crossings across active ranch lands. NPS would also collaborate with ranchers on methods to help ensure minimal disruption to ranch operations such as self-closing or spring-loaded swing gates with simple signage that would help ensure that gates are closed once people pass through. NPS would also work to develop public information and safety messages to support recreational activities that involve walking through active pastures without defined trail alignments.

To facilitate north/south trail connectivity across the planning area, NPS envisions a mix of established trails and off-trail routes with crossings across ranch lands to provide recreational access. Ranch operations and private housing would be considered when determining the locations of these routes and alignments.

Bicycles would continue to be allowed on public and administrative roads designated for bicycle use. NPS would improve signage to highlight existing opportunities for bicycles, clarify and update information for cyclists to help with trip planning, and evaluate new opportunities for bicycle access primarily using the extensive network of ranch roads. NPS would seek to close existing gaps for bicycle access by using the existing ranch road network to facilitate additional bicycle loops, such as in the area between L Ranch Road and Pierce Point Road. Site-specific implementation planning and compliance associated with providing additional bicycle access would meet the requirements of 36 CFR 4.30.

NPS would also work with adjacent land managers and partners to facilitate larger, regional trail connections to the planning area from outside the park and improve trail connectivity for pedestrians, equestrians, and bicyclists. NPS would actively work with adjacent land management agencies and others to explore these opportunities. Examples of opportunities include connecting the Cross Marin Trail to routes through the park.

Appendix E: Public Use and Enjoyment Detail provides some additional information that NPS could consider in implementing programmatic recommendations for public use and enjoyment (e.g. trail routes, trailhead improvements).

Development to Support Day Use and Overnight Accommodations

NPS would look for opportunities to expand day use and overnight accommodations in the planning area. These activities would be focused in previously developed areas, such as former ranch complexes, and would take advantage of adaptive reuse of historic buildings where possible. Implementation of any of the options below would depend on availability of an appropriate location as well as NPS's operational capacity and/or ability to work with partners to support the operation. The "Potential Use of Unoccupied Ranch Complexes and Historic Structures" section below describes the process that would be used for finding uses for any complexes that could potentially become unoccupied in the future. Potential day use and overnight opportunities that NPS would consider in the planning area include:

- Use of one or more vacant complexes as a concession operation (e.g., hostel in the buildings; campground in the pasture; possible yurts, tent cabins, or other similar structures that offer an overnight option between tent camping and commercial lodging)
- New location(s) for administrative or volunteer accommodations (e.g., camping, recreational vehicle hookup, or housing)
- Drive-in, hike-in, and boat-in camping sites with limited services and amenities (several locations offer possibilities to consider for expanding overnight camping, such as Schooner Bay near Drakes Estero or Home Ranch)
- Additional sites for day use activities, such as picnicking, close to roads and other infrastructure (where applicable, these activities would be sited so as not to interfere with grazing and could also include new boat-in opportunities)
- An education camp in a ranch complex or other previously developed or disturbed area if a partner were interested and able to create and maintain the facility
- Opportunities for overnight use or other adaptive reuse at the RCA Receiving Station

Development to Support/Enhance Interpretation and Education

NPS would explore new opportunities, techniques, and contemporary media to help interpret park resources and ranching in the planning area. NPS would collaborate with ranchers and other park partners, such as Point Reyes National Seashore Association or park concessioners, on interpretive messaging and techniques that share the story of ranching in the park. As ranch operations diversify and engage in additional public serving activities using existing infrastructure, NPS would collaborate with ranchers to find opportunities to integrate interpretive and educational messaging. Selected waysides would be focused at existing destinations, such as at trailheads and the visitor center, and could also be installed at key pullouts, such as along L Ranch Road.

NPS would preserve and interpret the historic RCA Receiving Station under all alternatives. NPS could cooperate with a non-profit group and could also explore expanded adaptive uses of the facility, including overnight uses, through a park partner or through a request for proposal process.

NPS would also expand interpretation and visitor opportunities around the Naval Radio Compass Station. NPS would place a trailhead on Sir Francis Drake Boulevard and use the old road to/through the property as a trail to the site of the former lifesaving station and the naval radio compass facility. NPS would also provide interpretation of these historic resources to enhance the visitor experience. Non-historic structures associated with the property would be removed.

Development Related to Shuttles and Parking

NPS may continue to use shuttle or other operations to manage traffic and crowding issues at various locations in the park. The park would explore additional or expanded shuttle use, or collaborate with the county to expand transit systems, as tools to manage visitor use. NPS would also seek improvements to parking at trailheads to improve visitor safety and facilitate access to trails and park destinations.

Potential Use of Unoccupied Ranch Complexes and Historic Structures

Most of the ranch complexes are components of the historic districts and contain contributing buildings and other characteristic features that NPS strives to preserve whenever possible. NPS would preserve the ranch complexes in the planning area collaboratively with complex occupants, the Point Reyes' Historic Preservation Crew, and other NPS programs. Appendix F provides a list of preservation and maintenance guidelines for ranch buildings under lease/permit. Adaptive reuse of complexes and buildings would be used as a maintenance strategy if the complexes and buildings are not being used to support ranch operations. NPS would undertake all new uses and associated changes to the structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

When a contributing structure, structures or an entire ranch complex becomes vacant, NPS would use the following process to determine its future use:

- NPS would first consider if the structure or complex is needed and could be sufficiently used for NPS operational uses, such as housing, operations, visitor services, or partner use.
- If NPS does not have a use for the complex or structure, it may issue a request for proposals, seeking proposals for adaptive reuse in ways compatible with park purpose and desired conditions. Stabilization techniques such as mothballing structures may be implemented to arrest deterioration.
- NPS may also offer a complex or building to the rancher on the surrounding lands for ranch operations and/or rancher or ranch worker housing if the facilities could be sufficiently utilized.
- If ultimately no use can be found for the complex, NPS would consider demolition of the structures after consultation with the SHPO.
- Structures that are non-contributing to the National Register historic district may also be demolished after consultation with the SHPO.

Visitor Carrying Capacity

GMPs are required to identify and include implementation commitments for visitor carrying capacities (also referred to as visitor capacity) for all areas of the system. Visitor capacity is a component of visitor use management defined as the maximum amount and types of visitor use that an area can accommodate while sustaining desired resource conditions and visitor experiences, consistent with the purpose for which the area was established. By establishing and implementing visitor capacities, NPS can help ensure that visitors have the opportunity for a range of high-quality experiences and resources are protected. NPS is a leading member of the collaborative six federal agency council known as the Interagency Visitor Use Management Council (IVUMC) that provides a consistent approach to visitor use management. 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 were identified and include parking, crowding and congestion, trash, and waste. The discussion of issues helped inform the development of indicators (measurable attributes that can be tracked over time) and thresholds (minimal acceptable condition for each indicator), as well as monitoring protocols, management strategies, and actions that can be taken to help maintain desired conditions.

The following indicators were identified for the planning area:

- number of visitors per year;
- 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; and
- Documented condition assessment changes to cultural resources from visitor caused actions and disturbances, as defined in NPS Archeological Site Management Information System.

Thresholds, monitoring protocols, and management strategies can be found in Appendix G: Indicators, Thresholds, and Visitor Capacity Details.

Visitor capacities were then identified for the planning area following the IVUMC framework and by using best practices and examples from other plans and projects across the national park system. Based on these best practices, the planning team used the following process to identify capacity: (1) determine the analysis area, (2) review existing direction and knowledge, (3) identify the limiting attribute, and (4) identify visitor capacity and strategies to implement visitor capacity.

Three key areas were identified, which together compose the majority of the visitor use areas in the planning area:

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

Visitor capacities identified for these areas generally maintain current visitor use levels, measured primarily by vehicle counts, with some opportunities to increase other types of use such as biking and trail-based recreational experiences. Visitor capacity analysis also illustrates the opportunity to redistribute some visitor use temporally and spatially in the planning area and throughout the park.

Strategies that would be implemented to manage visitor capacity generally involve providing more information to visitors to be able to accurately wayfind and select experiences; expanding the range of visitor opportunities in the planning area; managing access through a broader range of tools; formalizing trailheads and parking; managing large-scale trail-based event requests; and partnering to improve safe multi-use of the roads notably for bicycle access.

Appendix G presents the detailed visitor capacity identification as it relates to the visitor use management framework for the planning area. The appendix includes additional detail describing the rationale and methodology for development of the indicators listed above; associated thresholds; and associated monitoring protocols, management strategies, and actions that can be taken to help maintain desired conditions. This appendix also outlines the future monitoring of use levels and data that will inform NPS if use levels are at or near visitor capacities, along with the adaptive management strategies that would be taken. These adaptive management strategies represent the suite of actions that could be taken to manage visitor capacity if thresholds are approached or exceeded. Not all of these strategies would necessarily be

taken or needed to manage capacity. Adopting this visitor capacity framework would amend the 1980 GMP by adding guidance and management direction for managing visitor capacity in the planning area. It also fulfills the statutory requirement for general management plans related to visitor carrying capacity.

Ranch Management

Subzoning Framework

To ensure protection of natural and cultural resources, streamline the permitting process for typical ranch activities, and provide consistent guidance to ranchers, this alternative adopts a subzoning framework for the 28,700-acre Ranchland zone that would be implemented 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. Specific diversification activities that would be authorized in the Pasture and Ranch Core subzones are described in the "Diversification" section. Activities authorized within each subzone would be subject to mitigation measures, operational constraints, and maintenance requirements as necessary. The four subzones would be defined for each ranch in a ROA see "Ranch Operating Agreement" section below. The ROA would identify and include authorized activities, diversification, and required site-specific mitigations consistent with the information presented in this EIS. The area of each subzone would differ by ranch, based on the site topography and presence of wetlands, rare plants, and other sensitive resources. Appendix H provides the methods used to develop the initial estimates for each subzone by ranch. Draft maps of the subzoning for each ranch operation are provided in figures 8 through 31 in appendix A. These maps would continue to be refined in collaboration with ranchers.

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 alternative B, 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 planning area but not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd.

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 would be identified as Range subzone.

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 would be identified as Pasture subzone. Nutrient management on dairies would be authorized in the Pasture subzone. Under alternative B, some diversification activities would be authorized in the Pasture subzone

as described in the "Diversification" section, below. Forage production would be authorized individually as described in alternative A; 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.

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 would be 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) and 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 ROA.

Agricultural Lease/Special Use Permits

NPS would issue agricultural lease/permits with up to 20-year terms to continue beef and dairy operations on approximately 26,100 acres. 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 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.

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 (1) the types of ranching and diversification activities allowed on the ranch, (2) maintenance requirements, and (3) the mitigation measures that apply to authorized activities. A list of potential mitigation measures is provided in appendix D. 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 this 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 this EIS, additional environmental review would be required. If authorized by NPS, the proposed activities would be incorporated into the ROA.

Animal Units. Under alternative B, each ranch would continue to have a maximum number of AUs allowed to graze at one time. AUs allowed under a lease/permit would continue to be managed to meet the 1,200 pounds per acre RDM standard. NPS would determine the annual adjustments to AUs based on the use of a rangeland forage production model (see appendix I), monitoring data, NPS range program manager and rancher expertise, historical information, 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. RDM performance standards would remain as described for alternative A.

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

NPS would not authorize any additional AUs for personal, non-commercial livestock. All livestock other than beef and dairy cattle would be considered a diversification activity and would be managed as described in the "Diversification" section below.

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

Appraisal Process. Under alternative B, rather than individual appraisals, NPS anticipates development of a master appraisal process managed by the US Department of the Interior to determine FMV for park ranch operations. The appraisal would also include consideration of a maintenance reserve account and identify appropriate methods to adjust the annual rental rate over time. This would allow for more standard application of FMV across the planning area and more transparency regarding rental rates in the park.

Diversification

New diversification activities could be allowed in specified subzones under alternative B as defined below with the use of required mitigation measures specific to each activity (see appendix D). Diversification of ranching activities under alternative B could include new types of livestock, row crops, horse boarding, ranch tours and farm stays, small-scale processing of dairy products (e.g., cheese), and sale of local agricultural products. Existing diversification activities on ranches would be authorized consistent with the guidance under alternative B. All diversification 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.

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

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 associated with planting row crops would be limited to the 2.5-acre Ranch Core subzone, and seeding would be limited to hand broadcast and no-till seed drill. Management of any wildlife associated with protection of row crops would not be allowed in the planning area; however, ranchers would be allowed to fence row crops to exclude wildlife.

Under alternative B, NPS would allow public-serving ranch diversification activities that support park goals for interpretation and education (e.g., farm tours in the ranch core) and that do not create new management issues (i.e., traffic congestion). NPS would also authorize adaptive reuse 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.

Pasture Subzone. Under alternative B, sheep, goats, and chickens would be allowed in the Pasture subzone. For grazing purposes, sheep and goats have AU equivalents of 0.2 and 0.15 AU, respectively (USDA-NRCS 2006a). 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). Alternative B 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. Guard animals (i.e., dogs, llamas, donkeys) would be allowed with the use of established mitigation measures (see appendix D).

Range Management and Monitoring

The guidelines and monitoring protocols for range management would be the same as those described for alternative A. The expectations and requirements contained in these guidelines would be incorporated into each ROA and updated and revised as new information becomes available.

Ranch Infrastructure

Under alternative B, 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 under alternative A, and additional detail is provided in appendix D. 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 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.

Activities associated with road upgrade and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as those described under alternative A. Under alternative B, 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 under alternative B 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.

Vegetation Management

Under alternative B, 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 under alternative A, and additional detail is provided in appendix D. 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 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.

Under alternative B, 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. Like alternative A, 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).

Under alternative B, 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.

Prescribed grazing would be the same as alternative A.

Other Activities (Applicable Only on Ranches Where Currently Authorized)

Forage Production. The methods used to produce silage, haylage, and hay as well as the scale (approximately 1,000 acres) would be the same as described for alternative A and would be authorized in the Pasture subzone. Consistent with alternative A, if ranchers want to discontinue forage production in permitted areas, those acres would be retired, and the total acreage of forage production in the park would be reduced.

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 planning 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) under alternative B would be consistent with the mitigation measures in appendix D. 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 under alternative B. Under alternative B, application of commercially produced compost and fertilizer would not be authorized.

Ranch Complex Management

Under alternative B, ranchers would continue to use residential units, barns, and other structures. Occupancy of residential units in the building complex would be limited to immediate family members of

lease/permit holders, employees of that ranch (and their immediate family), and, with NPS approval, employees of other park ranches. The types of agricultural structures (e.g., loafing barns) and utility services (e.g., electricity, water) on ranch complexes would be the same as those described for alternative A. Pest control restrictions under alternative B would be the same as those described for alternative A.

Maintenance. Maintenance is an important ongoing activity that would continue to be accomplished in collaboration between NPS and ranchers, as described for alternative A. Ranchers would continue to maintain ranch service roads in a safe condition, using practice standards that limit impacts on sensitive resources; no new roads or trails would be established without prior written permission from NPS. Under alternative B, the lease/permit would establish a maintenance reserve account that would be directed to priority maintenance and improvements through the ROA.

Use of Ranch Complexes. NPS and its partners would strive to maintain the integrity of the two historic districts in the planning area. Most ranch complexes are components of the historic districts and contain historic buildings and other features that NPS would preserve whenever possible. NPS would preserve the ranch complexes in the planning area collaboratively with complex occupants through guidance in the ROAs, the Point Reyes' historic preservation crew, and other NPS programs. Adaptive reuse of individual structures or full ranch complexes may be used as a preservation strategy if they are no longer used to support ranch operations. NPS would oversee all new uses and associated modifications to ranch complexes and structures to ensure conformance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

New Development/Infrastructure Improvements and Alterations. All improvements to or alterations of buildings, fences, and corrals would need to be included in the ROA prior to implementation. ROAs would include specific direction on what types of improvements comply with NPS standards. Actions would comply with NPS standards for fencing, roads, and historic buildings and would be documented in the individual ROAs.

As described for alternative A, the overall condition of the historic structures is poor to fair. NPS has identified the need for a substantial capital investment in many of the historic structures. Upon completion of these structural improvements, annual maintenance investment by ranchers would be ongoing.

Improvements to or alteration of non-historic structures, upgraded worker housing, or new development/infrastructure would be the responsibility of the rancher at their own cost, would require prior written approval from NPS, and would be done in accordance with applicable laws as described for alternative A. All worker housing would comply with local building codes and safety standards. New development would require additional site-specific environmental review once a specific proposal is submitted to NPS. Except in limited circumstances, new development would only be considered in the Ranch Core subzone.

Elk Management

The management of free-range elk under alternative B would allow elk in the Point Reyes portion of the planning area 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. 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 take actions to manage the population level of the Drakes Beach herd in Point Reyes and would continue to take actions described for alternative A to reduce conflicts related to the presence of elk on ranches (e.g., hazing); mitigate elk damage to ranches; and conduct monitoring, disease testing, and reporting.

Population Level Management and Geographic Extent

Under alternative B, NPS would actively manage the free-range elk herds in the Point Reyes portion of the planning area. At Tomales Point, NPS would continue to maintain the elk fence that serves as the northern boundary to the planning area, and the elk at Tomales Point would continue to be managed as a fenced population in accordance with the 1998 Tule Elk Management Plan/EA. NPS would manage the herds to remain in Point Reyes, in coordination with CDFW.

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). The herd would be maintained at a stable level and viable population level compatible with authorized ranching operations. 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, NPS has set a population threshold of 120 adult elk for this alternative (see Becker et al. 2019, appendix I). While the elk population may experience a slight increase each year as a result of spring calving, a population count would be conducted each fall, and if necessary, elk would be removed to reach the population threshold prior to the next spring calving season. Most removals would occur outside the calving and rut seasons. The population threshold is not anticipated to change unless there are long-term or permanent changes to existing conditions. Male elk that stray from core use areas would be monitored closely, and actions may be taken to mitigate for impacts on ranching operations. Population reduction efforts may target male elk outside the core area if conflicts with ranching operations arise.

NPS would manage the Drakes Beach herd to the population threshold 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 CWD policies. For translocation outside the park to be practicable, NPS would need to document that the elk are free of Johne's disease and CWD. The State of California 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 Drakes Beach herd at a reduced number and 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 the population threshold. 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 appropriate state and federal agencies, including the NPS Office of Public Health, the California Department of Food and Agriculture, USDA, and CDFW. Elk carcasses that are difficult to retrieve would be left in place.

Limantour Herd. Management of the Limantour herd would be based on the concept of not allowing new herds to establish in the planning 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 and lethal removal may be used to manage the geographic extent if individuals establish outside the core use areas (figure 2 in appendix A). These individuals would be monitored closely, and actions may be taken to mitigate for impacts on ranching operations.

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 Tule Elk Management Plan/EA 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.

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

ALTERNATIVE C

General Description and Management Zoning

Like alternative B, under alternative C, NPS would adopt new programmatic guidance and a Ranchland zone that would amend the 1980 GMP. Under alternative C, ranching would continue the same as described for alternative B, but the Drakes Beach herd would be removed. See figures 32 and 33 in appendix A.

Application of the Ranchland zone would be the same as alternative B. NPS would issue lease/permits with up to 20-year terms to the existing ranch families to continue beef and dairy operations on 26,100 acres and would implement the subzoning framework described for alternative B. The subzoning framework by ranch would be the same as provided in table 2. Ranch management and strategies for the management of historic structures and reuse of vacant structures would be the same as those described for alternative B. AUs would be the same as described for alternative B. Alternative elements specific to alternative C are described below.

Preservation of Area Resources

Preservation of area resources under alternative C would be the same as described under alternative B.

Public Use and Enjoyment

Public use and enjoyment under alternative C would be the same as described under alternative B. Under alternative C, with the removal of the Drakes Beach herd, disturbances to the elk herd would no longer be an issue, and additional visitor uses may be feasible at D Ranch.

Visitor Carrying Capacity

Visitor carrying capacity under alternative C would be the same as described under alternative B.

Ranch Management

Ranch management under alternative C would be the same as described under alternative B.

Elk Management

Drakes Beach Herd

Under alternative C, the Drakes Beach herd, totaling 124 individual elk in 2018, would be removed using agency-managed, contractor-led lethal removal methods. In cooperation with CDFW, translocation of a limited number of individuals outside the park would be explored, if practicable. If translocation became a practicable option in the future, additional compliance would be completed at that time to address potential impacts on elk and other resources. Removal of the Drakes Beach herd, which would occur during daylight hours and outside the calving and rut seasons, is anticipated to be a one-time event, lasting approximately four to six months. During the removal, portions of roads may be closed for short durations. NPS would evaluate options to donate meat to the maximum extent possible.

Limantour Herd

As described for alternative B, NPS would continue to take actions to prevent or mitigate elk damage to ranches and conduct disease testing and reporting for the Limantour herd. The Limantour herd would be managed as described for alternative B, and no new herds would be allowed to establish in Point Reyes.

ALTERNATIVE D

General Description and Management Zoning

Like alternative B, under alternative D, NPS would adopt new programmatic guidance and a Ranchland zone that would amend the 1980 GMP. Under alternative D, ranching would be reduced, and the Drakes Beach herd would be managed as described for alternative B.

Application of the Ranchland zone would be the same as alternative B; however, the subzoning, described below, would vary. Under alternative D, ranching operations would be phased out over a one-year period on approximately 7,500 acres, leaving 19,000 acres in active ranching (see figures 34 and 35 in appendix A). These areas include grazing-only leases with minimal infrastructure. Grazing authorizations in areas that are outside the two historic districts would also be removed. NPS would authorize the continuation of beef and dairy cattle ranching operations under 20-year lease/permits for the remaining ranches, as described for alternative B. Grazing-only permits would be phased out over a one-year period. The two remaining life estates are part of the 7,500 acres, and after the life estate expires, ranching would be discontinued consistent with the RUO. NPS would authorize the continuation of beef and dairy cattle ranching operations under the agricultural lease/permit requirements as described for alternative B on the remaining 19,000 acres.

For areas where ranching continues, specific AUs would be authorized, consistent with those described in alternative B. With the removal of 7,500 acres of ranching, approximately 1,700 AUs of beef cattle and 3,130 dairy animals would be authorized under alternative D. For areas remaining in ranching, NPS would authorize the operations with lease/permits under a subzoning framework like the one described for alternative B. For pastures removed from grazing, the determination of need and level of prescribed grazing would be driven by NPS resource management goals and objectives. Alternative elements specific to alternative D are described below.

Preservation of Area Resources

Preservation of area resources under alternative D would be the same as described under alternative B.

Public Use and Enjoyment

Public use and enjoyment under alternative D would be the same as described under alternative B.

Visitor Carrying Capacity

Visitor carrying capacity under alternative D would be the same as described under alternative B.

Ranch Management

Subzoning Framework

Resource Protection Subzone. Under alternative D, the Resource Protection subzone would include the 7,500 acres where ranching would be discontinued and would encompass approximately total 9,800 acres.

Range Subzone. Under alternative D, based on analysis of existing sensitive resource data, approximately 11,600 acres (61%) of the lands under lease/permit would be identified as the Range subzone.

Pasture Subzone. Under alternative D, approximately 7,100 acres (37%) of the area under lease/permit would be identified as Pasture subzone. Nutrient management on dairies would continue to be authorized in the Pasture subzone. Under alternative D, no diversification activities would be authorized in the Pasture subzone, as described below.

Ranch Core Subzone. The Ranch Core subzone would be the same as alternative B.

Diversification

Diversification activities in the Ranch Core and Pasture subzones would be the same as described for alternative B, except that no livestock (sheep, goats, or chickens) except cattle would be authorized in the Pasture subzone. Pigs, chickens, sheep, and goats would continue to be authorized in the Ranch Core subzone.

Vegetation Management

Vegetation management activities on lands under lease/permit would be the same as described for alternative B. For areas removed from grazing, the determination of need and level of prescribed grazing would be driven by desired management objectives for vegetation communities.

Ranch Complex Management

Under alternative D, ranchers would continue to use residential units, barns, and other structures. The types of agricultural structures and utility services on ranch complexes would be the same as those described for alternative A. Plans for adaptive reuse or decommission/deconstruction of unoccupied structures or complexes would be developed as described for alternative B.

Elk Management

Under alternative D, both the Drakes Beach and Limantour herds would be managed as described for alternative B. Like alternative B, no new elk herds would be allowed to establish in areas under lease/permit. If new herds were formed on lands where ranching has been discontinued, they would be allowed to continue.

ALTERNATIVE E

General Description and Management Zoning

Like alternative B, under alternative E, NPS would adopt new programmatic guidance and a Ranchland zone that would amend the 1980 GMP. Under alternative E, the six active dairy ranches in the planning area would cease operations and there would be limited management of the Drakes Beach herd.

Application of the Ranchland zone would be the same as alternative B. Dairies would be phased out over a period of up to five years, and ranchers would be eligible to convert dairy operations to beef cattle grazing (figures 36 and 37 in appendix A). Like Alternative B, 26,100 acres would be available for ranching under alternative E. For areas remaining in beef cattle ranching, NPS would authorize the operations with lease/permits under a subzoning framework like the one described for alternative B, including the management of historic structures. The RDM standard would be managed the same as described under alternative B. Adaptive reuse of historic buildings on dairy ranches would be considered to support a change in operational activities to either beef ranching or as an inactive ranch, as described below.

Specific AUs would be authorized based on the current conditions when the ROAs are developed, as described for alternative B. Assuming all dairy ranches convert to beef ranches, approximately 3,150 AUs of livestock would be authorized under alternative E. If an existing dairy rancher does not want to convert to beef ranching, NPS would seek occupation of the ranch that is consistent with maintaining multi-generational ranching in the planning area.

Elements specific to alternative E are described below.

Preservation of Area Resources

Preservation of area resources under alternative E would be the same as described under alternative B.

Public Use and Enjoyment

Public use and enjoyment under alternative E would be the same as described under alternative B.

Visitor Carrying Capacity

Visitor carrying capacity under alternative E would be the same as described under alternative B.

Ranch Management

Subzoning Framework

The areas for all subzones would be the same as those described under alternative B. With the closure of dairy operations, manure spreading and forage production would cease in the Pasture subzone.

Diversification

Diversification activities in the Ranch Core and Pasture subzones, including the existing commercial chicken and horse boarding operations would not be authorized under alternative E.

Vegetation Management

Requests to manage shrubs for maintaining or increasing areas of grassland habitat to improve forage production would not be considered because forage production would not be authorized. Shrub management, which could include prescribed grazing and mechanical removal (e.g., mowing), would be authorized only to meet NPS resource management goals and objectives. Weed management would be the same as described for alternative B. Seeding would only be authorized to meet NPS resource management goals and objectives. Aeration would not be authorized.

Other Activities

Forage production would not be authorized and would be discontinued.

Under alternative E, the need for manure and nutrient management activities associated with dairy operations would be eliminated. Application of commercially produced compost and fertilizer, as well as animal manure and compost generated in the planning area would be not authorized.

Ranch Complex Management

Under alternative E, ranches in the park would continue to use residential units, barns, and other structures. The types of agricultural structures and utility services on beef cattle ranch complexes would be the same as those described for alternative A. Adaptive reuse or decommission/deconstruction of unoccupied structures or complexes would be developed as described for alternative B; however, the transition from dairy to beef cattle ranching operations would change the use of some contributing structures, such as milking barns, and some buildings may no longer have a use to support these operations. If several ranch complexes or structures were to become vacant as a result of phasing out dairy ranches under this alternative, preservation of structures at ranches would be prioritized in the following order: L, B, I, C, A, and J. This ranking prioritizes those properties that are the most complete and illustrative of the region's dairy history by containing the requisite historic milking and dairy production structures, residential/domestic structures, ranch support structures (e.g., barns, sheds, and garages), and historic landscape features (e.g., pastures and windbreaks). The relative condition of ranch structures would also be considered in prioritizing maintenance activities.

Elk Management

Under alternative E, NPS would take no action to limit the population growth or geographic extent of free-range elk in Point Reyes. NPS management of elk would occur only to support other resource protection needs and management goals.

If new herds were formed, they would be allowed to continue, regardless of geographic location if they do not move outside Point Reyes. Authorized AUs for each ranch would be adjusted as needed to meet RDM goals.

Except for hazing, NPS would continue to take actions described for alternative A to reduce the conflicts related to the presence of elk on ranches (e.g., fence repairs); mitigate elk damage to ranches; and conduct monitoring, disease testing, and reporting.

ALTERNATIVE F

General Description and Management Zoning

Under alternative F, ranching operations would be discontinued, and visitor opportunities would be expanded. The free-range elk populations could expand across the planning area. Under alternative F, NPS would adopt new programmatic guidance that would amend the 1980 GMP. NPS would apply a new management zone to the planning area called the Point Reyes Peninsula/Olema Valley zone, which would replace the zones from the 1980 GMP. This 28,700-acre zone would be managed to support the desired conditions for the planning area defined in chapter 1 and to recognize the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District listed on the National Register. NPS would also apply a Historic Ranch Preservation subzone that would be managed for the adaptive reuse of historic ranch complexes associated with the two historic districts (see figure 38 in appendix A).

Under alternative F, the 18 historic ranch complexes would be included in the Historic Ranch Preservation subzone. Maintenance and adaptive reuse of the developed ranch core would be prioritized for each of the historic ranches based on the condition and integrity of the existing infrastructure. For the Point Reyes Peninsula Dairy Ranches Historic District, B Ranch, C Ranch, D Ranch, Home Ranch, I Ranch, and L Ranch would be the highest priorities for preservation and adaptive reuse. For the ranches of the Olema Valley Dairy Ranches Historic District that occur in the planning area, Zanardi Ranch, R. Giacomini Ranch, McIsaac Ranch, and Stewart Ranch would be prioritized for preservation and adaptive reuse opportunities. The process for identifying new uses would consider the preservation priority and the framework for the use of unoccupied ranch complexes and historic structures outlined below.

Ranching operations with developed complexes would be phased out over a five-year period, except for the two life estates in the park (see figure 39 in appendix A). Grazing-only operations would be phased out in one year. After the life estates expire, no agricultural activities would be permitted. The agricultural leases, range management, subzoning framework, and diversification elements described for the other alternatives would not be applicable under alternative F. Shrub and weed management and seeding would occur only to meet NPS resource management goals and objectives, as described for alternative E. The total acres available for ranching would be zero. Elements specific to alternative F are described below.

Preservation of Area Resources

Strategies to preserve area resources under alternative F would be similar to those described for alternative B; however, NPS would no longer implement these strategies on lands with active ranching once ranching has been removed. The management strategies identified for the two remaining categories of lands in the planning area and on lands where use has changed would be the same in alternative F. Furthermore, as ranching operations are discontinued, NPS would likely apply the strategies outlined in the lands where use has changed over a greater percentage of the landscape.

Public Use and Enjoyment

Once ranching has been removed, under alternative F, additional planning for visitor use that comprehensively addresses and evaluates trail-based recreation, day use, and overnight opportunities in the planning area could be needed to reconsider the distribution of visitor opportunities in the park.

Development of Trails and Trail-Based Recreation

Development of trails and trail-based recreation would be similar to alternative B. Under alternative F, NPS would consider trail linkages that connect new visitor opportunities located in former ranch complexes. The exact locations of additional linkages would depend on the future uses of the ranch

complexes and which ranch complexes maintain a public-facing presence, as opposed to NPS or park partner operations use. The overall quantity of trail opportunities would be similar to all other alternatives because it would be driven by NPS capacity to build and maintain these trails.

Development to Support Day Use and Overnight Accommodations

Development to support day use and overnight accommodations would be the same as described for alternative B, and all ranch complexes would become available for adaptive reuse to support visitor opportunities under alternative F. The change in land use could create additional opportunities such as a string of lodging or camping sites connected by trails. NPS would likely evaluate opportunities for additional adaptive uses through a request for proposal process. The overall diversity and quantity of overnight and day use opportunities would be expanded under this alternative.

Development to Support/Enhance Interpretation and Education

Development to support/enhance interpretation and education would be the same as described for alternative B, and under alternative F, NPS would use a wider range of techniques to interpret the history of ranching in the park, potentially including exhibits in historic structures that are no longer actively used for ranching. A collaborative interpretive plan that tiers from this EIS would be developed for the continued interpretation of ranching history across the landscape following the phase out of ranching.

Use of Unoccupied Ranch Complexes and Historic Structures in the Historic Ranch Preservation Subzone

The majority of ranch complexes are components of the historic districts and contain contributing buildings and other characteristic features that NPS would strive to preserve whenever possible. NPS would determine preservation strategies for the ranch complexes in the planning area using the approach identified below. NPS would undertake all new uses and associated changes to the structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

When a contributing structure(s) or a full a ranch complex becomes vacant, NPS would use the following process to determine appropriate adaptive reuse:

- NPS would first consider if the structure or complex is needed and could be sufficiently used for NPS operational uses, such as housing, operations, visitor services, or partner use.
- If NPS does not have a use for the complex or structure, it may issue a request for proposals, seeking proposals for adaptive reuse in ways compatible with park purpose and desired conditions. Stabilization techniques such as mothballing structures may be implemented to arrest deterioration.
- If ultimately no use can be found for the complex, NPS may consider demolition of the structures after consultation with the SHPO.
- Structures that are non-contributing to the National Register historic district may also be demolished after consultation with the SHPO.

Under alternative F, by applying the process above, there could be additional opportunities for use of some of the vacant ranch complexes to support a higher level of visitation such as a car-camping campground, larger trailhead, and other visitor facilities. Under alternative F, with the removal of ranching operations, NPS would have additional buildings to consider using for park maintenance operations as well as additional structures that could be considered for removal if no appropriate use could be found.

Visitor Carrying Capacity

Under alternative F, NPS would adopt the visitor capacity framework outlined in alternative B, using the same indicators, thresholds, monitoring protocols, and management strategies. NPS would also manage visitor capacity based on the same three key areas identified in alternative B; however, additional key

destinations along Sir Francis Drake Boulevard from Pierce Point Road through the end of the planning area could be considered in the analysis. NPS would apply an adaptive management approach to evaluating visitor capacity levels once all ranching operations were discontinued and new visitor opportunities were established. Additional visitor capacity likely would be allowed under alternative F; however, visitor capacity is not expected to be significantly different from alternative B. NPS would prioritize gathering updated data based on new uses to determine specific visitor capacity. Once ranching has been discontinued, a future planning effort that comprehensively addresses trail-based recreation and day use and overnight use opportunities throughout the park would be considered as a mechanism to integrate this updated visitor capacity analysis.

Ranch Management

Under alternative F, NPS would not apply the Resource Protection, Range, Pasture, and Ranch Core subzones in the planning area. In the absence of active ranching operations, these subzones would not be needed for management.

Grazing Practices

NPS may use prescribed grazing on lands in the planning area to meet resource management goals and objectives (e.g., maintenance of disturbance regimes in grasslands which contribute to the historic character of the two National Register historic districts). Prescribed grazing would be conducted by contract through NPS. The scale of these operations is anticipated to be on the order of 100 to 200 AU or less in the planning area and limited to spring through fall, to avoid the wet season. NPS would identify priority areas for vegetation management.

Use of Ranch Complexes

Under alternative F, NPS would implement a strategy to minimize impacts on the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District as described above in the “Historic Ranch Preservation Subzone” section.

Elk Management

Under alternative F, NPS would not limit the population growth or geographic extent of free-range elk in Point Reyes. NPS management of elk would occur only to support other resource protection needs and management goals. Until cessation of ranching operations, NPS would consider limited, non-lethal management measures for elk. Once ranching operations cease, new herds would be allowed to develop in Point Reyes, and the elk fence at Tomales Point would be removed, consistent with the removal of other boundary fences in the planning area.

Based on preliminary modeling, the existing free-range elk herds at Drakes Beach and Limantour could potentially expand to 2,000 individuals over a 20-year period (see appendix I). The core use areas of these herds would likely expand throughout Point Reyes. Following the removal of the fence at Tomales Point, elk from this herd are expected to expand beyond Tomales Point. The total elk population in Point Reyes is difficult to predict over the 20-year period, given the uncertainty about the reproductive response of the Tomales Point herd once the fence is removed. Given the absence of cattle from the planning area, the herd size is not expected to grow to a level that would necessitate population management related to adequate forage in Point Reyes. NPS would not allow elk to expand into Golden Gate or lands outside park boundaries.

TABLE 3: COMPARISON OF ALTERNATIVE ELEMENTS

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
General Description and Management Zoning						
	NPS would continue to follow previous planning guidance, including the 1980 GMP. The inconsistency between the 1980 land management zones and current ranching operations would continue.	NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the planning area. NPS would allow for continued ranching and provide a population threshold for management of the Drakes Beach herd. NPS would apply a new management zone, the Ranchland zone, to the planning area.	Same as alternative B except the Drakes Beach herd would be removed.	NPS would adopt new programmatic guidance and a Ranchland zone that would amend the 1980 GMP. Ranching acreage would be reduced, and the Drakes Beach herd would be managed as described for alternative B. Application of the Ranchland zone would be the same as alternative B; however, the subzoning would vary. Ranching operations would be phased out over a one-year period on approximately 7,500 acres.	NPS would adopt new programmatic guidance and a Ranchland zone that would amend the 1980 GMP. There would be limited management of the Drakes Beach herd. Application of the Ranchland zone would be the same as alternative B. Dairies would be phased out over a period of up to five years, and ranchers would be eligible to convert dairy operations to beef cattle grazing.	Ranching operations would be discontinued, visitor opportunities would be expanded, and the free-range elk populations could expand across the planning area. NPS would adopt new programmatic guidance that would amend the 1980 GMP to apply a new management zone to the planning area called the Point Reyes Peninsula/Olema Valley zone, which would replace the zones from the 1980 GMP. NPS would also apply a Historic Ranch Preservation subzone that would be managed for the adaptive reuse of historic ranch complexes associated with the two historic districts.
Preservation of Area Resources						
	NPS would continue to follow previous planning guidance, including the 1980 GMP.	NPS would adopt desired conditions and associated management strategies for preservation of ecological function; preservation of native species, including threatened and endangered species; management of invasive/non-native species; and preservation of cultural resources.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B, except NPS would no longer implement these strategies on lands with active ranching once ranching has been removed.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Public Use and Enjoyment						
	NPS would continue to follow previous planning guidance, including the 1980 GMP.	NPS would adopt the following strategies and actions to achieve the desired conditions for facilitating public use and enjoyment and visitor experience in the planning area for the following key areas: development of trails and trail-based recreation; development to support day use and overnight accommodations; development to support/enhance interpretation and education; development related to shuttles and parking; and potential use of unoccupied ranch complexes and historic structures.	Same as alternative B, except with the removal of the Drakes Beach herd, disturbances to the elk herd would no longer be an issue, and additional visitor uses may be feasible at D Ranch.	Same as alternative B.	Same as alternative B.	Same as alternative B plus once ranching has been removed, additional planning for visitor use that comprehensively addresses and evaluates trail-based recreation, day use, and overnight opportunities in the planning area could be needed to reconsider the distribution of visitor opportunities in the park available for potential visitor use.
Visitor Carrying Capacity						
	NPS would continue to manage for visitor capacity as part of regular park operations but would not have a documented framework for programmatic decision-making related to visitor capacity. NPS would respond to individual situations or issues on a case-by-case basis.	Strategies that could be implemented to manage visitor capacity generally involve: providing more information to visitors to be able to accurately wayfind and select experiences throughout the park; expanding the range of visitor opportunities in the planning area; managing access through a broader range of tools; formalizing trailheads and parking; managing large-scale trail-based event requests, and partnering to improve safe multi-use of the roads notably for bicycle access.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B, with additional key destinations along Sir Francis Drake Boulevard from Pierce Point Road through the end of the planning area considered. NPS would apply an adaptive management approach to evaluating visitor capacity levels once all ranching operations are discontinued and new visitor opportunities were established.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Ranch Management						
Subzoning Framework						
	Not applicable.	Ranchland Zone with four subzones: Resource Protection, Range, Pasture, and Ranch Core. Subzones would be defined in each ROA. *Resource Protection Subzone:* Areas removed or outside of lease/permit grazing activities. Approximately 2,600 acres—comprising 800 acres within current lease/permit boundaries but already excluded from ranching; 1,200 acres that would be excluded from ranching; and approximately 600 acres in the planning area but not part of any existing ranch lease/permit. *Range subzone*: Grazed or potentially grazed lands that support native vegetation, managed as a natural ecosystem. Approximately 16,900 acres of the lands under lease/permit. *Pasture subzone:* – grazed lands outside of the Range subzone where no sensitive resources are known to occur. Used primarily for the production of livestock, composed of introduced or domesticated native forage species. Approximately 9,000 acres of the area under lease/permit. *Ranch Core subzone:* the developed complex of buildings and structures on each individual ranch including up to 2.5 additional acres of disturbed land immediately adjacent to the developed complex. Approximately 180 acres (less than 1%) of the area under lease/permit.	Same as alternative B.	*Ranchland Zone* – same as alternative B. *Resource Protection subzone:* Areas removed or outside of lease/permit grazing activities. Approximately 9,800 acres—comprising approximately 7,500 acres where ranching would be discontinued, 800 acres within current lease/permit boundaries but already excluded from ranching; 900 acres that would be removed from lease/permits where no or limited prescribed grazing would be authorized; and approximately 600 acres in the planning area but not part of any existing ranch lease/permit. *Range subzone:* Approximately 11,600 acres of the lands under lease/permit *Pasture subzone:* Approximately 7,100 acres of the area under lease/permit. *Ranch Core Subzone:* same as alternative B.	Same as alternative B.	In the absence of active ranching operations, subzones would not be needed for management, so they would not be applied.
Agricultural Lease / Special Use Permit						
Approximate Acres Available for Rancher Use	27,000	26,100	26,100	19,000	26,100	0
Lease/Permit Term	5 or 10-year lease/permit terms.	Up to a 20-year term.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Ranch Closures	None.	None.	None.	Specific grazing-only leases/permits on ranches without residential complexes would be phased out over a one-year period.	All dairy operations (6) would be phased out over a five-year period. Dairy ranches would be given the option to convert to a beef cattle ranching operation.	All ranching operations would be phased out. Ranching operations with residential complexes would be phased out over a five-year phase. Grazing-only permits would be phased out over a one-year period.
Ranch Operating Agreement	Not applicable.	Approved agreement with annual review required.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.
Animal Units (AU)	AUs would continue on existing authorizations, approximately 2,400 AUs of beef cattle and 3,315 dairy cattle.	Approximately 2,400 AUs of beef cattle and 3,130 dairy cattle.	Same as alternative B.	Approximately 1,700 AUs of beef cattle and 3,130 dairy cattle.	Approximately 3,150 AUs of beef cattle (assuming all dairy ranches convert to beef ranches). Based on the elk population, authorized AUs for each ranch would be adjusted as needed to meet RDM goals.	Not applicable.
Succession	Relinquish land to neighboring ranchers, remove portions of the lease from ranching for natural resource purposes, or in the case of RUO expiration, initiate a lease/permit with the longstanding grazing operator.	Succession planning would be consistent with maintaining multi-generational ranching in the planning area.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.
Appraisal Process	Ranch by ranch.	Development of a master appraisal process managed by the US Department of the Interior to determine FMV for park ranch operations. The appraisal would also incorporate consideration of a maintenance reserve account and identify appropriate methods to adjust the annual rental rate over time.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Diversification						
Other Livestock	Limited number of livestock species including poultry, pigs, sheep and horses are currently authorized under personal use. One commercial chicken operation would continue to be authorized.	Livestock authorized as defined below with required mitigation measures in appendix D. Ranch Core subzone: Pigs, chickens, sheep and goats would be authorized. Pasture subzone: Sheep, goats, and chickens would be authorized. Sheep or goats may be present on Pasture subzone at level up to 10% of authorized AU or NTE 10 AU if authorized AU is greater than 100. This allocation is not in addition to, but part of permitted AU. Up to 500 chickens would be allowed (not to exceed 3 mobile huts on pasture), in the Pasture subzone for operations with residential complex (not grazing only leases). Temporary fencing would be allowed, but no permanent fencing or other infrastructure may be constructed. No predator management would be allowed but the use of guard animals would be allowed following established mitigation measures.	Same as alternative B	Same as alternative B except no livestock (sheep, goats, or chickens) would be allowed in the Pasture subzone.	No diversification activities would be authorized.	Not applicable.
Row Crops	None	Ranch Core subzone: Up to 2.5 acres of row crops not requiring irrigation would be allowed in previously disturbed areas with mitigation measures specified in appendix D. Wildlife management to protect crops would not be allowed: however, ranchers would be allowed to fence row crops to exclude wildlife.	Same as alternative B.	Same as alternative B.	Row crops would not be authorized.	Not applicable.
Other Uses	Horse boarding on one ranch would continue.	Ranch Core subzone: Commercial horse boarding allowed with mitigation measures specified in appendix D. Potential for farm stays and farm tours through adaptive reuse of existing structures. Scale determined through individual ROAs, taking existing infrastructure into account.	Same as alternative B.	Same as alternative B.	Horse boarding and other uses would not be authorized.	Not applicable.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Range Management and Monitoring						
RDM Standard	Continued as directed by the 1990 Range Management Guidelines and subsequent updates (minimum RDM level of 1,200 pounds/acre).	Same as alternative A but updated/revised as necessary.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.
Mitigation Measures	Continue as identified in the 1990 Range Management Guidelines and subsequent updates, including from other agencies and application of specific measures on a case-by-case basis for individually reviewed and authorized activities.	Continue as identified in the 1990 Range Management Guidelines and subsequent updates, including guidance from other agencies and with establishment of defined management activity standards and mitigation measures for ranch activities in a regularly reviewed ROA.	Same as alternative B.	Same as alternative B	Same as alternative B.	Not applicable.
Ranch Infrastructure						
	Regular management and maintenance of ranch operation would continue. Review of activities on a case-by-case basis; these include: road upgrade and decommissioning; stream crossings; infrastructure management; fencing; livestock water supply; pond restoration; and waterway stabilization.	Following NPS review and approval, the following types of activities would be authorized management activity standards according to mitigation measures in appendix D: road upgrade and decommissioning; stream crossings; infrastructure management; fencing; livestock water supply; pond restoration; and waterway stabilization.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Not applicable.
Vegetation Management						
	Vegetation management practices would be authorized in individual lease/permits with new practices incorporated into lease/permit on a case-by-case basis. Management practices include upland and riparian vegetation management and planting, mowing and integrated pest management and prescribed grazing.	Following NPS review and approval upland and riparian vegetation management and planting, mowing and IPM, and prescribed grazing would be authorized according to management activity standards and mitigation measures in appendix D.	Same as alternative B.	Same as alternative B. For pastures removed from grazing, the determination of need and level of prescribed grazing would be driven by desired ecological objectives for vegetation communities.	Shrub management (e.g. prescribed grazing and mowing) would be approved for meeting NPS resource management goals and objectives only. Requests to manage shrubs to improve forage production would not be considered.	Not applicable as there would be no ranching operations. However, NPS may use prescribed grazing on lands in the planning area to meet resource management goals and objectives.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Other Activities (Applicable Only on Ranches Where Currently Authorized)						
Forage Production	NPS would continue to set the standards for cultivation of ranch lands for forage production following NRCS's cultivation practice recommendations. Forage production would continue to be authorized on 1,000 acres.	Same as alternative A and authorized in the Pasture subzone.	Same as alternative A and authorized in the Pasture subzone.	Same as alternative A and authorized in the Pasture subzone.	Forage production would not be authorized.	Not applicable.
Manure and Nutrient Management	Stored manure or compost generated on ranches would continue to be spread across approximately 2,500 acres within lease/permit areas. Minimal use of commercial fertilizer. The use of commercial fertilizer would continue to not be authorized on certified organic lands and natural pastures in the park.	Application of animal manure and compost generated within the Ranch Core and Pasture subzones would be allowed with an approved nutrient management plan and would be consistent with the mitigation measures in appendix D. Application of commercially produced compost and fertilizer would not be allowed.	Same as alternative B.	Same as alternative B.	The need for nutrient management activities associated with dairy operations would be eliminated. Application of commercially produced compost and fertilizer would not be authorized. Application of animal manure and compost generated within the planning area would be not allowed.	Not applicable.
Ranch Complex Management						
Maintenance	Ranchers would continue to maintain ranch complex infrastructure, including ranch roads used by NPS, the public and ranchers. In-residence pest control for rodents using traps would be allowed. Use of poison or bait is not allowed on park lands	Same as alternative A. Additionally, the lease /permit would establish a maintenance reserve account directed to priority maintenance and improvements through the ROA.	Same as alternative B.	Same as alternative B.	Same as alternative B.	All maintenance would be the responsibility of NPS or partner organizations. NPS would implement a strategy to minimize impacts on the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District by prioritizing specific ranch buildings, structures, and landscapes for preservation based on their relative historic significance and identify opportunities for adaptive reuse. As appropriate, NPS would evaluate potential for decommissioning/deconstruction of low priority or substantially degraded structures/ complexes.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
New Development, Infrastructure Improvements and Alterations	All improvements or alterations to buildings, fences, and corrals would continue to be the responsibility of the ranch operator with prior written approval from NPS.	All improvements or alterations to buildings, fences, and corrals would be included in the ROA prior to implementation.	Same as alternative B.	Same as alternative B.	Same as alternative B.	All maintenance would be the responsibility of NPS or partner organizations.
Vacant Complexes	Vacant complexes would remain vacant. As opportunities for reuse arise, they would be considered on a case-by-case basis.	NPS would preserve the ranch complexes in the planning area collaboratively with complex occupants through guidance in the ROAs, the Point Reyes' historic preservation crew, and other NPS programs. Adaptive reuse of individual structures or full ranch complexes may be used as a preservation strategy if they are no longer used to support ranch operations.	Same as alternative B.	Same as alternative B.	Same as alternative B; however, the transition from dairy to beef cattle ranching operations would change the use of some contributing structures, such as milking barns. If several ranch complexes or structures were to become vacant as a result of phasing out dairy ranches, preservation of structures at ranches would be prioritized in the following order: L, B, I, C, A, and J.	NPS would implement a strategy to minimize impacts on the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District by prioritizing specific ranch buildings, structures, and landscapes for preservation based on their relative historic significance and identify opportunities for adaptive reuse. As appropriate, NPS would evaluate potential for decommissioning/ deconstruction of low priority or substantially degraded structures/ complexes.
Elk Management						
Geographic Extent of Elk	Would not alter or limit the population level or geographic extent of elk in Point Reyes. Continued fence repair, habitat enhancements, and hazing would occur to reduce elk presence on ranches. Any elk that leave Point Reyes for Golden Gate or non-federal lands would be removed.	Both the Drakes Beach and Limantour herds would be actively managed to remain in their core area. Male elk would be allowed to wander outside of a core area provided they do not establish new herds. Same actions as alternative A to reduce conflict related to elk presence on ranches.	The Drakes Beach herd would be removed, so the geographic extent of the herd would not be managed. The Limantour herd would be managed the same as alternative B.	Same as alternative B.	NPS would take no action to limit the geographic extent of elk within the park boundary. NPS would not allow elk to expand into Golden Gate or lands outside park boundaries. Management of the geographic extent of elk would only occur to support other resource protection and park goals. Except hazing, NPS would take actions similar to alternative A to reduce conflict related to elk presence on ranches.	NPS would not limit the population growth or geographic extent of free-range elk in Point Reyes. NPS management of elk would occur only to support other resource protection needs and management goals.

	Alternative A No Action	Alternative B NPS Preferred Alternative	Alternative C	Alternative D	Alternative E	Alternative F
Establishment of New Herds	The elk population would be allowed to continue to grow.	No new herds would be allowed to establish. Hazing techniques would be used to prevent the establishment of new herds. More direct (lethal) action would be a method of last resort.	Same as alternative B.	Same as alternative B. In the event new herds form on lands where ranching has been discontinued, they would be allowed to continue.	If new herds form, they would be allowed to continue, regardless of geographic location if they do not range outside Point Reyes.	Until cessation of ranching operations, NPS would consider limited, non-lethal management measures for elk. Once ranching operations cease, new herds would be allowed to develop in Point Reyes, and the elk fence at Tomales Point would be removed, consistent with the removal of other boundary fences in the planning area.
Population Level Management	Elk populations would continue to grow in line with current trends. NPS would not alter or limit the population levels.	NPS would manage the population of the Drakes Beach herd to a threshold of 120 individuals. If necessary, elk would be lethally removed after a count in the fall and prior to spring calving to reach the population threshold. 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 planning 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 and lethal removal may be used to manage the geographic extent if individuals establish outside the core use areas.	The Drakes Beach herd would be removed by lethal methods or a few by translocation outside of the planning area if practicable. Removal would be a one-time event, occurring over approximately four to six months. The Limantour herd would be managed the same as alternative B.	Same as alternative B.	There would be no population level management towards defined herd sizes. All herds would be allowed to grow without interference.	Same as alternative E.
Monitoring and Testing	Monitoring of elk herds would continue, as would testing for Johne's disease and chronic wasting disease.	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A.

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ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The following alternatives were considered but dismissed from further analysis for reasons explained below.

Ranch Management

Converting Beef Cattle Operations to Dairy Operations

A request for converting beef cattle ranching operations to dairy ranching operations was considered but is beyond the scope of this analysis and was dismissed from further analysis in the EIS. This conversion would require adding infrastructure specific to dairy ranching (e.g., milking barns and nutrient management lagoons) to meet current regulatory requirements, changing operations (e.g., greater confinement of cattle for milking, supplemental feeding, and increased nutrient management), and increasing travel on park roads for dairy operations. These changes could cause additional impacts on resources including, but not limited to, increased trampling and grazing of vegetation adjacent to milking facilities, increased risk of water quality impacts from increased quantities of manure, or a greater risk of invasive plants spreading from a higher disturbance of soils in areas adjacent to milking facilities. Consideration of individual proposals to convert beef cattle ranching to dairy ranching would occur under separate planning processes and would be based on site-specific information that would address infrastructure needs, operational changes, and compliance with appropriate regulations (such as water quality).

Management of All Park Lands for the Protection, Restoration, and Preservation of Natural Resources

Commenters suggested NPS should manage all park lands solely for the protection, restoration, and preservation of natural resources. In addition to managing park lands for the protection of natural resources, NPS also must manage cultural resources and provide for visitor use and enjoyment in a manner consistent with applicable legal requirements. As a result, management decisions cannot solely be based on impacts to natural resources. This approach was dismissed from further analysis because it would not address impacts on other NPS resources and values that NPS is mandated to consider.

Moreover, the action alternatives in this EIS that include ranching would implement activities and mitigation measures to minimize impacts on natural and cultural resources while also protecting them. Additionally, the no ranching alternative would be similar in nature to an alternative focused on the protection, restoration, and preservation of natural resources on all NPS lands.

Implementing the Proposed Action from the 1980 General Management Plan

Commenters suggested that NPS consider an alternative that manages park lands as stated in the proposed action for the 1980 GMP. Commenters state that the park currently does not follow the management described for the proposed action because it allows ranching in areas that are zoned as natural and environmental protection zones. The July 2017 Settlement Agreement requires NPS to prepare an amendment to the 1980 GMP. Through this GMP Amendment planning process, NPS is updating the 1980 GMP for lands in the planning area, including the north district of Golden Gate, which was not included in the 1980 GMP.

Since the 1980 GMP was released, other elements of the 1980 GMP are no longer feasible or appropriate because new and different issues and objectives have arisen, and new information is available to inform decision-making (e.g., the presence of National Register historic districts and a free-ranging elk herd in the planning area). Therefore, in the context of this new information and planning objectives, this GMP Amendment revisits management approaches for lands and resources in the planning area based on current information and goals and localized impacts from the presence of elk. Implementing the proposed action from the 1980 GMP does not meet the purpose and need for the GMP Amendment and was dismissed from further analysis.

Reduced Ranching—Closure of Ranches Draining Only to Drakes Estero

Commenters suggested a reduced ranching alternative that would close ranches that drain into Drakes Estero as proposed in the 2008 draft GMP because of water quality concerns related to ranching. As part of this EIS planning process, mitigation measures and activities to protect and improve water quality are prescribed across the entire planning area, so impacts to the watershed that drains into Drakes Estero were not identified as a primary consideration when developing the reduced ranching alternative (alternative D). Closing the ranches that drain into Drakes Estero would greatly affect the Point Reyes Peninsula Dairy Ranches Historic District, and alternative F already considers and analyzes an alternative with similar impacts. The reduced ranching alternative (alternative D) that was carried forward for detailed analysis minimizes the impacts on cultural resources and results in improved water quality conditions in Drakes Estero and other areas. As a result, an alternative that only reduces ranching on ranches that drain into Drakes Estero is not sufficiently different to warrant full consideration.

Reestablishing Ranches and Grazing in Areas Where Ranching was Previously Discontinued

Commenters suggested that the EIS consider the reestablishment of ranches and grazing in areas where ranching was previously discontinued. These areas are outside the scope of the EIS and beyond the scope of the planning analysis, which is focused on lands currently under lease/permit. Therefore, this alternative was dismissed from further analysis.

Diversification of Livestock (Ducks, Geese, Turkeys, Rabbits)

Diversification of livestock applies to the production of livestock species other than beef and dairy cattle. Small-scale production of ducks, geese, turkeys, and rabbits was considered but will not be authorized because of concerns regarding adverse effects on native wildlife from escaped animals cross breeding with native species; potential increase in predation; disease or parasites; loss or degradation of habitat; construction of additional infrastructure (e.g., watering facilities, feed storage facilities, and pens); or the need for the use of non-wildlife friendly fencing. The production of ducks, geese, turkeys, or rabbits was dismissed from further analysis because introduction of these species as a diversification activity would have too great of an environmental impact. Turkeys currently exist as a diversification activity on one life estate as a private property right. Once that life estate expires, turkeys would no longer be an authorized use in that location.

Issuance of Rolling Leases

Commenters suggested that NPS issue “rolling” leases in lieu of leases with 20-year terms. Rolling leases are leases that renew automatically and thus have no fixed termination date. Issuance of rolling leases is not consistent with ranching in a setting as complex as the planning area where environmental and regulatory conditions change over time and lease provisions would need to be updated accordingly. Most lease/permits have multiple ranch family signatories. Having a lease/permit with a fixed expiration date provides an opportunity for family members no longer wishing to remain on the lease to exit the arrangement and for new generations of family to become signatories. Moreover, the 2013 Secretarial delegation of authority to NPS and recent Congressional guidance direct NPS to consider issuing leases with 20-year terms.

Elk Management

Fertility Control

Contraception. Contraceptive use, particularly pellucida (PZP) and GonaCon, to restrict the growth of the elk population was considered but dismissed. In conjunction with the University of California, Davis, NPS conducted a research project to investigate the efficacy of PZP immunocontraception and fecal steroid monitoring techniques in elk at Tomales Point (Shideler et al. 2002). One of the main problems with treating elk consistently was animal accessibility and the ability to re-treat enough animals on a yearly basis. Additionally, the incidence of injection site abscesses in the elk was high enough to be of

concern. After this experience, park management decided that because of the topography of the park, accessibility of animals, and a vaccine that lasted only 10 to 12 months, the use of the vaccine did not have sufficient efficacy to justify the effort to deliver the product (NPS 2015a). Because of these issues, and the fact that PZP has behavioral effects and hormonal residue concerns and is not registered by the USEPA, the use of PZP as a means of contraception was not carried forward for further analysis.

GonaCon, another form of reproductive control agent, was recently approved for use with deer. It does not have the same issues with hormonal effects as PZP and appears to be effective for more than a year. However, USEPA does not currently approve GonaCon for use in elk. The use of GonaCon would also require repeatedly capturing elk to first mark them so that they can be identified correctly for future treatment and to administer the treatment by hand injection, the only currently approved injection method. Over time, ground darting as a means of capture becomes less effective because animals become increasingly harder to approach. Eventually, helicopters would need to be used to capture animals, but helicopters pose a high human safety risk and are expensive and highly intrusive, especially in and near wilderness areas. Furthermore, a high number of marked or collared animals may affect the wildlife viewing experience for visitors. Therefore, using GonaCon was dismissed as a potential contraceptive measure. In the future, a contraceptive agent for use in elk may be approved that would not have adverse biological effects, would be effective for many years, and would be able to be administered without the use of helicopters; however, until that occurs, contraception is not being considered for use in the park.

Surgical Sterilization. Surgical sterilization is an invasive procedure that requires full anesthesia and a veterinarian to remove the ovaries or to conduct a tubal ligation or castration. No sterile environment or facility is available in the park, and while a temporary or mobile field station could be set up in the field, the possibility of infection would be high so that mortality of individual elk could occur. Further, animals would need to be captured, and capture is difficult and would likely require the use of helicopters, as described in the "Contraception," section above. In addition to the stress of the capture, individual animals would also be stressed by the tranquilizers/anesthesia, surgical procedures, and recovery, any of which could increase mortality of sterilized individuals. The procedure is labor intensive, and even though this treatment is permanent for individuals, annual sweeps would be needed to treat new elk in the area. For these reasons, surgical sterilization is not considered a viable alternative element and is dismissed from further analysis.

Introducing Natural Predators

Commenters suggested that predators such as the gray wolf should be introduced to the park to control the elk population. Gray wolf populations are not known to have ever existed in the park. Introducing a non-native predator is contrary to NPS *Management Policies*, would likely create an imbalance of predators and prey in the park (Kovacs et al. 2016), and would be a threat to ranch animals. Introduction of other large carnivores that once occurred in the planning area (i.e., black and grizzly bears) was also dismissed because other threats to their existence, such as human development, would remain on lands surrounding the park. Additionally, while bears may prey opportunistically on elk, they would not serve as a tool for population management. For these reasons and because the park cannot support viable populations of wolves and bears (as required by NPS *Management Policies 2006* [NPS 2006a]), the option of introducing predators into the park for elk management was dismissed from further analysis.

Commenters also suggested that mountain lions should be reintroduced into the park to assist in elk management. Mountain lions already exist in the park; therefore, this suggested alternative was dismissed from further analysis.

Translocation in the Park

NPS has considered translocation in the park and conducted tests to determine the efficacy of these methods. Elk that have been translocated from Drakes Beach to Limantour have returned to Drakes Beach. In March 2015, two male elk and one female were captured and moved to Limantour as part of an experiment to understand relocation response. All three animals returned to Drakes Beach over the next

year. Translocation of free-ranging elk to Tomales Point has also proven ineffective because the animals either did not survive following release or returned to the location of capture. In February 2017, two female elk were relocated from Drakes Beach to the Tomales Point Elk Reserve; one female left the fenced reserve and returned to Drakes Beach in July 2017, while the other died of unknown causes in March 2018. Based on the ineffectiveness of this technique, this element was dismissed from further analysis.

Improve Elk Habitat in Wilderness

Commenters suggested that the habitat in the Limantour portion of the Phillip Burton Wilderness is poor, which is why elk have migrated to the planning area. Members of the public suggested that the park should ensure that proper forage and water are available in wilderness areas by manipulating the habitat to make it more desirable for elk. No evidence is available to suggest that forage and habitat conditions in the wilderness area are responsible for the movement of elk onto ranches, and a large majority of the Limantour herd remains in wilderness areas. Cobb et al. (in press) found that of the three elk herds at Point Reyes, the Limantour herd had the lowest productivity. By improving elk habitat in the Limantour area, productivity would likely increase, as would the numbers of elk moving onto adjacent ranches. The Limantour portion of the Phillip Burton Wilderness is outside the scope of this EIS, and manipulation of wilderness is inconsistent with the Wilderness Act. Therefore, this alternative element was dismissed from further analysis.

Fencing Elk into Specific Geographic Locations

The option of constructing a fence along the boundary of the Phillip Burton Wilderness to prevent elk from entering ranchlands was considered but dismissed for several reasons—the high cost of construction and maintenance of a fence; ineffectiveness; and impacts on other wildlife, the visitor experience, and wilderness values. A wilderness border fence would have to be constructed on park lands outside the wilderness area to comply with the Wilderness Act. Based on the terrain of the area between the wilderness area and the ranches to the west, fencing along the wilderness boundary would be very costly to build and maintain. Moreover, the fence would not be a full-enclosure fence. Following consultations with wildlife biologists at CDFW and the NPS Biological Resource Management Division, it was determined that elk would get around such a fence by simply following the fence line in either direction.

Erecting fencing along the Phillip Burton Wilderness may also result in pushing elk outside Point Reyes, potentially affecting neighboring landowners. The fence would be highly visible to park visitors in many locations, would interrupt the natural and scenic views of the park landscape, especially near designated wilderness, and would disrupt wildlife movement patterns. For these reasons, it was dismissed from further analysis.

Restricting the D Ranch herd to the Horseshoe Pond area by building a fence along Drakes Beach Road to the cliff was explored. However, elk could travel along a wide beach to move around a fence. Elk have been seen on the beaches, indicating that they would get around a fence that ended at the cliff. Additionally, this option would turn a free-range herd into a captive herd at Point Reyes. For these reasons, this option was dismissed from further analysis.

Recreational Hunting

A managed hunt (or public hunting or recreational hunting) was considered as a possible alternative to reduce the elk population. Although hunting is prohibited in most national park units, hunting could be allowed in Point Reyes based on language contained in the Point Reyes enabling legislation that states: “The Secretary may permit hunting and fishing on lands and waters under his jurisdiction within the seashore in such areas and under such regulations as he may prescribe during open seasons prescribed by applicable local, State, and Federal law” (16 U.S.C. Sec. 459c-6(b)). NPS would need to initiate a rulemaking process to allow hunting in Point Reyes. Public or recreational hunting differs from the use of qualified volunteers for population management. Hunting is an activity administered by state wildlife agencies through licenses and involves fair chase and the taking of meat by the individual hunter. Direct

reduction, on the other hand, is a tool used to reduce populations that have exceeded management objectives; it is a controlled and structured activity used to meet specific management objectives and is not implemented for recreational purposes.

A public hunting alternative was not carried forward for further analysis based on factors relating to cost, efficiency, and safety. First, hunting would not be less expensive or more efficient than using NPS staff or contractors. Any hunting done in Point Reyes needs to be done in a managed environment; no unsupervised public hunting could occur in the traditional sense because removals need to be targeted to certain elk or certain demographics. NPS staff would need to oversee all hunting activities to ensure the taking of the correct numbers, ages, and sexes of elk. This would also be true for any hunting by ranchers themselves. NPS would incur substantial costs and impacts on schedule to develop training for hunters and to supervise hunters to reduce risk and provide for the necessary level of public safety, which is also an issue to consider when using lethal control methods. Sharpshooting offers safety features that a typical managed hunt does not. Although it is not suggested that hunts cannot be done in a safe manner, the extensive planning and oversight that would be required to ensure a level of safety comparable to wildlife professionals engaged in sharpshooting activities make a managed hunt less feasible. Many developed areas and potentially occupied buildings are scattered throughout the park, and the Drakes Beach herd is in one of the most highly visited areas of Point Reyes. Having hunters access ranches and high visitor use areas may pose visitor and rancher safety issues. Because of these concerns, this alternative element was dismissed from further analysis.

Complete Removal of Elk on Ranchlands

Based on preliminary forage model results, the roughly 50 individual elk that move onto ranch lands from the Limantour herd do not affect the forage availability or RDM for ranches in that area. Further, in an extreme scenario, such as a fire similar to the 1995 Mount Vision fire, all free-ranging elk could temporarily move onto the ranch lands to forage, helping to avoid the inadvertent elimination of the free-ranging elk herd, which is an important consideration in the context of this planning discussion. Alternative C analyzes the removal of the Drakes Beach herd. Similarly, individuals from the Tomales Point herd occasionally enter ranchlands, so complete removal of elk from ranchlands is not feasible. For these reasons, this alternative element was dismissed from further analysis.

Hazing Elk Using All-Terrain Vehicles, Dogs, and Drones

Since 2012, NPS staff have had moderate success in conducting hazing on foot to push elk herds off active ranch lands, which reduces the time elk spend foraging on ranches. During the initial planning stages for the GMP Amendment, the public suggested that NPS consider other hazing mechanisms in addition to the hazing currently being done by NPS staff. Although some kinds of noisemakers or visual deterrents may be considered in the future, NPS has ruled out the use of all-terrain vehicles, dogs, and drones (unmanned aircraft). All-terrain vehicles can cause elk to scatter more, rather than being directed to a certain location. Use of dogs to haze elk could disturb other wildlife and livestock. Therefore, this alternative element has been dismissed from further analysis.

MITIGATION MEASURES

Mitigation measures that would be applied to specific ranching activities are included in appendix D. The ROA would identify the site-specific management activity standards and mitigation measures that apply to each ranch.

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CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

The "Affected Environment" chapter describes existing conditions in the planning area for those elements of the natural and cultural environments that could be affected by implementing the alternatives considered in this GMP Amendment EIS. Impacts on these resources are analyzed in "Chapter 4: Environmental Consequences."

SOILS

Topography

The elevation at the park varies from sea level to 1,407 feet at Mount Wittenberg along Inverness Ridge, and is home to a variety of landscapes, consisting of low-lying coastal areas, gently rolling grassy hills, forested mountains, and steep coastal bluffs. The park encompasses approximately 86,000 acres in the Coast Range physiographic province (Jennings et al. 1977). Figure 40 in appendix A displays the topography of the planning area, including areas where the slope is greater than 20%.

Soils

Generally, soil issues in the major land resource areas of the Central California Coastal Valleys are erosion, maintenance of soil organic matter content, and low infiltration rates resulting from hydrophobic soils (USDA-NRCS 2006b). Land uses in the planning area may affect soil processes through erosion, compaction, alteration of soil structure and microbial communities, and reduced soil productivity or fertility. Activities associated with beef and dairy cattle ranching operations such as livestock grazing and trailing; tilling/cultivation; seeding; mowing for forage production; and nutrient, brush, and weed management may affect soil processes. During the winter, erosion hazards could stem from sheet or gully erosive processes on unprotected upland soils and sloped terrace soils (USDA-NRCS 2006b).

Soil Erosion

Natural erosion processes occur in the park's landforms in areas with steep slopes and bluffs, because of instability from faults, erosive and erodible soils, and intense precipitation and wind (Pawley and Lay 2013). Anthropogenic land features and activities, including trails, roads, and vegetation removal, can also cause erosion and modify stormwater runoff patterns, causing soil instability and erosion. Overland runoff can result in gully, sheet, and rill erosion. Two common signs of range degradation include sheet and gully erosion (Sugnet and Bartolome 1983).

In the planning area, the erosion hazard is slight for approximately 39% of the area, moderate for 25% of the area, severe for 18% of the area, and very severe for 13% of the area with the remaining acreage composed of water and other unrated areas (figure 41 in appendix A) (USDA-NRCS 2014a). For the purposes of this analysis, soils in the severe and very severe erosion hazard category are combined into one category of soils with "high" erosion potential. This erosion hazard rating indicates the hazard of soil loss from off-road and off-trail uses such as grazing. The USDA-NRCS web soil survey, which provides access to the largest natural resource information system in the world, also evaluates the potential for soil erosion from wind using the interpretation Wind Erodibility Group, which is based on slope, soil types, and wind characteristics. Areas lacking sufficient vegetation cover are referred to as high-intensity-use areas and can include livestock trails and concentration areas and agricultural fields. These areas are susceptible to wind erosion. In the planning area, approximately 2% of soils have low susceptibility to wind erosion, 55% are moderately susceptible, and 40% are highly susceptible.

The planning area contains an estimated 150 acres (less than 1%) of bare soil adjacent to high-intensity-use areas such as stock ponds, cattle trails, salt licks, and feeding areas. On beef ranches, high-intensity-use areas are dispersed, intermittent, and generally around some troughs or feed sites. On dairies, the

cattle travel from grazing areas to milking areas up to twice a day. Cattle trailing results in erosion of the topsoil along pathways between areas (Sugnet and Bartolome 1983).

Park permits for tilling specify that operators may not till on slopes greater than 20% because they are more susceptible to erosion and landslides than shallower slopes.

Soil Compaction

Soil compaction increases bulk density by reducing soil pore space, which reduces water infiltration and water holding capacity, destroys soil structure, and increases runoff and erosion. The web soil survey parameter, Soil Compaction Resistance, uses soil characteristics to describe "the level of the soil's resistance to compaction" (USDA-NRCS 2014a). Low resistance "indicates that the soil has one or more features that favor the formation of a compacted layer, whereas moderate resistance "indicates that the soil has features that are favorable to resisting compaction." Approximately 58% of soils in the planning area have low resistance to compaction (high compaction potential), 36% of soils have moderate resistance, or moderate compaction potential, and the remaining soils are not rated (figure 42 in appendix A) (USDA-NRCS 2014a). Moderate resistance predominantly occurs in soils with upper profiles of sand or sandy loam.

Stream Incision/Streambanks/Streambeds

Erosion of streambanks and streambeds occurs in the watersheds throughout the park. Factors such as soil type, slope, vegetation coverage, precipitation, presence of livestock, stream channel modification, and water transport and diversion patterns influence the stability of banks and beds. The sediment regime of a waterbody can also affect the amount of instream bank erosion and stream incision. Typically, accelerated stream incision and erosion result from increased surface runoff and sediment transport from human activities such as over-grazing, cultivation (Ansari 2018), logging, channel straightening, and road building (Reckendorf 2009). The SWRCB lists sediment, which can result from erosion, as a pollutant of concern in the Tomales Bay watershed. Some ranches experience erosion and sedimentation issues that result in streambank instability, headcuts, and rills prior to implementing restoration measures (UCCE 2011). Projects and restoration activities in the park to address localized stream erosion issues in the past have included fencing, waterway stabilization, road upgrades and decommissioning. Roads and trails in or adjacent to the planning area may concentrate water and discharge to areas at high volumes and rates, leading to headcutting and incision. The "Water Resources" section discusses instream erosion and water quality issues associated with sedimentation.

WATER RESOURCES

Surface Water

Surface water resources in the planning area include perennial and intermittent streams, natural lakes and ponds, human-made impoundments including stock ponds, and various wetlands including tidal estuaries and sag ponds. Overall, there are 54.7 miles of streams, 84.1 acres of ponds, and 1,970 acres of wetlands in the planning area (NPS 2016a). Streamflow patterns are seasonal with low or no flow in summer and fall, low to moderate base flow in winter, and occasional winter peaks associated with storm events (Pawley and Lay 2013). In addition to these resources, NPS also manages the marine habitats from the shoreline to 0.25 mile offshore of the park (NPS 2012a). The watersheds in the planning area include Tomales Bay (including sub-watersheds Lagunitas Creek and Olema Creek), Kehoe Drainage, Abbotts Lagoon, Drakes Estero, Drakes Bay, and Coastal (Pacific Ocean) Drainages (figure 43 in appendix A). The level of water quality constituent contribution (i.e., loading rate) varies between the different watersheds in the planning area. Larger watersheds with higher peak flow rates and associated runoff contribute the majority of water constituents to surface water resources such as Tomales Bay (SWRCB 2013). Two Areas of Special Biological Significance (ASBS), Duxbury Reef and Point Reyes Headlands, receive waters from the planning area. The state characterizes both areas as no discharge zones. Tomales

Bay has numerous designations, including being named a "Wetland of International Importance" under the Ramsar Convention in 2002 because it supports plants, animals, fish, waterbirds, and other wetland-dependent species including threatened and endangered species.

Surface Water Quality

The main sources of water quality degradation in the planning area are potentially pathogenic bacteria and nutrient loading from nonpoint sources associated with ranches, dairies, septic systems, and stormwater runoff (NPS 2013a; 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 also affect 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, Well, 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 2001a).

Section 303(d) of the Clean Water Act authorizes USEPA to assist states, territories, and authorized tribes in listing impaired water and developing total maximum daily loads (TMDLs) for these waterbodies. A TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality. The San Francisco RWQCB administers waste discharge requirements for point and nonpoint sources of pollutants to achieve narrative and numerical water quality objectives (San Francisco RWQCB 2013). Only half of the freshwater quality parameters (e.g., bacteria, pH, and dissolved oxygen) have established objectives put in place by San Francisco RWQCB or USEPA; other parameters (temperature, specific conductance, turbidity, and nitrate) do not have established water quality objectives but can be compared to ecological objectives drawn from scientific literature (Wallitner and Pincetich 2017).

Grazing and dairy operations in the planning area can receive a waiver of waste discharge requirements instead of meeting numeric constituent targets established either by TMDLs in the planning area or by the RWQCB's Basin Plans. A Conditional Waiver of Waste Discharge Requirements for Existing Dairies can be granted for eligible dairy operations if operators are in compliance with the *Statewide Minimum Standards for Discharges of Animal Wastes* (Title 27, California Code of Regulations). All dairies operating in the planning area fall under the conditional waiver, which was renewed in 2015 and expires in 2020. A General Waste Discharge Requirements Waiver was adopted in 2016, and dairies will be required to enroll under this general waiver after the current conditional waiver expires.

Tomales Bay Watershed. In total, the Tomales Bay watershed encompasses almost 140,800 acres. Tomales Bay itself is an approximately 12-mile-long flooded valley, covering 6,912 acres, straddling the San Andreas Fault. Most of the freshwater delivered to Tomales Bay originates in two major subwatersheds: Lagunitas Creek and Walker Creek. The Lagunitas Creek watershed, which includes drainage from Olema Creek, represents 52% (73,216 acres) of the overall Tomales Bay watershed and delivers about 65% of the freshwater input to Tomales Bay (SWRCB 2013). Combined, the ranches in the planning area are just over 10,000 acres (7%) of the total Tomales Bay watershed, between the Lagunitas Creek (3,900 acres), Olema Creek (5,200 acres), and direct drainage to Tomales Bay (1,060 acres).

Approximately 10% of the freshwater input to Tomales Bay is delivered by the small drainages that line the east and west shores of the bay. These small drainages represent 13% (18,304 acres) of the overall Tomales Bay watershed area. As noted above, within the planning area, 1,060 acres of grazing lands for beef and dairy ranches are directly in the Tomales Bay drainage area. None of the developed dairy complexes are in the Tomales Bay watershed.

The remainder of the Tomales Bay watershed is located outside the planning area and includes the Walker Creek watershed to the northeast of Tomales Bay. The Walker Creek watershed encompasses 49,280 acres, represents 35% of the Tomales Bay watershed area, and contributes 25% of the freshwater delivery to Tomales Bay (SWRCB 2013).

The San Francisco 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). Sources of nutrients and potentially pathogenic bacteria include animal waste, human waste from failing septic or treatment systems, boat discharges, fertilizers, and decomposing organic material (SWRCB 2013). Sources for elevated concentrations of total suspended solids include soil disturbance associated with the San Andreas Fault zone, historical logging activities, and historical and current agricultural practices.

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 (Ghodrati and Tuden 2005). A TMDL for sediment in Lagunitas Creek and an implementation plan to achieve the numeric sediment targets was completed in 2014 (San Francisco RWQCB 2014). As part of these efforts, a Conditional Waiver of Waste Discharge Requirements for Grazing Lands in the Tomales Bay Watershed was developed to outline control measures and operational practices to reduce bacterial input to the watershed from grazing operations, in particular from stormwater runoff (San Francisco RWQCB 2018). The current five-year grazing waiver was renewed in October 2018 (San Francisco RWQCB 2018). Ten park ranch operations report under this conditional waiver. This waiver implements the load allocations reported for the Tomales Bay Pathogens TMDL and the Lagunitas Creek Sediment TMDL. The TMDL for nutrients will be developed along with ongoing management efforts with the Tomales Bay watershed (San Francisco RWQCB 2017).

Recent monitoring studies in Tomales Bay, Lagunitas Creek, and Olema Creek have observed exceedances of San Francisco RWQCB potentially pathogenic 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 in NPS 2013a; NPS 2004a; NPS 2017a; SWRCB 2013; Wallitner 2016). Monitoring data from the 2005 Tomales Bay TMDL staff report showed that watersheds in the planning 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. The largest contributor of fecal coliform bacteria was the lower Walker Creek subwatershed (Ghodrati and Tuden 2005).

From 2013 to 2014, approximately 7% of the fecal coliform bacteria samples recorded in the Lagunitas Creek watershed exceeded the single sample contact recreation objective. Many of these exceedances occurred during the dry season at the Lagunitas Creek/Tomales Bay interface (Wallitner 2016). Turbidity and nitrate as nitrogen levels decreased from upstream/upper sites to downstream/lower sites for both Lagunitas Creek and Tomales Bay (SWRCB 2013; NPS 2013a; NPS 2016a; NPS 2017a). In Lagunitas Creek, the overall turbidity objective of the Lagunitas Creek Sediment TMDL is being met, but the narrative objectives for sediment and settleable and suspended materials are not (San Francisco RWQCB 2014).

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, increases in precipitation during that period resulted in increases in potentially pathogenic bacteria concentrations with increases in cumulative 24-hour and five-day precipitation. 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. This spatial trend was harder to observe in turbidity samples from Olema Creek, which had high individual levels during storms but relatively few samples exceeding the NPS screening criteria of 50 nephelometric turbidity units (NPS 2013a; NPS 2016a; NPS 2017a). 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).

Monitoring on Lagunitas and Olema Creeks generally produced low nitrate values, with the most upstream site having the lowest values and the highest values at a downstream site (SWRCB 2013). Other than several high values recorded in inner Tomales Bay and Olema Creek, most nitrate samples were below the 0.30 milligram/liter ecological threshold established by L. M. Roche (Roche et al. 2013) for limiting eutrophication of streams (NPS 2013a; NPS 2016a; NPS 2017a; SWRCB 2013). Most of the samples with the highest individual nitrate values for Olema Creek were collected during storm events (NPS 2017a).

Stream protection activities have been implemented in the Lagunitas Creek watershed and include habitat restoration, road upgrades and decommissioning, waterway stabilization, livestock water supply, and placement of fencing to control timing and duration of grazing in sensitive areas. In 2007–2008, NPS and the Point Reyes National Seashore Association implemented an approximately 613-acre wetland restoration project in the southern end of Tomales Bay. The Giacomini Wetlands Restoration Project principally focused on conversion of a former dairy ranch into tidal wetlands. NPS focused on restoring natural hydrologic tidal and freshwater processes to promote restoration of hydrologic and ecological functions. The location of the Giacomini wetland at the confluence of Lagunitas Creek, Olema Creek, and Tomales Bay allows these waters to spread out over the restored marsh plain, resulting in improved ecological habitat and water quality for Tomales Bay. Compared to baseline conditions at the beginning of the Giacomini Wetlands Restoration Project, dissolved oxygen levels increased 16%, while nitrate, ammonia (NH_3), phosphate, phosphorous, and fecal coliform bacteria levels decreased at least 23% (Parsons and Ryan 2015).

Drakes Bay and Drakes Estero Watersheds. NPS programs and other sampling efforts have observed high concentrations of total suspended solids and nutrients in Drakes Bay and Drakes Estero watersheds (NPS 2004a; 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 2004a). Occasionally high potentially pathogenic bacteria counts have been observed in some drainages (Pawley and Lay 2013). Potentially pathogenic bacteria pollutant sources in these watersheds include stormwater runoff from pasture and grazing land, sewage systems, wildlife, and boat discharges in the tidal and marine environment (outside the planning area) (CDPH 2011). Drakes Estero was previously proposed for listing because of high levels of potentially pathogenic bacteria, but the listing was based on the previous use for shellfish production, which ceased in early 2014 (San Francisco RWQCB 2017).

Kehoe Drainage, Abbotts Lagoon, Coastal Drainages. In 1999–2000, USGS conducted a water quality assessment of the Abbotts Lagoon watershed. The study determined that tributaries draining dairy operations or dairy grazing land had the highest nutrient levels or loading rates especially following storm events (USGS 2005). Data collection in Kehoe Creek has shown elevated levels of contaminants including nutrients and sediment (NPS 2004a; Pawley and Lay 2013). Stormwater runoff from nearby dairy operations and pasture land into Kehoe Creek is contributing to these high levels. High potentially pathogenic bacteria counts have also been observed in Kehoe Creek and Abbotts Lagoon, and many samples exceeded the potentially pathogenic bacteria standard (Cooprider 2004; Pawley and Lay 2013). Many of these exceedances occurred near dairy operations. To address these water quality concerns, several conservation practices and infrastructure improvements have been implemented, including installation of a new loafing barn at I Ranch dairy in 2004, additions and improvements to the loafing barn facilities at J Ranch dairy, and installation of exclusion fencing to create buffers along drainages.

The installation of the loafing barn at I Ranch allowed for the closure of a 40+ acre high-use impact area that was subject to runoff during the winter months.

The primary sources of pollution to the Duxbury Reef and Point Reyes Headlands ASBS in the planning area are urban, road, and stormwater runoff (SWRCB 2017). Numerous conservation practices have also been completed in ASBS watersheds to address runoff from grazing lands.

Groundwater

The complex geologic environment of the park and associated vertical and horizontal fractures result in aquifers with connections to surface waters (NPS 2007a). Surface water can recharge groundwater through the fractures (McClelland 1963). The hydrologic connection between alluvial groundwater resources and surface water allows for the recharge of groundwater resources through streambed infiltration and the replenishment of surface resources. These connections also allow pollutants in surface water to contaminate groundwater. Infiltration of precipitation recharges shallow groundwater resources in both upland areas and valleys (Marin County Department of Public Works n.d.). This groundwater then recharges surface waters during the drier summer months. Groundwater seeps often serve as the "headwaters" for many of the smaller drainages in the planning area. Perched groundwater tables with shallow subsurface flows also occur in some of the grasslands/ranchlands adjacent to the dunes (Baye 2008, as cited in NPS 2009).

Multiple springs, seeps, and wells in the planning area are used for cattle watering and private potable water supply (NPS 2012a; Pawley and Lay 2013). Many of these wells likely use water stored in shallow alluvial aquifers throughout the area (NPS 2007a). These groundwater resources likely have limited storage capacities or yields and are adequate only for uses requiring small quantities of water (McClelland 1963).

Groundwater Quality

Local septic systems and stormwater runoff from surrounding beef and dairy operations can affect groundwater resources. Failing septic tanks located on slopes, close to high water tables associated with streams, and close to fractured granite would have a greater impact on groundwater quality by contributing nutrients (Valentino 1989). Nonpoint source pollution can transport animal wastes into local surface water and groundwater during the wet season. Although dependent on site conditions, microbial pathogens on the surface can infiltrate into groundwater through the unsaturated zone (USDA-NRCS 2012). During the drier summer months when surface water levels are lower, groundwater can contribute a relatively larger amount of freshwater and associated nutrients or potentially pathogenic bacteria to receiving water sources. Shallow groundwater and surface water can mix in the area of sediment and porous space beneath stream beds, which can allow pollutants to enter groundwater (Stocker et al. 2016).

Most groundwater water quality objectives are in narrative form; however, some have numeric criteria. Narrative objectives require the maintenance of high-quality groundwater and prohibit pollutant concentrations that adversely affect beneficial uses including agricultural, municipal, and domestic water supply. These objectives also prohibit exceedances of water quality standards for surface water that is hydrologically connected to groundwater (San Francisco RWQCB 2013). Groundwater numeric criteria differ based on the beneficial use. Overall however, limited groundwater quality data is available for the planning area.

Water Quantity (Surface Water and Groundwater)

Generally, livestock operations in the region withdraw more from surface water sources than groundwater sources (USGS 2010). In 2010, approximately 1 million gallons of water per day were withdrawn in Marin County for livestock use, while groundwater withdrawals accounted for 0.45 million gallons per day (USGS 2010). The ranches in the planning area use both surface water and groundwater as the water

source for livestock production operations with some of this water supplied by NPS. Ranches also use some surface water including stock ponds, spring development on pastures, and other resources.

The use of surface water in California requires a water right administered by SWRCB. Exceptions to this include the use of a small amount of surface water for either domestic, irrigation, or commercial livestock watering purposes, which only require registration of the use. State water rights only allow surface water use for beneficial and reasonable purposes, including domestic and stock watering. NPS holds and maintains water rights for ranch operations in the planning area. In some cases, NPS provides water to ranches from existing water systems, similar to a utility system, and operators are billed for the water used. Ranchers using water rights are responsible for reporting annual storage and use to NPS for water rights reporting.

Local springs or wells also supply residential water use on the ranches. Dispersed residential use is limited. Approximately 190 people live on 18 ranches in the planning area. Residential water uses varies significantly across the state. In 2016, the average residential water use in the San Francisco Bay region was 64 gallons per day (gpd) (Legislative Analyst's Office 2017). Overall, based on the number of people living in the planning area, total residential use is approximately 4.5 million gallons per year.

The amount of water required by cattle depends on multiple factors, including environmental temperature, humidity, precipitation, body weight, breed, feed intake, pregnancy, milk production, type and water content of feedstuff, and the physical characteristics of the water itself (i.e., temperature) (Stull et al. 2012). Beef operations primarily use water for livestock consumption, whereas dairy operations use water for livestock, barn and equipment cleaning, and other minor uses (table 4). Dairy operations that are provided water by NPS have used amounts of water ranging from a low of approximately 1,200 gpd to a high of 11,000 gpd, not including water from other sources such as ponds (NPS, Ketcham, pers. comm. 2018a). Overall, based on the number of permitted cattle in the planning area (table 1) and the water usage values presented in table 4, the beef operations use approximately 9,192 gpd to 39,985 gpd and the dairy operations use approximately 127,000 gpd to 300,000 gpd, for a total water usage of approximately 50 million gallons to 124 million gallons per year.

TABLE 4: WATER REQUIREMENTS PER ANIMAL FOR BEEF AND DAIRY OPERATIONS

Type of Livestock Operation	Drinking Water Use (gpd) Low Air Temperatures	Drinking Water Use (gpd) High Air Temperatures	Other Use (gpd)	Total Water Usage (gpd)
Beef	4.0–11.4	6.3–17.4	N/A	4.0–17.4
Dairy	6.3–29.0	9.9–40.0	15–23	21.3–63

Sources: Le Riche et al. (2017); Stull et al. (2012)

VEGETATION, INCLUDING FEDERALLY LISTED SPECIES

Vegetation in the planning area is displayed in figure 44 in appendix A.

Wetlands

California's wetlands have high ecological diversity and provide a wide variety of ecosystem services. Since European settlement, wetlands have been greatly reduced and altered by agricultural conversion, urban development, and other land use activities (Duffy et al. 2016; Grewell, Callaway, and Ferren 2007). The planning area contains three distinct wetland types—palustrine (inland and nontidal), estuarine, and lacustrine (lake).

Palustrine wetlands—the most abundant wetland type, by far, in the planning area (table 5, below, and figure 45 in appendix A) (NPS 2016a)—are diverse, including freshwater marshes, seasonal wetlands,

wet meadows, floodplain wetlands, seeps, and sag ponds, and can be dominated by various species including small-fruited bulrush (*Scirpus microcarpus*), rush (*Juncus balticus*), slough sedge (*Carex barbarae*), water parsley (*Oenanthe sarmentosa*), seep monkeyflower (*Erythranthe guttata*), Floating marsh pennywort (*Hydrocotyle ranunculoides*), spikerush, (*Eleocharis macrostachya*), California bulrush (*Schoenoplectus californicus)*, cattails (*Typha* spp.), broadfruit bur-reed (*Sparganium eurycarpum*), and Pacific reedgrass (*Calamagrostis nutkaensis*).

Estuarine wetland areas support a variety of vegetation, including pickleweed (*Salicornia* spp.), rush (*Juncus lescurii*), saltgrass (*Distichlis spicata*), salt marsh daisy (*Jaumea carnosa*), gumplant (*Grindelia stricta*), arrowgrass (*Triglochin maritima*), California sea lavender (*Limonium californicum*), Pacific cordgrass (*Spartina foliosa*), and bulrush (*Bolboschoenus martimus*). For palustrine and estuarine vegetation, the mix of species depends on site-specific factors. Vegetation in lacustrine wetland areas is often composed of California bulrush and cattail.

In collaboration with ranchers, NPS has protected some wetlands in grazed areas by using protective measures, including fencing to control the timing and duration of grazing to improve water quality and ecological function.

TABLE 5: WETLANDS TYPES AND ACRES IN THE PLANNING AREA

Wetland Type	Total Wetland (National Wetland Inventory + Field-Verified) (Acres)	Percent of Total
Palustrine	1,859.3	94.3
Estuarine	108.3	5.5
Lacustrine	0.1	<0.1
Other*	3.0	0.1
Total	1,970.7	100

Sources: NPS (2015b); USFWS (2014)

* Wetlands classified as *Other* are two locations in which a drainage is either directed to a culvert under development or is an upland swale. In both instances, these two drainages do not contain vegetation but facilitate stormwater flow at several times during the year.

Riparian Areas

Woody riparian habitat, a critical wildlife resource, especially for birds, is used by a wide variety of species (Pawley and Lay 2013). Riparian forest and shrubland in the planning area are dominated by broad-leaved deciduous trees or shrubs, including red alder forest, mixed willow forest, and arroyo willow forest. In the red alder forest, red alder (*Alnus rubra*) dominates the canopy with California bay (*Umbellularia californica*) often present in substantial cover. Arroyo willow (*Salix lasiolepis*) may form a subcanopy to the alder. The understory is usually moderate to dense. Berry species, including salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), and California blackberry (*Rubus ursinus*) along with red elderberry (*Sambucus racemosa*), are the common shrubs. Hedgenettle (*Stachys* spp.), sedges, rushes, small-fruited bulrush, and ferns (swordfern [*Polystichum munitum*], lady fern [*Athyrium filix-femina*]) dominate the herbaceous layer (NPS 2004b, 2006b; Pawley and Lay 2013). Other forested riparian areas are dominated by mixed willow forest, represented in the planning area by yellow willow (*Salix lutea*), often associating with other willows (NPS 2004b, 2006b). Arroyo willow in its shrub form stands between 16 to 23 feet high and strongly dominates the canopy. Other taller willows or alder may be present in small numbers. The understory is usually extremely dense because of the thicket-forming growth habits of this species. Shrubs such as berry species are commonly found interspersed through the understory. California wax myrtle (*Morella californica*) or poison oak

(*Toxicodendron diversilobum*) may be present. Sedges, rushes, small-fruited bulrush along with hedgenettle, beeplant (*Scrophularia californica*), and ferns dominate the herbaceous layer (NPS 2004b, 2006b; Pawley and Lay 2013).

These streamside forests and shrublands make up approximately 1% of the planning area (NPS 2014b). Within the 1%, mixed willow forest makes up approximately 79% of riparian forest/shrubland areas, while red alder forest makes up 21% (NPS 2014b). Protection of riparian areas in the planning area has focused on the salmonid watersheds, and currently most of the perennial systems are fenced, and no grazing occurs. Riparian recovery has been dramatic in some areas in a period of 5 to 10 years, with full closeout of the overstory canopy where limited vegetation previously existed along the riparian corridor. Some unfenced intermittent systems remain, however, and in some fenced locations, the riparian habitat is dominated by brush rather than riparian trees (NPS, Ketcham, pers. comm. 2018a).

Grasslands

Coastal Prairie. California's coastal prairie, patchily distributed from the Oregon border to San Luis Obispo County, is generally only found within several miles of the coast where summer drought is moderated by oceanic cooling (Ford and Hayes 2007; Eviner 2016). Native perennial grasses are often the dominant plants, although forbs can constitute a significant proportion of the species richness (Hayes and Holl 2003). Compared with other grassland types of the western US, the coastal prairie contains almost double the number of species (Stromberg, Kephart, and Yadon 2001). Across all of California, agriculture, development, introduction of non-native plants, and anthropogenic changes to nutrient and hydrological cycles and to disturbance regimes such as fire and grazing have noticeably reduced and altered the coastal prairie (Ford and Hayes 2007).

Coastal prairie intergrades with several shrub and forest community types. Control of woody vegetation is a common management concern for conservation of coastal prairie habitat (Ford and Hayes 2007; Pawley and Lay 2013). Perennial bunchgrasses dominate pristine coastal prairie in the planning area. Pacific reedgrass is the most common native grass in the planning area along with tufted hairgrass (*Deschampsia cespitosa*), California oatgrass (*Danthonia californica*), meadow barley (*Hordeum brachyantherum*), California brome (*Bromus carinatus*), and purple needlegrass (*Nassella pulchra)*. Where Pacific reedgrass occurs in association with rushes and sedges, it is included in the wetland vegetation type. Native grasses are often found in association with annual non-native grasses, coyote brush (*Baccharis pilularis*), California blackberry, and a variety of native and non-native herbs (NPS 2004b, 2006b).

Coastal scrub frequently encroaches on coastal prairie where grazing and fire are absent; complete conversion of prairie to coyote brush-dominated coastal scrub can take place within 15 to 25 years (Ford and Hayes 2007). When this occurs, habitat values necessary for coastal prairie native plant and animal species are lost, and forage available for both domestic and wild grazing animals is reduced. Both grazing and prescribed burning can limit coyote brush encroachment into coastal prairie, but the effectiveness of management techniques depends on grazing intensity, frequency of fire, and environmental conditions (Ford and Hayes 2007). Point Reyes' recent Natural Resources Condition Assessment (NRCA) includes an analysis of 51 plots in Point Reyes grazed coastal grassland from 1988 through 2013. Coyote brush occurred in about half of the plots. It increased in cover on 10 plots, 6 of them to a major degree, and decreased in cover on 8, although in some plots, cattle grazing had ceased. The plots did not capture the full range of sites and vegetation (NPS 2019a).

California Annual Grassland. The Olema Valley grassland belongs to the California annual grassland type rather than coastal prairie and is composed primarily of non-native annual grasses and forbs. Ford and Hayes (2007) note that patches of California annual grassland occur in areas of coastal prairie, probably because of the history of agriculture. At Point Reyes, these patches are dominated by a suite of non-native species, largely the same as those found elsewhere in California, such as soft chess (*Bromus hordeaceus*), oats (*Avena* spp.), ripgut brome (*Bromus diandrus*), barley (*Hordeum* spp.), flax (*Linum* spp.), and filaree (*Erodium* spp.). Non-native annual grasses and forbs have dominated this type of

grassland for many decades, and native plants typically make up only a very small percentage of the total cover. Despite this, numerous native plant species remain, generally at very low cover, that make up a significant proportion of the species richness; the majority of these native species are likely to be annual forbs. California annual grassland exhibits considerable spatial and temporal variation at many scales. Annual rainfall amount and pattern, temperatures during the growing season, diverse soil chemistry and texture, topographic variation, and land-use history, among other variables, largely determine plant species composition, biomass production, and dominance relationships (Jackson and Bartolome 2002; Eviner 2016).

Agricultural Pasturelands. Pasturelands is an agricultural vegetation type, distinguished from grazed grasslands and other grazed, naturally occurring vegetation types in the planning area (Keeler-Wolf, van der Leeden, and Schirokauer 2003; Pawley and Lay 2013). Pastureland comprises naturalized non-native species, including seeded grass and legume forage species, with invasive members of the mustard family (Brassicaceae) and thistles (Asteraceae) patchily abundant (Pawley and Lay 2013). Pastureland can be enclosed to graze cattle or horses, managed to produce forage for cattle, or used for other agricultural purposes.

The planning area is 48% grasslands (44% annual grasslands and 4% perennial grasslands) and 12% pastureland (NPS 2014b). Ranches in the planning area encompass large portions of the coastal prairie ecotype. In Olema Valley, some westward-facing slopes with intermixed forest are California annual grassland, dominated by non-native annuals. Ranches exposed to high winds and seasonal fog on the extreme end of the Point Reyes Peninsula have a wide variety of coastal prairie sub-types, from high terraces and bluffs to wet, lowland prairie (Keeler-Wolf, van der Leeden, and Schirokauer 2003). This variable vegetation type is dominated by non-native or native grasses, much of which is grazed by cattle, and may have up to 15% shrub cover (NPS 2004b, 2006b). Roughly 91% of the grasslands in the planning area are dominated by non-native annual and perennial grasses, and the remaining 9% or so are dominated by native perennial grasses (NPS 2014b).

The NRCA (NPS 2019a) includes an analysis of 51 plots in Point Reyes grazed coastal grassland from 1988 through 2013. The analysis found that, during the sampled period, ryegrass, a non-native grass, was the most common species. Two other non-native grasses, common velvetgrass (*Holcus lanatus*) and purple false brome (*Brachypodium distachyon*) increased, while California oatgrass, a native perennial bunchgrass, decreased. However, the analysis did not include any ungrazed comparison plots and was not representative of the park's coastal grasslands.

Coastal Dunes

Point Reyes protects some of the "last remaining high quality coastal dune habitat in the United States," which provides habitat for 11 federally listed plant and wildlife species (NPS 2015b). Sixty percent of the park's coastal dunes are now dominated by two non-native species—European beachgrass (*Ammophila arenaria*) and iceplant (*Carpobrotus edulis*). Overall, these two species represent roughly 50% and 25%, respectively, of all coastal dune vegetation (NPS 2004b, 2006b, 2015b). In areas where these two species dominate, they form dense monocultures with few or no other species present (NPS 2004b, 2006b). The two non-native species also alter natural dune physical processes by impeding sand movement and changing sand deposition patterns (NPS 2015b). Under normal conditions, coastal dunes are constantly changing as sand is transported by wind and wave, typically resulting in distinct foredune and backdune communities. European beachgrass and iceplant stabilize the dunes, homogenizing habitat values (NPS 2015b).

Because of the direct and indirect impacts of these invasive species on federally listed and other rare species, NPS began a large-scale coastal dune restoration program starting in 2001. Since then, NPS has removed approximately 269 net acres of invasives in approximately 524 acres (75%) of coastal dunes (NPS, Parsons, pers. comm. 2019b). Restoration used manual removal, mechanical excavation, and herbicide treatment methods (NPS 2015b). Where herbicide has been used to treat European beachgrass

and iceplant, NPS implemented several measures to avoid impacts on existing native habitats and ranchlands, such as establishing buffers to organic pastures using manual removal or mechanical excavation in buffer areas and strict observation of climatic restrictions on spraying during windy or wet days (NPS 2015b). The remaining 25% of the coastal dune vegetation is composed of remnant patches of the native plant community, primarily dune sagebrush (*Artemisia pycnocephala*), coast buckwheat (*Eriogonum latifolium*), dune lupine (*Lupinus chamissonis*), and goldenbush (*Ericameria ericoides*), sometimes with intermixed, light to moderate cover of the two non-native species, European beachgrass and/or iceplant. Total vegetation cover with native dune habitats such as dune mat and dune scrub is often low and interspersed with bare sand (NPS 2004b, 2006b; Pawley and Lay 2013).

Coastal dunes make up approximately 2% of the planning area (NPS 2014b). Most ranch operations abut coastal dunes; some the dunes contain finger-shaped parabolic features formed by wind and colonized by various species over time.

Coastal Scrub

Along the central California coast, coastal scrub and coastal prairie co-occur in a "continuum of herbaceous to dense woody shrub cover" (Ford and Hayes 2007). Approximately 97% of coastal scrub in the planning area is dominated by coyote brush (NPS 2014b). Coyote brush scrub is highly diverse and variable, ranging from fairly low, open areas where it mixes with grasses to tall, dense multi-species shrubland (Keeler-Wolf, van der Leeden, and Schirokauer 2003). Coyote brush scrub can be roughly equally divided in the planning area between open and dense variations. In its more open variation, coyote brush commonly is associated with non-native and native grasses (see "Grasslands" section above) and California blackberry. It may also be found in association with sedges and rushes. In its taller, denser variation, poison oak is the most commonly associated shrub, often at fairly high cover. Coffeeberry (*Frangula californica*), thimbleberry, California blackberry, and California sagebrush (*Artemisia californica*) are other common associates in dense coyote brush scrub (NPS 2004b, 2006b; Pawley and Lay 2013).

An additional approximately 2% of coastal scrub is dominated by a diverse list of shrub species that includes coffeeberry, California wax myrtle, salmonberry, yellow bush lupine (*Lupinus arboreus*), hazel (*Corylus cornuta*), and blue blossom (*Ceanothus thyrsiflorus*) (NPS 2004b, 2006b, 2014b). Chaparral accounts for less than 1% of the coastal scrub type (NPS 2014b). Manzanitas (*Arctostaphylos* spp.), primarily Eastwood manzanita (*Arctostaphylos glandulosa*), and chamise (*Adenostoma fasciculatum*) are the dominant shrubs in this type (NPS 2006b).

Coastal scrub makes up 18% of the planning area (NPS 2004b, 2006b).

Non-Native Vegetation

California's grasslands have been invaded by non-native species, with 300 of the state's 1,100 established non-native plant species occurring in grassland ecosystems (Zavaleta et al. 2016). The California annual grassland is dominated by naturalized non-native annual grasses and forbs but continues to undergo further invasion by species such as medusahead (*Taeniatherum caput-medusae*) and purple false brome, both of which are known to occur at Point Reyes (NPS 2014b). Although less likely to be dominated by non-native species, many areas of coastal prairie contain significant cover of non-native perennial grasses and annual species. Common velvetgrass is the dominant non-native perennial grass in the planning area. Dominant non-native annuals include Italian ryegrass (*Festuca perennis*) (can be biennial), brome fescue (*Festuca bromoides*), and soft brome (*Bromus hordeaceus*) (NPS 2019a). Vegetation designated as pastureland comprises primarily naturalized non-native species with patches of invasive mustards, radish (*Brassica* spp.), and thistles. Other threats to ranchlands in the planning area include Scotch broom (*Cytisus scoparius*), woolly distaff thistle (*Carthamus lanatus*), fertile capeweed (*Arctotheca calendula*), rosy sand crocus (*Romulea rosea* var. *australis*), and potentially stinkweed (*Dittrichia graveolens*).

Patches of thistle and/or poison hemlock (*Conium maculatum*) can come to dominate locally disturbed areas or the edges of riparian zones.

As described above, coastal dunes at Point Reyes have also been substantially altered by two invasive, non-native species—European beachgrass and iceplant—that affect dune sand dynamics, species composition, and habitat values. In addition, in areas where these species are removed, new, "secondary" invaders often appear to usurp newly established bare ground or open space: these include European searocket (*Cakile maritima*), New Zealand spinach (*Tetragonia tetragonoides*), European black nightshade (*Solanum nigrum*), and other annual grasses and forbs such as ripgut brome, fescue brome (*Festuca bromoides*), common groundsel (*Senecio vulgaris*), and sow thistle (*Sonchus arvensis*) (Parsons et al. 2019).

The NRCA found that the "total number of invasive plant species and the number of new introductions are high enough to warrant significant concern" in the park, and these species are spread through multiple pathways including, the "predictable (e.g., road, trail, and riparian corridors), sudden (e.g., long-distance dispersal through cargo containers and air freight), and unexpected anthropogenic pathways (e.g., weed seeds in restoration planting mixes)" (NPS 2019a). Livestock can have both positive and negative effects on invasive species control (Spiegal et al. 2016). Livestock grazing can be an effective management tool for some invasive plant species—one of the few that can be deployed at the landscape scale (Spiegal et al. 2016). Conversely, livestock production has been implicated in the introduction of weeds into uninfested areas because seeds of invasive species can adhere to the coats of livestock and fall off elsewhere (e.g., Chuong et al. 2016), pass unharmed through the digestive system of livestock, and be deposited with feces in other areas (e.g., iceplant) or contaminate hay fed to livestock. Weeds can also be introduced via seed mixes, supplemental feed, imported soils, and equipment used in ranch operations. Concentrated livestock use can also increase exposed soil, providing favorable germination sites for weeds.

Special-Status Plants

The park's database includes 48 special-status plant taxa present in the planning area. These plant taxa are not all federally listed as threatened and endangered species but are state-listed or considered rare by organizations such as the California Native Plant Society (CNPS 2019). Three of the four federally endangered plants are monitored annually in the planning area; however, other non-federally listed species are monitored and/or mapped opportunistically, typically in association with NPS projects being conducted in the vicinity. An active rare plant program in the early 2000s attempted to map the rare plants in Point Reyes: these maps are amended as possible with updated information from more recent mapping efforts. Actions taken could possibly affect special-status plants, depending on the location and extent of the action. Table J-1 in appendix J provides a detailed list of these species and their preferred habitat.

Federally Listed Plants

Nine plants listed as threatened or endangered under the Endangered Species Act (ESA) are found in the planning area. A list of federally threatened and endangered species was obtained from USFWS (2018a). Table J-2 in appendix J lists the federally listed plant species, subspecies, or varieties that could occur in the planning area, including their status, habitat, and whether they are analyzed further due to potential impacts from ranching activities. Potential impacts on seven federally listed plants are analyzed further and include: beach layia (*Layia carnosa*), Marin dwarf flax (*Hesperolinon congestum*), showy Indian clover (*Trifolium amoenum*), Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), Sonoma spineflower (*Chorizanthe valida*), Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*), and Tidestrom's lupine (*Lupinus tidestromii*). A detailed description of each taxon, including its legal status, habitat requirements, ecology, and status in the planning area can be found in the "Evaluated Species Information" section of the biological assessment (BA) for USFWS (appendix K).

WILDLIFE, INCLUDING FEDERALLY LISTED SPECIES

The planning area hosts diverse terrestrial and aquatic ecosystems that support many mammals, birds, fishes, reptiles, amphibians, and invertebrates. Elk are addressed as a standalone impact topic. These species rely on a number of habitat types that are described in the "Vegetation" section.

Federally Listed Wildlife

The planning area provides habitat for several animals listed as threatened or endangered under the ESA, including critical habitat for some species. A list of federally threatened and endangered species was obtained from USFWS (2018a) and NMFS (2018). Listed marine animals (e.g., whales, seals, sea lions, sea turtles, and abalone) may use beaches adjacent to the planning area but are not included in this analysis because ranch activities would not affect these species in the planning area. Elephant seals (*Mirounga angustirostris*) are found immediately adjacent to ranch lands and are expanding by the Ken Patrick Visitor Center; however, ranch operations do not affect them. Table J-3 in appendix J lists the wildlife species, subspecies, or distinct population segments that were analyzed for known or likely occurrences and designated critical habitat in the planning area. Park staff further refined this list to identify only those species that could be potentially affected by ranch activities, based on knowledge of species' occurrences and prior consultation with USFWS and NMFS regarding ranching in the park (NMFS 2004; NPS 2001b; USFWS 2002a). Seven animals could potentially be impacted, including: one amphibian (California red-legged frog); one bird (western snowy plover [*Charadrius alexandrines nivosus*]); three fishes (coho salmon [*Oncorhynchus kisutch*], steelhead [O*ncorhynchus mykiss*], and Chinook salmon [*Oncorhynchus tshawytscha*]); and two invertebrates (Myrtle's silverspot butterfly [*Speyeria zerene myrtleae*], and California freshwater shrimp [*Syncaris pacifica*]). Information about known occurrences in the planning is provided below under the respective species group headings. A detailed description of each taxon, including its legal status, habitat requirements and ecology, and status in the planning area can be found in the "Evaluated Species Information" section of the BAs for USFWS and NMFS, appendix K and L, respectively.

One amphibian and two anadromous fish [coho salmon and steelhead] have designated critical habitat in the planning area (USFWS 2018b) (figure 46 in appendix A). Critical habitat is designated immediately adjacent to the planning area for two species (northern spotted owl [*Strix occidentalis*] and western snowy plover) (figure 47 in appendix A). The park was excluded from the 2012 critical habitat designation for the northern spotted owl because management actions in the planning area already promote the subspecies' conservation (*Federal Register* [FR] 77 71876). Because effects from ranching would not affect northern spotted owl habitat in the planning area, it is not analyzed further.

Special-Status Wildlife

Numerous animals in the planning area are considered "special status" because of concerns about population declines, range retractions, or small population sizes, which increase a species' susceptibility to risk of extinction. Special-status species or subspecies include animals that are (1) listed as threatened or endangered under the California Endangered Species Act (CNDDB 2018); (2) listed by CDFW as a species of special concern, sensitive species, or watch list species (CDFW 2018a); (3) protected by California statute as fully protected species (CDFW 2019); or (4) listed by USFWS as birds of conservation concern (USFWS 2018a). Further declines of a special-status species could qualify it for state or federal threatened or endangered status.

Park biologists compiled and reviewed a list of special-status species to identify those that could be potentially affected by agricultural activities. The California Wildlife Habitat Relationship System was also consulted (CDFW 2014). Table J-3 in appendix J lists 29 special-status wildlife species known to occur in the planning area, including 1 amphibian, 18 birds, 3 fishes, 6 mammals, and 1 reptile species. The table describes their status and preferred habitat type(s). Several species of invertebrates in the planning area are listed on the CDFW (2018a) "Special Animal List" and are tracked by the California

Natural Diversity Database because they are rare, restricted in distribution, or declining throughout their range. This list includes several invertebrates found in coastal dunes, such as the globose dune beetle (*Coelus globosus*), sandy beach tiger beetle (*Cicindela hirticollis gravida*), and bumblebee scarab beetle (*Lichnanthe ursina*). Other sensitive invertebrates tracked by the California Natural Diversity Database, such as the monarch butterfly (*Danaus plexippus*) and Point Reyes blue butterfly (*Icaricia icarioides parapheres*), are generally found in the planning area where an abundance of nectar sources (i.e., flowering forbs) is available near water.

Mammals

Approximately 40 mammals are found in the planning area, including both native and non-native, domestic species (NPS 2012b). Common native mammals are the Columbian black-tailed deer (*Odocoileus hemionus columbianus*), coyote (*Canus latrans*), gray fox (*Urocyon cinereoargenteus*), American badger (*Taxidea taxus*), bobcat (*Lynx rufus*), brush rabbit (*Sylvilagus bachmani*), black-tailed jackrabbit (*Lepus californicus*), raccoon (*Procyon lotor*), striped skunks (*Mephitis mephitis*), and several species of bats, rodents, and shrews (NPS 2018b). Most species use grasslands, shrublands, or pastures to complete a portion of their life history and could be affected by ranching through disturbance, competition for resources, and habitat alteration. Some species are adaptable to agriculture (e.g., coyotes and raccoons), while others are not. Ranching could affect small mammals such as California meadow voles (*Microtus californicus*), black-tailed jackrabbits (*Lepus californicus*), Botta's pocket gophers (*Thomomys bottae*), and western harvest mice (*Reithrodontomys megalotis*). Some mammals are attracted to agricultural fields for the food or cover they provide, such as Columbian black-tailed deer. Black-tailed deer could occasionally compete with livestock for habitat; however, unlike cattle, they are browsers and have a mixed diet of grasses and forbs, shrubs, and trees. Fences in the planning area can affect the movement of deer and other large mammals and cause injury. Mammals also include the limited number of animals that ranches are authorized to keep for personal noncommercial use (e.g., pets or guard animals), consisting of non-native species such as horses, cats, and dogs. Domestic cats are a major predator of birds and small mammals. The planning area is adjacent to beaches used by elephant seals throughout the year and occasionally other marine mammals. Although infrequent impacts to marine mammals could occur if livestock were to escape pasture fences onto beaches, it is unlikely they would affect marine mammals. Thus, impacts on marine mammals are not analyzed further.

Birds

Point Reyes hosts the greatest avian diversity of any national park unit in the United States and nearly half of the bird species of North America, with around 490 species recorded from approximately 60 bird families (NPS 2004b, 2018c). This diversity can be explained by the park's latitude, its diverse habitats, and its location along the Pacific Flyway (NPS 2018c). Many birds use the planning area for a portion, or all of their life history, particularly during spring migration and summer nesting. Ground-nesting species, such as the California horned lark (*Eremophila alpestris actia*), savannah sparrow (*Passerculus sandwichensis*), grasshopper sparrow (*Ammodramus savannarum*), song sparrow (*Melospiza melodia*), western meadowlark (*Sturnella neglecta*), California quail (*Callipepla californica*), and northern harrier (*Circus cyaneus*), could be susceptible to impacts from cattle grazing and vegetation management (e.g., plowing and harvesting). Agricultural activities that affect songbird populations could also affect the foraging of American peregrine falcons (*Falco peregrinus anatum*), which nests at Point Reyes lighthouse, and merlins (*Circus cyaneus*). Several other special-status raptors rely on grassland habitats, including the burrowing owl (*Athene cunicularia*), white-tailed kite (*Elanus leucurus*), and ferruginous hawk (*Buteo regalis*) (table J-3 in appendix J), and could be affected by habitat alteration from livestock grazing and vegetation management. Additionally, agricultural activities in the planning area attract some birds via food sources, habitat alteration, or livestock presence, such as common ravens (*Corvus corax*), brown-headed cowbirds (*Molothrus ater*), tricolored blackbirds (*Agelaius tricolor*), Brewer's blackbirds (*Euphagus cyanocephalus*), European starlings (*Sturnus vulgaris*), and American crows (*Corvus brachyrhynchos*), among others. Nest parasitism by brown-headed cowbirds or competition with

non-native European starlings for cavity nesting sites could negatively affect other native birds. Ravens are nest predators of the federally threatened western snowy plover, which nests on beaches adjacent to the planning area (table J-4 in appendix J).

Fish

Fish that could occur in the planning area include 14 species that are freshwater, 3 estuarine (mix of fresh and saltwater), 10 anadromous (migrate up rivers from the sea to spawn), 3 catadromous (migrate down rivers to the sea to spawn), and 2 amphidromous (move between fresh and salt water but not to spawn) (NPS 2007b, 2018d). Freshwater streams in the planning area are characterized by naturally low species diversity (NPS 2004b). The threespined stickleback (*Gasterosteus aculeatus*; anadromous), prickly sculpin (*Cottus asper*; catadromous), and California roach (*Hesperoleucus symmetricus*; freshwater) are the predominant fish species in perennial streams. Three federally threatened anadromous fish that could occur include coho salmon, steelhead (an anadromous rainbow trout), and Chinook salmon (table J-4 in appendix J). The Lagunitas Creek watershed supports one of the largest remaining spawning populations of the Central California Coast coho salmon evolutionarily significant unit (Carlisle, McNeill, and Reichmuth 2018). Steelhead from the Central California Coast distinct population segment occur in the planning area in the Lagunitas and Olema Creek watersheds and in tributaries to Drakes Estero. Chinook salmon from the California Coastal evolutionarily significant unit are sporadic visitors to the Lagunitas Creek watershed; only a few adults have been observed in 12 of 17 years (MMWD 2018). Other special-status fish in the planning area could include the Pacific lamprey (*Lampetra tridentatus*) and western river lamprey (*Lampetra ayresii*), which are both anadromous and ecologically similar, and the riffle sculpin (*Cottus gulosus*), a freshwater species residing in cold, clear headwater streams (table J-3 in appendix J). Historical logging, development, and grazing in the planning area have negatively affected fish habitat as a result of sedimentation, loss of habitat complexity, and diminished riparian ecosystem function (NPS 2001b). Major perennial streams that are habitat for federally listed fish in the Tomales Bay watershed (Lagunitas and Olema Creeks) either do not have adjacent grazing or have been fenced to exclude cattle. However, agricultural activities contribute to habitat degradation and reduced water quality and quantity for fishes (see “Water Resources” section).

Reptiles and Amphibians

A dozen species of reptiles could occur in the planning area (NPS 2007c, 2018e). The western pond turtle (*Clemmys marmorata*), a California species of special concern, uses freshwater ponds and backwater areas of large streams in the planning area. Four lizard species occur in almost every habitat, except the dampest, most interior forests and tidal salt marshes, and eight snake species could occur in the planning area (NPS 2007c, 2018e). These species typically prefer riparian areas, shrublands, grasslands, and rock outcrops (California Herps 2016). Amphibians in the planning area, found in and near streams and ponds, include six species of salamanders and four species of frogs and toads (NPS 2018f), including the non-native bullfrog. Although extirpated or greatly reduced throughout its range in California, the federally threatened California red-legged frog is still locally abundant in the planning area. Several populations inhabit the park, and the NPS has recorded 136 known occurrences[1] in the park, primarily associated with stock ponds (NPS 2019a). Also, the coast range newt (*Taricha torosa torosa*), a subspecies of the California newt (*Taricha torosa*), is a special-status species found in the planning area. Agricultural activities could affect habitat suitability and water quality for reptiles and amphibians.

[1] Occurrences document the areas surveyed for threatened and endangered animals in which a species is, or was, present. In many cases, an occurrence represents several observations of multiple individuals or multiple visits at a given location.

Invertebrates

Thousands of aquatic and terrestrial invertebrates inhabit the planning area. Limited information about the diversity and distribution of these species is available. Numerous flying insects are important pollinators of native plants, which could be affected by livestock grazing and vegetation management activities. Other aquatic invertebrates, including numerous insects, are important indicators of water quality and support aquatic food webs that could be affected by runoff from agricultural activities. Two federally endangered invertebrates are known to occur in the planning area, the Myrtle's silverspot butterfly and California freshwater shrimp (table J-4 in appendix J). Recent surveys of for Myrtle's silverspot butterflies showed occurrences on 13 ranches, all which support livestock operations (Adams 2004). California freshwater shrimp are found in Lagunitas Creek and lower Olema Creek. No additional special-status invertebrate species are known to occur (table J-3 in appendix J).

TULE ELK

Elk are mixed grazers and browsers; they feed on both ground-level herbs and grasses and on woody shrubs and trees. In the park, elk favor non-forested habitats, such as open grassland and coastal scrub, eating a variety of plants that include grasses, coyote brush, willow, bush lupine, plantain (*Plantago*, spp.), and miner's lettuce (*Claytonia perfoliata*). Tule elk have an estimated AU equivalent of 0.26 to 0.47 at Point Reyes, based on elk weights collected in 2015–2016 (Bernot and Press 2018; NPS, Press, pers. comm. 2019c). Elk feed in the early morning and late evening and are inactive during the day and middle of the night, when they spend most of their time chewing their cud.

Elk breed in a polygamous mating system where males compete during the rut or breeding season for dominance. The result is that the dominant bull mates with many females, accomplished through forming a reproductive herd or harem. Thus, only 15% to 25% of males breed compared with 90% of females over their lifetime (NPS 1998a). Elk mating season is prolonged in the park and lasts from July to October.

Currently, coyotes and mountain lions are the only predators of elk in the park. Coyotes and mountain lions may target individual elk but do not affect the total population.

Current Status and Distribution of Elk in the Park

Elk in the park currently occur in three distinct herds, two of which are located in the planning area—Drakes Beach herd and Limantour herd. The Tomales Point herd, located outside the planning area, is composed of descendants of the 10 individuals introduced to the park in 1978. A 3-mile-long fence spanning the peninsula from the Pacific Ocean to Tomales Bay generally isolates the herd from adjacent dairy ranches. They are contained in the 2,600-acre Tomales Point Tule Elk Reserve and do not interact with ranching operations, except for a few male elk that occasionally escape the reserve. The Tomales Point herd consisted of 432 animals at the end of 2018 (NPS, Press, pers. Comm. 2019c).

The Drakes Beach herd consisted of an estimated 124 total animals at the end of 2018 (NPS, Press, pers. comm. 2019c). The main herd and male bachelor groups spend time on A Ranch, B Ranch, C Ranch, E Ranch, D Ranch, and in surrounding areas where no cattle grazing occurs (figure 2 in appendix A). The core use area for the Drakes Beach herd straddles the east and west sides of Drakes Beach Road and is located mostly in the ranchlands. A male bachelor group of bull elk regularly occurs at the northern end of the core area near the top of Drakes Beach Road, while larger female/juvenile groups are located to the south of the core area, closer to Drakes Beach. Individual male elk or small groups regularly wander toward the Point Reyes headlands and other surrounding areas.

NPS monitors the presence of elk on ranches through visual observations and the deployment of GPS collars on individual animals. The GPS collars, first deployed in the fall 2012, have only been used for the Drakes Beach herd and collect location data every three hours throughout the day and night. Because elk are herd animals, the GPS data collected from a single animal often represent the movements of an entire herd of animals.

The larger main herd of elk at Drakes Beach consists of adult cows, calves, yearlings, some immature males (spikes), and an occasional bull or two. The main herd is most cohesive during the fall and winter following the rut, with as many as 80 elk. During the spring calving period and the summer rut, the animals that comprise the main herd disperse into smaller groups and are more widespread through the core area, from the center area of C Ranch to the east toward Drakes Estero. The female groups spend more time at the southern end of Drakes Beach Road and thus more time in areas not permitted for grazing (Bernot and Press 2016, 2018). On average, initial GPS collared females from November 2012 to October 2014 spent 60.1% of time throughout the year in areas not permitted for grazing (Bernot and Press 2016). The ranch most affected by the main herd is C Ranch, with female GPS collars showing 19.5% of time spent on this ranch year-round during the same period (Bernot and Press 2016). However, the use of C Ranch by the main herd is not evenly distributed throughout the year. Use increases during the summer and fall compared to other times of year (Bernot and Press 2016, 2018). NPS has conducted hazing to push the Drakes Beach herd off active ranch lands to reduce time spent and forage consumed by elk on ranches. During initial hazing efforts, the elk were hazed in the morning but often returned by evening. Through repeated efforts, hazing has been more effective at keeping elk away from C Ranch for longer periods. Hazing has not been very effective for bachelor groups.

Male elk in the Drakes Beach herd spend most of the year on ranches. The larger bachelor group at the top of Drakes Beach Road regularly crosses the road at sunset and sunrise, spending nights on C Ranch and days to the east of Drakes Beach Road on E Ranch and D Ranch. As such, males spend most time on C Ranch and D Ranch. Similar to the main herd, there are seasonal patterns in how the male elk are distributed. Following the rut, a group of approximately 12 bull elk move to A and B Ranches for several months. Another group moves to E Ranch, spending most time on the ocean side of Sir Francis Drake Boulevard, between the road and the dunes backing South Beach. The males consolidate into the largest groups when the bulls are in velvet during the late winter and spring. Males are most evenly distributed across the ranches and non-ranching areas in the core use areas during the summer, which is likely explained by the rut when males form the cow groups into separate smaller harems distributed throughout the core use area.

A recent study using the GPS collar data also found that male elk in the Drakes Beach herd tend to spend more time on ranches than females (Hughey et al. 2019). Overall habitat selection appeared to be most consistently correlated with low elevation habitat on gentle, south-facing slopes, near ponds. However, biotic factors related to forage productivity and livestock production had the largest effect on elk habitat selection overall, which suggests that cattle play a noticeable role in determining the distribution of elk in this system (Hughey et al. 2019).

Habitat modifications for the Drakes Beach herd included two projects. The first—a water project at D Ranch—was completed in 2013 and is ongoing; it provides reliable water sources for elk away from ranches. The second—repeatedly mowing portions of D Ranch in spring 2018—was to test both the elks' response and this approach for controlling invasive plants that degrade the suitability of habitat for elk.

The Limantour herd consisted of an estimated 174 animals at the end of 2018 (NPS, Press, pers. comm. 2019c). This herd is distributed across a larger geographic area than the Drakes Beach herd. The range of the Limantour herd includes designated wilderness areas extending south beyond Coast Camp and adjacent ranchlands to the north. Four separate core use areas exist within the herd's range, two of which are occupied by males and are located wholly or partially on ranchlands. Approximately 45 males spend time on ranch lands at any one time, with most concentrated use on Home Ranch, N Ranch, D. Rogers Ranch, and, to a lesser extent, in surrounding areas with no cattle grazing, particularly on the western slope of Mount Vision. A smaller group of six to eight males extends up to H and I Ranches, and also occurs occasionally on L and M Ranches. The male elk are known to cross Sir Francis Drake Boulevard at only one location, traveling through the bishop pine forest above N Ranch and then across Schooner Creek and Sir Francis Drake Boulevard to D. Rogers Ranch. Most males return to the wilderness areas to join the female groups during the rut from summer into fall.

Female/juvenile groups generally remain in the wilderness areas northeast and southwest of Limantour Road, particularly the Glenbrook and Muddy Hollow Drainages, and rarely cross onto ranchlands. A small group of four elk (two cows and their calves) has moved far south to near Glen Camp. In recent years, cow groups have moved farther upslope of the Inverness Ridge, extending up to and beyond the Laguna and Muddy Hollow Trailheads. Rather than being concentrated in large groups like at Drakes Beach, the cow groups are usually broken up into many smaller groups distributed across a large area. During the summer rut, it is common for one or two small harems to occasionally move to the Drakes Head area of Home Ranch. In addition, a group of up to 20 cows, spikes, and juveniles occurs regularly during the winter in the back portions of Home Ranch, moving back and forth between ranch pastures and the adjacent wilderness. Hazing of the Limantour herd has occurred at Home Ranch when small female groups become established on the ranch. The female groups have not traveled far onto the ranch, but the hazing efforts have been only partially successful in returning the animals to the adjacent wilderness area to the south.

Elk occurring on ranches have the greatest effect on cattle fences and the availability of forage. Because elk move together in large herds and tend to follow established routes of travel, fences are usually crossed in the same areas repeatedly. Fences that are old and in poor condition, too tall for elk to easily jump over, or do not have wires spaced properly for elk to pass through become damaged by elk crossing and even come down entirely at places. While male elk on the D. Rogers Ranch pass easily over a single-strand electric fence, C Ranch has had more difficulty maintaining single-strand electric fences when the main herd moves there. Male elk can also damage fences by using wooden posts as antler rubs. NPS has also received reports of occasional infrastructure damage to water pipes. Competition for forage between elk and cattle is possible if they occur together in the same space and time and limited forage is available.

Seasonal patterns of elk use in the Drakes Beach area, particularly by the main herd, reduce the likelihood of competition because elk use of ranches is more concentrated following the peak growing seasons of winter and spring. All the ranches where elk occur adhere to the RDM monitoring standards. Ranchers regularly provide additional feed to cattle in the pastures, such as hay and alfalfa. While elk have occasionally been seen consuming this supplemental feed, it has not been identified as a widespread problem. Elk have occasionally been seen eating from the hay racks on C Ranch, but this is a rare occurrence. More commonly, the male group that moves to E Ranch following the rut feed regularly on alfalfa placed for cattle adjacent to Sir Francis Drake Boulevard. Ranchers report no observed instances of elk consuming cattle feed in the Limantour herd. NPS has received reports of bull elk goring dairy cattle in the Drakes Beach area. Behavioral differences between dairy cattle and elk and the possibility of unexpected encounters, particularly at night, lends validity to these reports despite the absence of any real-time observations of a goring incident.

Elk Herd Health

Several diseases have the potential to affect wildlife in the park. Johne's disease and CWD are two diseases currently of concern for ungulates, including elk. Johne's disease, caused by the bacterium *Mycobacterium paratuberculosis* is an incurable diarrheal wasting disease of livestock and wild ungulates. Prior to the establishment of the free-ranging herd in 1999, individuals of the Tomales Point herd in the park were infected with Johne's disease through contact with other infected animals or contaminated soil, probably from cattle, black-tailed deer, or non-native deer (Riemann et al. 1979, as cited in NPS 1998a; Jessup et al. 1981, as cited in NPS 1998a). In fall 2015, the presence of Johne's disease was confirmed in individual elk from the Drakes Beach herd following the implementation of a testing program for the park's free-range elk (Bernot and Press 2016).

CWD, a fatal neurologic disease, infects cervids such as deer, elk, and moose. Although CWD has not been discovered in California or neighboring states, it has the potential to spread to California's deer and elk populations. California has implemented legislation and other policy actions to minimize the risk of introducing CWD. Based on these policy measures and geographic factors limiting the likelihood of

CWD spreading to California, CDFW has determined that California is at relatively low risk for CWD (CDFW 2018b); therefore, it is unlikely to affect the park's elk populations.

Limitations on Population Size

Overall, the population trend among elk herds in the planning area seems to be steadily increasing among both the Drakes Beach and Limantour herds (Cobb et al., in prep.). Forage availability, closely tied to annual precipitation, is likely the most important determinant of elk herd growth patterns in the park. A recent modeling study based on elk data from Point Reyes showed that annual herd growth varied across herds as a function of differences in elk vital rates, which in turn responded uniquely to annual changes in density and climate (Cobb et al., in prep.). Contrary to expectations, density-dependence had a measurable effect on herd growth at Drakes Beach despite the herd not being confined in any way. As expected, there was no evidence of any density-dependent effects in the Limantour herd. Productivity was noticeably lower in the Limantour herd than the Tomales Point and Drakes Beach herds, possibly due to lower quality available elk habitat and increased rates of predation in the Limantour area (Cobb et al., in prep).

Other regulating factors, such as inbreeding, disease, and trace element deficiencies, have all been documented in the Point Reyes elk herds. Point Reyes' elk are believed to be among the most inbred in California, having lost an estimated 80% of their retained genetic variability (McCullough, Fisher, and Ballou 1996, as cited in NPS 1998a). Copper and selenium deficiencies have been previously reported in the Tomales Point elk (Gogan, Akenson, and Jessup 1989) and were more recently documented in the Drakes and Limantour herds (Bernot and Press 2016). These deficiencies can negatively affect many aspects of the overall health of elk, including decreased resistance to disease, poor production, muscle damage, and developmental problems (Bernot and Press 2016). The extent to which these stressors affect current herd growth patterns is unknown.

VISITOR USE, EXPERIENCE, AND ACCESS

The park contains a rich assemblage of natural and cultural features close to a major urban population, offering myriad recreational opportunities and enhancing the importance of the special qualities for which it was protected. The park is located within 40 miles of the San Francisco metropolitan area and hosts approximately 2 to 2.5 million visitors annually (NPS 2018g). Visitation has remained relatively stable over the past decade, with the recent low recorded in 2010 with 2.1 million visitors and the peak recorded in 2013 with 2.6 million visitors (NPS 2018g). Annual visitation figures are available on the park website. According to visitor surveys conducted by Sonoma State University (Ferry and LaFayette 1997; Fungi 1999), most visitors to the park spend 2 to 6 hours engaging in various activities, depending on the season. Common activities include hiking, visiting the beach, going to the visitor centers, sightseeing, whale watching, and bird-watching (Ferry and LaFayette 1997; Fungi 1999).

Visitor facilities and recreational opportunities in the planning area include scenic driving, hiking and biking trails, equestrian use, and the Kenneth C. Patrick Visitor Center. Many visitors to the park travel through the planning area to reach other park destinations, such as Drakes Beach, Tomales Point, and the Point Reyes lighthouse. While the roads used for traveling to these park destinations fall outside the planning area, visitors still enjoy the scenic quality of the planning area landscape while traveling along them. The planning area includes several designated hiking and biking trails that encompass a range of habitat types from wooded mountains to sandy beaches. Visitors bring horses to ride on designated horse trails, and horses are available for rent from commercial stables (NPS 2006b). Other visitor activities in the planning area include photography, wildlife viewing, birding, and interpretive opportunities. Unlike other areas of the park, no overnight visitor accommodation is available in the planning area.

The highest visitation to the park typically occurs from June to August, primarily on weekends (NPS 2018g). A survey conducted in 2005 indicated that 100% of visitors were *satisfied overall with appropriate facilities, services, and recreational opportunities* (University of Idaho Cooperative Parks

Studies Unit 2005). Additionally, 91% of respondents indicated that outdoor recreational opportunities were *very good*, and 82% of respondents indicated that opportunities to learn about nature, history, and culture were *very good*.

Nature study and wildlife viewing, including the viewing of elk, are important activities in the planning area. The park remains the only national park system unit where tule elk can be found (NPS 2018h), and elk viewing opportunities in the planning area are most prevalent along Drakes Beach Road.

Other wildlife viewing is also very popular in the planning area. Nearly 40 species of land mammals and at least a dozen species of marine mammals may be seen throughout the park, many of which can be observed in the planning area, including elephant seals. Birding is a very popular activity in the park and planning area. Visitors also enjoy viewing and photographing livestock on the ranches in the planning area. These unique and plentiful wildlife and livestock viewing opportunities bring many visitors to the park and the surrounding area.

Visitors often use the ranchlands for walking, bird watching, and other passive recreational activities. Ranching operations can also diminish the visitor experience. For instance, visitors have encountered cattle on trails and roadways in the park, and visitors have noted concerns regarding electric fencing, interactions with cattle, and manure management (NPS 2014a).

CULTURAL LANDSCAPES, HISTORIC DISTRICTS, AND HISTORIC STRUCTURES

The planning area includes portions of two ranching historic districts—Olema Valley Dairy Ranches Historic District, listed in the National Register on April 9, 2018, and the Point Reyes Peninsula Dairy Ranching Historic District, listed in the National Register on October 29, 2018 (figure 48 in appendix A). Three other historic districts are also located in the planning area—Marconi/RCA Bolinas Transmitting Station Historic District and RCA Point Reyes Receiving Station Historic District, both listed in the National Register on February 23, 2018; and the Drakes Bay Historic and Archaeological District, designated a National Historic Landmark in 2012. The Percy, Niman, and Martinelli Ranches are within the planning area but are not within the boundaries of any of the historic districts. NPS has also documented the Olema Valley Dairy Ranches Historic District, Point Reyes Peninsula Dairy Ranching Historic District, Marconi/RCA Bolinas Transmitting Station Historic District, and RCA Point Reyes Receiving Station Historic District as cultural landscapes and manages them according to NPS *Management Policies 2006* and the Cultural Resource Management Guidelines (NPS 1998b, 2006a).

Olema Valley Dairy Ranches Historic District

The Olema Valley Dairy Ranches Historic District occupies 14,127 acres in the western portion of the park and is mainly located in the north district of Golden Gate. Dairies in the Olema Valley were established in 1857. The 19 ranches in the historic district fall within two different valleys/watersheds—Olema Valley and Lagunitas Creek. Olema Valley encompasses the west-facing slopes from Bolinas Ridge to Olema and Pine Gulch Creeks. The ranches at the north end of the district are located east of Olema Valley on the east and west slopes of Bolinas Ridge, between Lagunitas Creek to the north and Samuel P. Taylor State Park to the southeast. Ranches that range in size from approximately 250 acres to more than 1,600 acres are located throughout the two areas of the historic district.

The following 13 individual ranches retain their ranch building core and are contributing to the larger historic district:

- Cheda Ranch
- Hagmaier Ranch (not in planning area)
- Giacomini Ranch
- Lupton/Five Brooks Ranch
- McFadden Ranch
- McIsaac Ranch
- Randall Ranch
- Rogers Ranch
- Stewart Ranch
- Teixeira Ranch (not in planning area)

- Truttman Ranch
- Wilkins Ranch (not in planning area)
- Zanardi Ranch

Six ranches do not retain individual integrity of their ranch core but still contain historic features, such as fences, roads, windbreaks, and grazing lands that contribute to the overall characteristics of the historic district:

- DeSouza Ranch
- Edwin Gallagher Ranch
- Genazzi Ranch
- Jewell Ranch
- McCurdy Ranch
- Neil McIsaac Ranch

Overall the Olema Valley Dairy Ranches Historic District has 157 contributing resources, comprising 97 buildings, 19 sites, and 41 structures. There are 28 non-contributing buildings and 1 non-contributing structure in the district. Typical buildings, structures, and landscape features at each ranch in the district include ranch houses (both single-family residences and bunkhouses for workers), creameries, milking barns, horse and hay barns, Grade A dairies, pastures, fences, corrals, and windbreaks clustered together in ranch cores nestled among large pastures. While upgrades occurred over time, the older buildings, such as milking barns, were left in place and oftentimes converted to new, compatible uses. New buildings and structures were located within the historic core and therefore, were compatible with the existing development pattern. Despite individual variations, the extant ranch cores maintain a common spatial organization, setting, and location. The result is a significant, intact vernacular landscape; collectively the ranches in the historic district convey the vast scale and remoteness of ranching life at the western edge of Marin County (NPS 2018i).

The Olema Valley Dairy Ranches Historic District continues to convey its historical significance as an agricultural ranching environment, exhibiting key characteristics of the late 19th and early 20th-century dairy ranches that once flourished here. The physical condition of the district remains much as it did during the latter portion of its period of significance, which spans from 1857 to 1958. The district exhibits the characteristics of late 19th/early 20th century ranches in northern California and continues to convey the historic character of the ranching landscape by retaining key physical characteristics of circulation; buildings and structures; and those characteristics that make up the ranch setting, including natural systems and features, spatial organization, land use, and vegetation. Ranch cores were sited to take advantage of the flat portion of the property, often surrounded by rolling hills and natural drainages, which provided easy access to water and grasslands for grazing. The ranch cores are composed of vernacular-style residential buildings, agricultural barns, and outbuildings, and ornamental vegetation, windbreaks, and fruit and nut trees. Outside the ranch building core, fences and roads divide pastures composed predominantly of pastures interspersed with native forests. The ranch core and pastures are connected by ranch roads that maintain their historical alignments and connect the ranches to the greater district by intersecting with regional roads.

Exterior condition assessments indicate that most structures in the working ranch complexes are in fair condition (table 6). Assessments indicate that both structural elements (e.g., foundations, roofs and walls) as well as windows, doors, and exterior finish elements range from poor to fair. While all ranches have historic structures in the complex, the overall square footage of those structures range from just 2% of total square footage to 100%. Condition assessments for the Giacomini, McIsaac, Stewart, and Zanardi Ranches, completed in 2018, indicate that the residences are generally in fair condition. The condition of outbuildings and barns range from poor to good.

TABLE 6: EXTERIOR CONDITION OF RANCHES IN THE OLEMA VALLEY DAIRY RANCHES HISTORIC DISTRICT IN THE PLANNING AREA

Ranch	Condition	Year of Assessment	Source
Cheda Ranch	Poor	2014	NPS (2014c)
Hagmaier Ranch	Fair	2011	NPS (2011a)
Giacomini Ranch	Fair	2018	NPS (2018j)
Lupton/Five Brooks Ranch	Fair	2014	NPS (2014d)
McFadden Ranch	Fair	2011	NPS (2011b)
McIsaac Ranch	Fair	2018	NPS (2018j)
Randall Ranch	Fair	2018	NPS (2018j)
C. Rogers Ranch	Fair	2011	NPS (2011c)
Stewart Ranch	Fair	2018	NPS (2018j)
Teixeira Ranch	Good	2014	NPS (2014e)
Truttman Ranch	Fair	2011	NPS (2011d)
Wilkins Ranch	Fair	2011	NPS (2011e)
Zanardi Ranch	Fair	2018	NPS (2018j)

Point Reyes Peninsula Dairy Ranching Historic District

The Point Reyes Peninsula Dairy Ranching Historic District, which was listed under criteria A and C in the National Register nomination, comprises approximately 22,237 acres of coastal prairie and coastal scrub areas on the northern end of the peninsula. The ranches in the Point Reyes Peninsula Dairy Ranching Historic District were established in 1857, becoming one of the earliest suppliers of dairy products to the San Francisco area. Two families—the Shafters and Howards—owned almost the entire peninsula and created 31 dairies that were leased to tenants, organizing the ranches into an alphabet system. Ranch size ranged from 800 to 2,200 acres, and boundaries often followed the rolling topography of the headlands and riparian corridors. Seventeen ranches form the Point Reyes Peninsula Dairy Ranching Historic District. The Home Ranch, located on the east shore of Drakes Estero, was the first to be built in 1857 and served as a model for the remaining tenant ranches, which were built predominantly between the early 1860s and early 1870s. Fourteen ranches retain their ranch building core and contribute to the historic district:

- A Ranch
- B Ranch
- C Ranch
- D Ranch
- E Ranch
- G Ranch
- H Ranch
- I Ranch
- J Ranch
- L Ranch
- M Ranch
- W Ranch (not in the planning area)
- D. Rogers Ranch
- Home Ranch

Three ranches do not retain individual integrity of their ranch core but still retain historic features such as fences, roads, windbreaks, and grazing lands that contribute to the historic district:

- F Ranch
- K Ranch
- N Ranch

The extant ranch cores convey over a century of change in the California dairy industry from the 1850s onward, including the evolution of dairy farming from the original wood frame milking barns to the concrete Grade A barns of the mid-1930s to 1940s (NPS 2018k). While most of the dairy operations in the Olema Valley Dairy Ranches Historic District were converted to beef production in the 1960s and 1970s, many of the ranches in the Point Reyes Peninsula Dairy Ranching Historic District maintained dairy operations. Thirteen ranches still operate within the historic district in the headlands of the Point Reyes peninsula and Tomales Point.

The Point Reyes Peninsula Dairy Ranching Historic District has 160 contributing resources that include 107 buildings, 17 sites, and 36 structures. There are 155 non-contributing resources, including 127 buildings, 1 site, 26 structures, and 1 object. When established in the mid-19th century, typical buildings, structures, and landscape features at each ranch included the main residence, creameries, horse barns, fences, corrals, and windbreaks clustered together in ranch cores nestled among large pastures. These initial building types reflect the distinctive, mild climate of the California coastline. As the dairy industry evolved over the next century, additional building types would be added to each ranch, including milking barns when cows were no longer milked outdoors, hay barns when ranchers began to supplement the grazing on pasture land with additional feed, and Grade A dairy buildings when regulations required strict sanitary conditions for collecting and storing milk. The new buildings and structures were located within the historic core and therefore compatible with the existing development pattern. They also continued to display a continuity of design as they were commissioned by the Shafter-Howard family. While upgrades occurred over time, the older buildings (i.e., the milking barns) were left in place and converted to new compatible uses. Windbreaks of blue gum eucalyptus (*Eucalyptus globulus*) and Monterey cypress (*Cupressus macrocarpa*) protect ranch cores and other structures from ocean winds. Eucalyptus trees were also historically used as a boundary marker between the Shafter and Murphy properties. This feature remains intact. The main road, Sir Francis Drake Boulevard, connects all the ranches between the tip of the peninsula to Inverness Ridge. A secondary road, Pierce Point Road, branches off the main road to provide access to the northern part of the peninsula.

The overall spatial distribution of the system of ranches in the Point Reyes Peninsula Dairy Ranching Historic District illustrates the evolution of the dairy industry over a 100-year period. The history of the dairy industry is reflected within the landscape of the historic district by the remaining ranch core developments, infrastructure, grazing lands, cattle, and continuing ranching land use as a whole. The ideal pastoral qualities of the landscape, the rolling hills covered by pastures, a climate that provides an extended summer grazing season, and water sources continue to characterize the historic district and allow for the maintenance of dairy and beef cattle ranching practices today. Many of the buildings, roads, windbreaks, and other supporting features constructed between 1857 and 1956 are intact and continue to sustain the vernacular ranching landscape (NPS 2018k).

The ranches in the Point Reyes Peninsula Dairy Ranching Historic District are in poor to good condition (table 7). Condition assessments for A, B, C, D, G, I, J, and Rogers Ranches were completed in 2018. All buildings surveyed in the 2018 condition assessment except the shed and historic residence on the D Ranch were found to be in poor condition. Historic residences on all the other ranches are generally in fair to good condition. Condition of outbuildings and barns range from fair to good condition.

TABLE 7: EXTERIOR CONDITION OF RANCHES IN THE POINT REYES PENINSULA DAIRY RANCHING HISTORIC DISTRICT IN THE PLANNING AREA

Ranch	Condition	Year of Assessment	Source
A Ranch	Fair	2018	NPS (2018j)
B Ranch	Fair	2018	NPS (2018j)
C Ranch	Fair	2018	NPS (2018j)
D Ranch	Poor	2018	NPS (2018j)
E Ranch	N/A	Not assessed	
G Ranch	Fair	2018	NPS (2018j)
H Ranch	N/A	Not assessed	
I Ranch	Good	2018	NPS (2018j)
J Ranch	Good	2018	NPS (2018j)
L Ranch	Fair	2004	NPS (2004c)
M Ranch	Good	2004	NPS (2004d)
W Ranch	N/A	Not assessed	
D. Rogers Ranch	Good	2018	NPS (2018j)
Home Ranch	Fair	2018	NPS (2018j)

Marconi/RCA Bolinas Transmitting Station Historic District

The Marconi/RCA Bolinas transmitting station was listed in the National Register under criteria A and C on February 23, 2018, for its role as the first station in the continental United States to transmit wireless messages across the Pacific Ocean and its mission revival architectural style (NPS 2018l). The 422-acre historic district is located 1-mile northwest of Bolinas on a bluff overlooking the Pacific Ocean in part of the southernmost planning area. The district has eight contributing buildings, two contributing sites including a large antenna field, three contributing structures, and five noncontributing buildings and structures. The general landscape of the district is characterized by low grasslands, which was never historically associated with the transmitting station and is currently maintained by grazing. Fencing separates the main compound of buildings and access road from the surrounding landscape. Areas adjacent to buildings have Monterey cypress, Monterey pine, and eucalyptus windbreaks. The antenna field, which is a contributing site in the district, contains antenna tower bases, wood H-frames, antenna poles, concrete foundations, downed poles, and guy wire anchors, and the lands are leased for grazing. Most of the buildings in the district are being used by Commonweal.

RCA Point Reyes Receiving Station Historic District

The RCA Point Reyes Receiving Station was also listed in the National Register on February 23, 2018, under criterion A as "one of only two known extant examples of a shortwave radio station from the early era of shortwave radio communications in the United States" and criterion C as exhibiting the distinctive characteristics of Art Deco architecture (NPS 2018m). The historic district is located approximately three-and-a-half miles west of Inverness, California. Located in the gently rolling coastal grasslands, the open landscape of the 160-acre district contains a cluster of three Art Deco style station buildings situated at the end of a quarter-mile-long access road. Other contributing resources include an antenna field, entrance road/allée, and a transformer vault. Noncontributing resources include a utility building, water tank, and satellite pads built in the 1970s and 1980s. None of the open areas of the district are used for grazing. The

Maritime Radio Historical Society is preserving the station and has revived the broadcast of the former RCA coast station, KPH. Some of the buildings are used for museum storage for the Point Reyes. The entrance road/allée, a contributing resource of the district, has recently become a visitor destination for photographing the scenic tree-lined entry road referred to as the Cypress Tree Tunnel.

SOCIOECONOMICS

Changes to ranching practices in the park may affect socioeconomic conditions in the planning area and the surrounding region. The regional economic context for these potential impacts is described below. The study area for the socioeconomic existing conditions assessment includes both Marin and Sonoma Counties in California because these counties encompass the area within which the primary impacts from the alternatives could be felt. Information about San Francisco County is also assessed because of its proximity to the study area and the economic relationship that ranches in the study area may have to this county. While these counties contain several larger cities, including San Rafael, San Francisco, Santa Rosa, Petaluma, and their surrounding areas, the planning area is located in a predominantly rural area away from the large urban areas. For the purposes of this assessment, the communities of Sea Haven, Inverness, Point Reyes Station, Tomales, Dillon Beach, Nicasio, Woodacre, Lagunitas-Forest Knolls, San Geronimo, and Olema have been identified as gateway communities to Point Reyes based on proximity to Point Reyes and potential economic ties to the planning area. Note that quantitative information for Sea Haven and Olema was not available at the time of this assessment; therefore, these communities are not presented below. Marin County is approximately 530 square miles; national park system land accounts for 25% of land ownership in the county (Headwaters Economics 2018). Information about the state of California is presented where appropriate for comparison. Unless stated otherwise, all dollar values below have been adjusted using Consumer Price Index to 2018 dollars (US Bureau of Labor Statistics 2018).

Population

Much of Marin County's population resides in the eastern portion of the county in San Rafael and the surrounding area. Much of western Marin County is rural with low population densities in primarily agricultural or forested lands that are scattered, small, and unincorporated. Towns in western Marin County primarily serve the tourism and agriculture industries and local residents. Sonoma County's population is larger than that of Marin County with most of its population residing in the center of the county around Santa Rosa, away from the Pacific coast.

Based on US Census Bureau data, Marin County had 259,358 residents between 2012 and 2016, a 5% increase from 2000. The population of San Francisco County was 850,282, and the population of Sonoma County was 497,776 between 2012 and 2016. Census Tract 1321 (population 1,956) contains the southern portion of the planning area near Bolinas, California; Census Tract 1322 (population 1,672) contains most of the planning area, including Drakes Bay; and Census Tract 1330 (population 2,877) includes Point Reyes Station and other ranches in the north district of Golden Gate (US Census Bureau 2000, 2016).

Gateway Communities

Gateway communities are identified as those cities and towns that are geographically close to the planning area and derive some measurable economic benefit from tourism and related activities in Point Reyes. These communities are generally located within several miles of the planning area. Gateway communities differ from other communities in Marin County and the state of California largely because of their relationship with the planning area. Some of these communities have a history of tourism, while others are a stop for travelers en route to destinations in or around the planning area. Historically, a number of these communities rely on agriculture and tourism and act as bedroom communities for larger cities in Marin and surrounding counties. Specifically, the National Parks Conservation Association notes that the village of Point Reyes Station would not be able to attract the volume of people that it does without the existence of Point Reyes (Bay Area Economics 2006). Lagunitas-Forest Knolls and Woodacre are the largest gateway communities to the planning area. The population of Lagunitas-Forest Knolls has

declined by 17% since 2000, while the population of Woodacre increased by 11% over the same period. Point Reyes Station and Inverness are located closest to the planning area and experienced a 30% and 24% decline in population from 2000, respectively (US Census Bureau 2000, 2016). Point Reyes Station has the largest commercial district among the gateway communities around the park and is an attraction for bicyclists, motorcyclists, and other visitors, especially on the weekends (West Marin Chamber of Commerce 2019). Marin and Sonoma County are also the "epicenter of California's lively artisanal cheese movement," and Point Reyes Station in particular is a popular destination for cheese tasting in California (New York Times 2013). Nationally recognized businesses including Cowgirl Creamery and Point Reyes Blue Cheese originated their operations in Point Reyes Station.

Employment

Location quotients (LQ) are often used in economic assessment as a method to quantify the level of industry specialization in a region compared to a larger geographic area. The LQ cannot be calculated for all sectors because of data suppression issues from information providers, a situation typically caused by either a small number of employees in a sector or a concentration of employees at only a small number of employers. Data for the agriculture, forestry, fishing and hunting industry are not available because of data disclosure issues, which limit the assessment of the agricultural industry, an industry that could be affected by the action alternatives. LQs help show which industries have a greater degree of specialization in a particular area compared to a larger area. LQs greater than 1.0 for an industry show that this area specializes in this industry compared to the larger geographic area. For example, an industry with an LQ of 1.3 indicates that about 30% more employees are employed locally in this industry compared to employment in the same industry in a larger geographic area. For the purposes of this analysis, Marin County is the smaller geographic area and is compared to the state of California. Employment in Marin County is highly specialized in the arts, entertainment, and recreation (LQ 1.65) and educational services (LQ 1.63) sectors. Real estate and rental and leasing (LQ 1.28), professional and technical services (LQ 1.32), and management of companies and enterprises (LQ 1.29) are all slightly specialized in the region of influence (US Bureau of Labor Statistics 2016).

An assessment of average employment in the study area at the sector level over the last 10 years reveals that approximately 49% of local employment is concentrated in industries that have increased employment since 2007. Employment in three industries—educational services, health care and social assistance, and accommodation and food services—in Marin County have grown at a faster rate than either national employment across all industries or national employment in the same industry.

The professional, scientific, and technical industry is the largest sector by number of jobs in both Marin and San Francisco Counties, responsible for 13% and 18% of total jobs in each county, respectively. The next largest industries in Marin County are the health care and social assistance industry at 11%, retail trade at 9%, and real estate and rental and leasing at 8%. Employment in farming, which makes up less than 1% of all jobs in Marin County, decreased by 14% between 2010 and 2016, while employment in farming in Sonoma County represents 2% of all jobs and remained relatively unchanged between 2010 and 2016. The number of jobs in the accommodation and food services sector is about 50% higher in Sonoma County than in Marin County (US Bureau of Economic Analysis 2016).

Unemployment rates in Marin County, Sonoma County, San Francisco County, the state of California, and the San Francisco-Oakland-Hayward metropolitan statistical area follow a similar pattern. This pattern was particularly notable in 2010, when unemployment peaked in all areas. With the onset of the economic recession in 2008 through 2013 to 2014, each of these counties, California, and the San Francisco-Oakland-Hayward metropolitan statistical area generally followed the same upward and downward fluctuation in unemployment. All geographies demonstrated a decrease in unemployment since 2010. Throughout this period, Marin County had the lowest unemployment as a percentage of the overall labor force, indicating it was particularly resilient to the impacts of the recession compared to the other areas (US Bureau of Labor Statistics 2017).

Tourism and Travel

Direct travel-related spending in the state of California in 2016 totaled $133 billion, generating $11 billion in local, state, and federal tax revenues and supporting 2.5% of California's gross domestic product in 2016 (Dean Runyan Associates 2016). Visitors who reside outside the state of California generated 60% of this spending. Of the $5.3 billion in sales in Marin County in 2015, 5.4% ($289 million) were generated by nonresidents to the county. In 2016, visitors to Marin County spent $872 million directly supporting 7,190 jobs and $75 million in tax revenues, $39 million of which went to local governments in Marin County (Dean Runyan Associates 2016). Travel-related spending included gas, lodging, food services, retail, auto rental, transportation, and recreation by visitors from outside the state. Nearly 1.1 million jobs are supported in California as a result of travel-related spending. Travel and agriculture are two of the most important export industries in the North Coast region of California, which includes Marin and Sonoma Counties (Dean Runyan Associates 2013).

The *National Park Service Visitor Spending Effects Report* shows that almost 2.5 million people visited Point Reyes for recreation in 2017 and that these visitors spent $108.5 million in gateway communities near the park, a 3% reduction from visitor spending in the prior year. This spending supported 1,244 jobs in the local area, a 9% decrease from the prior year, and had an aggregate benefit to the local economy of $132.4 million, a 4% decrease from the prior year. According to the report, most park visitor spending was for hotels (28.3%), followed by restaurants (22.3%), groceries (13.9%), retail (8.0%), and recreation industries (7.0%). In 2017, park visitor spending on groceries and retail in the local community increased compared to the prior year. Though visitor spending on recreation industries decreased in 2017, the number of recreation visitors to Point Reyes increased by 1% (NPS 2016b). Visitation and visitor spending information is not available for the north district of Golden Gate.

Grazing, Ranching, and Agricultural Activity in Marin County and in the Planning Area

In 2012, the latest year for which data is available from the US Census of Agriculture at the time of writing, Marin County was home to 323 farms with an average size of 529 acres, and each farm operation was valued at $3.6 million.[2] The market value for all agricultural products sold in the county totaled $100.4 million; most (91%) of the market value was in livestock, poultry, and their products.[3] In 2012, 134 farms with cattle and calves were located in the county, generating $16.1 million in sales, and 44 farms had dairy-producing cows that generated $67 million in sales.[4] Twenty-four farms sold poultry and eggs in 2012; these farms had $493,000 in sales that year (US Census of Agriculture 2012a, 2012b).

[2] In the 2012 agricultural census report form, each farm operation reported its best estimate of the current market value of land and buildings owned, rented from others on the operation, and rented or leased to others. The value of the operator's dwelling and other buildings are included in the estimate if they are used for farm operations (US Census of Agriculture 2012d).

[3] Market value of agricultural products sold includes a farm operation's direct sales of agricultural products and the value of shares received from other entities associated with the operation, such as partners, landlords, or contractors. Estimates of agricultural product market value do not include taxes, product production expenses, or income from federal farm programs or other farm-related services (US Census of Agriculture 2012d).

[4] In the 2012 agricultural census report form, each farm operation reported its best estimate of the current market value of land and buildings owned, rented from others on the operation, and rented or leased to others. The value of the operator's dwelling and other buildings are included in the estimate if they are used for farm operations (US Census of Agriculture 2012d).

The number of beef cattle operations in Marin County has increased from 95 in 2007 to 100 in 2012, with the number of beef cattle remaining relatively stable at around 9,300 over this period. This reflects a decrease in average beef cattle herd size of 6% over this period. The number of dairy operations also increased from 28 to 48 over the same period (2007–2012) in Marin County.[5, 6] Over the same period, the number of cattle and dairy ranches in the park remained the same (US Census of Agriculture 2012c). According to *Marin County Livestock and Crop Reports* published between 2010 and 2017, total dairy milk production in the county has been declining for the past eight years, from 1.7 million hundredweight in 2010 to 1.0 million CWT in 2017. Total dairy milk sales in the county were approximately $35 million in 2017, a 15% increase since 2010, after adjusting for inflation. Production of beef cattle in Marin County has remained relatively steady over this same period. There were 14,563 cattle sold in 2010 and 14,398 cattle sold in 2017. This value dropped to as low as 13,056 in 2013 and peaked at 15,894 in 2011. Total cattle sales were worth $11 million in 2017, the latest year that the county's livestock and crop report was published (Marin County Department of Agriculture, Weights and Measure 2010, 2011, 2013, and 2017).

Park staff assessed the number residents and employees on ranches in the planning area in spring 2019. According to the assessment, 40-full time, non-ranching family employees work on dairy and cattle ranches in the planning area. One additional employee works part time at one of the ranches. An additional 23 full-time employees are also part of ranching families in the planning area. Ranching operations support 63 direct full-time jobs in the planning area. In total, 188 full-time residents live on ranches in the planning area. This includes full- and part-time employees, ranchers and their families (NPS, Voeller, pers. comm. 2019d).

An assessment of the economic impacts of ranching operations in the planning area was undertaken using an IMPLAN analysis. Ranching in the planning area supported $1.6 million in beef cattle sales and $14.4 million in dairy sales in 2017. One commercial chicken operation supported 2,000 laying hens and 900 broilers, which were assumed to bring in approximately $50,000 annually in egg and meat poultry sales. In total, all sales from ranches in the planning area directly support 63 full time jobs in Marin County, while indirectly supporting 27 additional jobs in Marin County from the purchase of goods and services by ranches in the planning area from other businesses in Marin County, such as truck transportation and silage purchases.[7] An additional 7 jobs in Sonoma County are supported as a result of ranch operations in the planning area making purchases of goods and services in Sonoma County. Finally, another 15 induced jobs are supported through the household spending of workers who are either directly or indirectly supported by sales of beef and dairy products on ranches in the planning area. In total, these jobs support $6.6 million in labor income in Marin County and $350,000 in labor income in Sonoma County. Beef and cattle ranching in the planning area represents 15% of total cattle ranching, by sales, in Marin County, while dairy production in the planning area represents 41% of dairy production, by sales, in the county. Poultry farming in the planning area represents approximately 0.3%, by sales, of poultry production in the study area.

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[5] As defined by the North American Industry Classification System, establishments primarily engaged in milking dairy cattle are considered as part of the dairy cattle and milk production industry. Establishments primarily engaged in raising cattle (including cattle for dairy herd replacements) are considered the beef cattle ranching and farming industry (US Census of Agriculture 2012d).

[6] The 2012 Census of Agriculture was the latest comprehensive available data on agricultural operations in Marin County at the time of publishing this EA. Given that county level data shows a decline in dairy sales in the years since the 2012 Census of Agriculture, it is possible that the number of dairy operations has also decreased since 2012. This document will be updated with 2017 Census of Agriculture data when it is published later in 2019.

[7] The actual number of jobs supported by ranching sales is likely greater as some workers at ranches may not be counted in the identified IMPLAN sector and some of the actual jobs are part-time.

AIR QUALITY

Regulatory Framework

National Ambient Air Quality Standards

USEPA sets National Ambient Air Quality Standards (NAAQS) for six air pollutants (referred to as criteria pollutants): sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter of 10 micrometers and 2.5 micrometers (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), and lead. Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are regulated as precursors to O_3 (i.e., they undergo atmospheric reactions that form O_3). In California, NH_3, VOCs, NO_x, and SO_2 are considered precursors to $PM_{2.5}$.

The primary NAAQS are set at levels considered protective of human health (these levels are not necessarily protective of ecosystems). Areas that exceed the design value NAAQS are designated as nonattainment. Marin County is in marginal nonattainment status for O_3 (both the 2008 and 2015 standard) and moderate nonattainment status for the $PM_{2.5}$ 2006 standard. As such, the state regulatory agency, the California Air Resources Board (CARB), must develop plans to bring the area back into attainment. Federal agencies undertaking any federal action in a nonattainment area must demonstrate that project-related emissions will not impede the state's ability to bring the area back into compliance with the NAAQS, called a conformity determination. A conformity applicability analysis was completed for this project, and the emissions were below the *de minimis levels*.

Class I Areas and Protection of Air Quality Related Values

The Clean Air Act designated 48 units of the national park system, including Point Reyes, as Class I areas. Golden Gate is not a Class I area. Class I status provides the park with an additional measure of protection for park air quality (criteria pollutant ambient concentrations) and resources sensitive to air pollution (called air quality related values [AQRVs]), such as visibility, plants, animals, soils, water and ecosystems. NPS has an "affirmative responsibility" under the Clean Air Act to protect the air quality and AQRVs in the park. As a precursor to PM, NH_3 emissions can contribute to visibility impairment and to harmful ecosystem impacts from excess nitrogen deposition.

Environmental Context

Climate and Meteorology

California is divided into air basins defined partly by meteorological and topographical characteristics. Point Reyes, located along the western side of Marin County, is in the San Francisco Bay Area Air Basin. Because the area is within approximately 6 miles of the coastline, it is exposed to large concentrations of sea salt, a natural cause of haze (CEPA 2009). Point Reyes is a Class I park, and air quality is generally good because of the prevailing westerly marine flows. However, during periods when atmospheric conditions displace the east Pacific high-pressure system, air flows from the San Francisco Bay area can degrade the air quality of the park. This mainly occurs during the late summer and early fall, when the major atmospheric systems undergo a seasonal change. During this time, a general haze often affects visibility in the park (NPS 2019a).

Ozone

O_3 occurs naturally in the earth's upper atmosphere where it protects the earth's surface against ultraviolet radiation (USEPA 2012). However, it also occurs at the ground level (i.e., ground-level O_3) where it is created by a chemical reaction between NO_x and VOCs in the presence of sunlight (USEPA n.d.). O_3 precursors are emitted from both anthropogenic and natural source types, including power plants, industry, motor vehicles, oil and gas development, forest fires, and other sources (Beitler 2006).

O_3 is one of the most widespread pollutants affecting vegetation in the United States. (USEPA n.d.). Considered phytotoxic, O_3 can cause significant foliar injury and growth defects for sensitive plants in

natural ecosystems. Specific defects include reduced photosynthesis, premature leaf loss, and reduced biomass; prolonged exposure can increase vulnerability to insects and diseases or other environmental stresses (USEPA 2017a). Plant species occurring in the park are at low risk of O_3 damage (Kohut 2004, 2007). The O_3 W126 index (named after portions of the equation used to calculate it) measures cumulative O_3 exposure over the growing season in "parts per million-hours" (ppm-hrs) and is used for assessing the vegetation health risk from O_3 levels (USEPA 2014). NPS's Park Conditions and Trends assessment of vegetation health risk at the park is rated "good" based on 2011–2015 data and the estimated W126 metric of 1.9 ppm-hrs (W126 levels below 7 ppm-hrs are considered "good condition," 7–13 ppm-hrs are considered "moderate condition," and greater than 13 ppm-hrs are considered "significant concern").

At high concentrations, O_3 can aggravate respiratory and cardiovascular diseases in humans through reduced lung function, increased acute respiratory problems, and elevated susceptibility to respiratory infections (USEPA 2016). Visitors and staff engaging in aerobic activities in the park (e.g., hiking, biking, maintenance/physical labor), as well as children, the elderly, and people with heart and lung diseases are especially sensitive to elevated O_3 levels. The NAAQS for O_3 is 70 parts per billion (ppb) for the three-year average of the fourth highest daily maximum 8-hour average O_3 concentration. NPS policy considers O_3 concentrations exceeding the NAAQS as "significant concern," concentrations of 55–70 ppb as "moderate concern," and concentrations below or equal to 54 ppb as "good condition." NPS's Park Conditions and Trends rates human health risk from ground-level O_3 as moderate concern at the park based on 2011–2015 data showing an estimated O_3 level of 55.6 ppb (NPS 2018n). The nearest O_3 monitoring site is in San Rafael, where the 2015–2017 design value computed by USEPA was 58 ppb (USEPA 2017b). No trend information is available for O_3 concentrations because there are not sufficient on-site or nearby monitoring data.

Visibility

Air pollution, especially PM, influences a visitor's ability to view scenic vistas and landscapes at parks (NPS 2018o). The Clean Air Act sets a visibility goal of no manmade air pollution in Class I areas. PM is a complex mixture of extremely small particles and liquid droplets that become suspended in the atmosphere. It largely consists of acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles (USEPA 2018a). In coastal areas, salt spray also contributes to PM and can affect visibility (Lewis and Schwartz 2004). Two particle size classes are of concern: $PM_{2.5}$ –fine particles found in smoke and haze, which are 2.5 micrometers or less in diameter; and PM_{10} –coarse particles found in wind-blown dust, which have diameters between 2.5 and 10 micrometers (USEPA 2012). Fine particles are a major cause of reduced visibility (haze) in many national parks and wilderness areas (USEPA 2012). $PM_{2.5}$ can either be directly emitted from sources (e.g., forest fires) or can form when gas emissions from power plants, industry, and/or vehicles react in the air (USEPA 2018a). Particulate matter can either absorb or scatter light, causing the clarity, color, and distance seen by humans (i.e., visibility) to decrease, especially during humid conditions when additional moisture is present in the air.

Visibility conditions are assessed in terms of a Haze Index, a measure of visibility (termed deciviews [dv]) that is derived from calculated light extinction and represents the minimal perceptible change in visibility to the human eye (NPS 2013b). A visibility monitor is located in the park at the North District Ranger Station (IMPROVE network monitor ID: PORE1, CA). Conditions measured near 0 dv are clear and provide excellent visibility. As dv measurements increase, visibility conditions become hazier (NPS 2013b). Visibility on mid-range days is defined as the mean of the visibility observations falling within the 40th and 60th percentiles (NPS 2017b). A visibility condition estimate of <2 dv above estimated natural conditions indicates a good condition, estimates ranging from 2–8 dv above natural conditions indicate moderate concern, and estimates >8 dv above natural conditions indicate significant concern (NPS 2017b). NPS's Park Conditions and Trends assessment rates visibility as moderate concern based on 2011–2015 estimated visibility on mid-range days of 4.3 dv above estimated natural conditions (NPS 2018n). Natural visibility conditions are those estimated to exist in a given area in the absence of human-

caused visibility impairment. Estimated annual average natural condition on mid-range days equals 9.7 dv at Point Reyes.

Visibility trends are computed from the Haze Index values on the 20% haziest days and the 20% clearest days, consistent with visibility goals in the Clean Air Act and Regional Haze Rule, which include improving visibility on the haziest days and allowing no deterioration on the clearest days (NPS 2017b). For 2006–2015, the trend in visibility at the park improved on both the 20% clearest days and the 20% haziest days. Visibility on the haziest days improved from 26.9 dv in 1989 to 19 dv in 2015, while visibility on the clearest days improved from 10.6 dv in 1989 to 8.1 dv in 2015 (NPS 2018n). Fine sea salt is the largest natural contribution to haze at the park. Human-related contributions include ammonium nitrate and ammonium sulfate. Data specifically identifying the contribution of emission sources in the park compared to long-range transport emission sources from elsewhere in the region are not available.

$PM_{2.5}$ can be transported from sources hundreds of miles away to contribute to visibility problems at remote locations (San Joaquin Valley Air Pollution Control District 2018). During periods of southerly winds, the planning area may experience concentrations of PM from sources in the San Francisco Bay area (NPS 2018n). Local sources of PM include campfires, entrainment of dust from vehicle movement over unpaved roads, wildland and prescribed fires, and ammonia from agricultural sources. Regional scale wildfires (in the Sierra and Central Valley) have affected park visibility and air quality for more than one to weeks the last two to three years.

Nitrogen and Sulfur Deposition

Sulfur and nitrogen are emitted into the atmosphere primarily through the burning of fossil fuels, industrial processes, and agricultural activities (USEPA 2012). While in the atmosphere, these emissions form compounds that may be transported long distances, eventually settling out of the atmosphere in the form of pollutants such as particulate matter (e.g., sulfates, nitrates, ammonium) or gases (e.g., NO_2, SO_2, nitric acid, NH_3) (NPS 2008, USEPA 2012). Atmospheric deposition can be in wet (i.e., pollutants dissolved in atmospheric moisture and deposited in rain, snow, low clouds, or fog) or dry (i.e., particles or gases that settle on dry surfaces as with windblown dusts) form (USEPA 2012). Deposition of sulfur and nitrogen can affect ecosystems through the acidification of water and soils, excess fertilization or increased eutrophication, changes in the chemical and physical characteristics of water and soils, and accumulation of toxins in soils, water and vegetation (NPS 2019e). Deposition levels in a region are an indicator of risk for ecosystem effects from sulfur and nitrogen pollution—higher deposition levels increase the risk of harm to sensitive species. The majority of pollution deposited in national parks (including Point Reyes) originates from sources outside park boundaries, but in-park sources can contribute to cumulative deposition loadings. At the national level, NPS assesses current conditions in parks using total deposition estimates from the National Atmospheric Deposition Program.[8] This estimate combines measured wet deposition with atmospheric chemical models to predict deposition outside monitoring sites. Based on the most recent data, nitrogen deposition in Point Reyes ranges from 2.9 kilograms of nitrogen per hectare per year (kg-N/ha/yr) on the north side of the park to 5.7 kg-N/ha/yr on the south side of the park (National Atmospheric Deposition Program 2017).

To understand risk to the ecosystem, NPS compares atmospheric deposition values to critical loads of lifeforms known to occur in the park. A critical load is the threshold of deposition below which no harmful effects to the ecosystem are expected to occur. According to the NPS Inventory and Monitoring program, ecosystems in the park were rated as having high sensitivity to nutrient-enrichment effects relative to other parks monitored by the program (NPS 2019e). Nitrogen deposition may disrupt soil nutrient cycling and affect biodiversity of lichen communities and some plant communities (Geiser et al.

[8] https://nadp.slh.wisc.edu/

2019, Pardo et al. 2011). Continuous deposition through time, even at rates below an annual critical load, can accumulate and lead to the increased vigor of invasive species.

Ecosystems in the park were rated as having moderate sensitivity to acidification effects relative to all Inventory and Monitoring parks (NPS 2019e). Acidification effects can include changes in water and soil chemistry that affect ecosystem health. Sulfur deposition in Point Reyes ranges from 1.1 kilograms of sulfur per hectare per year (kg-S/ha/yr) to 2.3 kg-S/ha/yr with no defined gradient (National Atmospheric Deposition Program 2017). Point Reyes has five tree species that are at risk due to the elevated sulfur deposition (NPS 2019e). Otherwise, current levels of sulfur deposition are not expected to impact Point Reyes resources.

No trend information is available for nitrogen and sulfur deposition because there are not sufficient on-site or nearby deposition monitoring data.

Existing Emission Sources in the Planning Area

Existing air pollutant emissions from ranching were calculated for beef and dairy cattle at existing levels. As shown in table 8, existing ranching activities are estimated to generate emissions of NH_3, VOC, and $PM_{2.5}$ emissions as well as carbon dioxide equivalent (CO_2e) greenhouse gas (GHG) emissions. Ammonia emissions from ranching activities were considered in this analysis because NH_3 contributes to overall deposition levels, and nitrogen deposition is a concern for the park. However, most deposition sources likely affecting the park come from sources outside park boundaries, including mobile sources, power plant and industrial sources, and regional farming operations (see discussion of CARB 2015 emission inventory for Marin County below).

Mobile source (vehicles) emissions were also calculated for visitors. Emissions pathways associated with ranching that were quantified include:

- **Enteric emissions** directly from the digestive system of cattle (CH_4 and VOC emissions are a byproduct of the digestive system of ruminants).
- **Livestock waste emissions.** Manure (urine and feces) decomposition, and its application on the land can produce emissions of VOC, NH_3, nitrous oxide, and CH_4.
- **Fugitive dust emissions.** Cattle movement over the land can generate dust (particulate matter) emissions under certain soil, vegetation and weather conditions.

TABLE 8: ANNUAL EMISSIONS FROM RANCHING AND MOBILE SOURCES UNDER EXISTING CONDITIONS (TONS/YEAR)

Activity	NH_3	VOC	$PM_{2.5}$	CO_2-Equivalent (metric tons per year)
Ranching/Livestock Emissions	105.9	46.9	1.99	24,611
Mobile Source Emissions	0.27	0.56	1.6 (including dust)	3,734

For context and comparison to ranching-related emissions, mobile source emissions were estimated based on 2018 traffic data. The traffic data includes visitors, park employees, and others using the park road system. Traffic was assumed to travel the full length of each roadway in the park (travel from outside the region and outside park boundaries was not included). For this order-of-magnitude estimate, traffic was assumed to consist of entirely gasoline passenger vehicles and park roadway traffic speeds were assumed to be 25 miles per hour. January morning meteorology was assumed. USEPA's MOVES model was used (national scale run option using default data for Marin County) to develop general emission rates for NH_3, VOCs, $PM_{2.5}$, and CO_2e. Fugitive road dust emissions were also estimated. CO_2e emissions from mobile sources were estimated at 3,734 metric tons/year, which is approximately 15% of the emissions due to

ranching. Mobile source contributions to NH_3 and VOC are on the order of 1% or less relative to ranching related emissions. $PM_{2.5}$ emissions from ranching and mobile sources are of a similar relative magnitude.

CARB prepared a 2015 emissions inventory for Marin County that includes a breakout of farming-operation emissions. The inventory indicates that countywide NH_3 emissions from all source categories is 949 tons per year. Farm operations account for the majority of NH_3 emissions in Marin County, at 628 tons per year NH_3, or 66% of total Marin County NH_3 emissions. As shown in table 9, the NH_3 emissions estimated for ranching in the park represent approximately 11% of the total county-level emissions (from all source categories), or 17% of county emissions from farming operations.

VOC emissions for the park were compared to the CARB inventory's Reactive Organic Gases and represent 21% of county-level farming operation emissions. However, because agriculture is a relatively small component of overall VOC emissions, the VOC emissions estimated for ranching in the park are only 1.3% of total county VOC emissions (major sources of VOCs include industrial sources, solvent use and motor vehicles/equipment).

TABLE 9: POINT REYES RANCHING EMISSIONS COMPARED TO CARB 2015 MARIN COUNTY EMISSIONS INVENTORY (TONS/YEAR)

	Point Reyes Ranching/ Livestock Emissions	Total Marin County Emissions	Marin County Farming Operations Emissions	Point Reyes Ranching Emissions as % of County Total	Point Reyes Ranching Emissions as % of County Farming Operation Emissions
NH_3	105.9	949	627.8	11.16%	16.87%
VOC	46.9	3,504	226.3	1.34%	20.72%

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CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This "Environmental Consequences" chapter analyzes the beneficial and adverse impacts that would result from implementing any of the alternatives considered in this EIS. The resource topics presented in this chapter correspond to the descriptions of existing conditions in "Chapter 3: Affected Environment." As required by the CEQ regulations implementing NEPA, this chapter provides a comparison of the environmental consequences for each alternative.

GENERAL METHODOLOGY FOR ASSESSING IMPACTS

The following analysis evaluates direct, indirect, and cumulative impacts on the human environment (i.e., physical, natural, cultural, and socioeconomic resources) from EIS alternatives. The approach includes the following elements:

- Focusing the analysis to the greatest extent possible on management changes and associated issues that could have meaningful impacts on the resources or values being evaluated
- Using general analysis methods and assumptions that follow CEQ and US Department of the Interior regulations and guidance

The potential for significant impacts from management activities are assessed and described in each resource topic as applicable. Alternative elements, such as the length of lease/permits, that would not affect individual resource topics are not analyzed further.

ASSESSING IMPACTS USING COUNCIL ON ENVIRONMENTAL QUALITY CRITERIA

According to CEQ's NEPA regulations (40 CFR 1500–1508), the term "significant" is based on the criteria of context and intensity (40 CFR 1508.27). Specific methodologies and assumptions used to assess impacts are provided at the beginning of each impact topic analysis. Where impacts are likely to be significant, a significance determination is made. If significance is not addressed in the discussion that means impacts are not likely to be significant.

Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity. This refers to the severity or magnitude of an impact. CEQ identifies 10 factors to be considered in evaluating the intensity of an impact. For more information, see 40 CFR 1508.27(b).

CUMULATIVE IMPACTS

CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). All alternatives, including the no-action alternative, consider cumulative impacts.

Cumulative impacts were determined by combining the impacts of each alternative with the impacts of other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future projects and plans in the area of analysis, and if applicable, the surrounding region. Past actions are those that have occurred or have been occurring and reasonably foreseeable future projects are those that are likely to occur in the future. Following the CEQ

guidance, past actions were included, "to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for the actions and its alternatives may have a continuing, additive, and significant relationship to those effects" (CEQ 2005). Past, present, and reasonably foreseeable actions that could contribute to cumulative impacts on the alternatives are provided in table 10, followed by a full description of each project.

TABLE 10: CUMULATIVE PROJECTS

Cumulative Project	Resources Affected
Coastal Dune Restoration	Water Resources, Vegetation, Wildlife, Air Quality
Lagunitas Creek Salmonid Habitat Restoration Project Activities	Water Resources, Vegetation, Wildlife, Visitor Use, Air Quality
Fire Management Program	Soils, Water Resources, Vegetation, Wildlife, Visitor Use, Air Quality
Cultural Resource Preservation Maintenance Projects	Soils, Vegetation, Visitor Use, Cultural Resources, Socioeconomics, Air Quality
Road Improvement Projects at Point Reyes National Seashore	Soils, Water Resources, Vegetation, Wildlife, Visitor Use, Socioeconomics, Air Quality
Pacific Gas & Electric Company Fire Prevention Projects	Water Resources, Vegetation, Wildlife, Visitor Use, Socioeconomics, Air Quality
Corvid Management	Water Resources, Vegetation, Wildlife, Visitor Use
Invasive Plant Management	Water Resources, Vegetation, Wildlife, Tule Elk, Visitor Use, Socioeconomics
Marin Resource Conservation District Grant Program	Soils, Water Resources, Vegetation, Wildlife

Cumulative Project Descriptions

Coastal Dune Restoration

The park's coastal dune habitat is seriously threatened by the rapid encroachment of two non-native plants: European beachgrass and iceplant. Native coastal dunes provide habitat for up to 11 federally listed plant and wildlife species that are threatened by both physical and ecological changes associated with the presence of invasive plants. NPS has restored up to 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 plants 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.

The coastal dune restoration projects are expected to have major, beneficial, direct effects on special-status species and native dune plants. The projects have the potential to reverse the loss of several federally listed species. One of the primary objectives of the restoration project is to restore habitat for the federally threatened western snowy plover and several federally listed plants. Dune restoration projects are ongoing, with annual work in progress. Dune migration has occurred on ranchlands in one restored area. Subsequently, the buffer between treatment areas and pasture lands has been increased. Dune migration also occurs on some non-restored areas and is likely to continue in the future.

Lagunitas Creek Salmonid Habitat Restoration Project Activities

Multiple entities are focused on habitat enhancement and restoration in the Lagunitas Creek watershed to support endangered coho salmon. Lagunitas Creek supports the southernmost stable population of coho

salmon along the Pacific coast, and overwintering habitat for juvenile fish is the primary limiting factor on salmonid populations in the creek. The Marin Municipal Water District 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 Salmon Protection and Watershed Network 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.

Implementation began on four Marin Municipal Water District sites in summer 2017, and the Salmon Protection and Watershed Network completed treatment at one site in 2018. Restoration activities are expected to continue in 2019 and 2020 at specific sites along the Lagunitas Creek corridor.

Fire Management Program

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 within the parks, 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 parks' 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 located in the planning area. Prescribed burning could occur in the future in the planning 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 the county. Under this agreement, Marin County will continue to implement mechanical treatments and conduct prescribed fire burns to reduce the risk in the Wildland Urban Interface.

Cultural Resource Preservation Projects

Cultural resource preservation projects funded through internal NPS fund sources have been completed in the Olema Valley and the north district of Point Reyes over the last several years, and these investments are expected to continue at similar funding levels into the future. Preservation projects typically focus on the needs of a single building or a group of buildings requiring a similar treatment. Typical treatments include stabilization of a building's internal framing or foundation, siding repair and replacement, roofing projects, exterior painting, and repair or replacement of windows and doors. The Department of the Interior's focus on deferred maintenance in NPS units may lead to expanded funding opportunities for maintenance of historic buildings and structures that could potentially have a more sweeping impact on maintenance needs throughout the park.

Road Improvements Projects at Point Reyes National Seashore

NPS in cooperation with the Federal Highway Administration, Central Federal Lands Highway Division, proposed to repair 22 miles of road and adjacent parking areas in the park. This program includes four separate road projects—Limantour Road, Lighthouse Road, Chimney Rock Road, and Pavement Preservation on various spur roads and parking areas. The project includes upgrading road and parking surfaces and drainage features, installing new signs, striping the roads and parking areas, downsizing a beachside parking area, and improving accessibility at two parking areas. The purposes of the project are to provide safe driving surfaces for all travelers on national seashore roads, reduce the possibility of road failures, and reduce maintenance costs.

Most construction work would be limited to the existing road and parking area prisms and drainage ditches. Work on the culverts, drainage ditches, pullouts, and road approaches may disturb vegetation and soil associated with wetlands outside the existing roadway. However, construction boundaries would be

established at these sites to help minimize the size of disturbed areas. Equipment and material staging and storage as well as construction vehicle turnarounds would be confined to the road or parking areas. Construction activities would be scheduled to avoid affecting sensitive species. Other best management practices would also be employed to help avoid or minimize impacts.

The Federal Highway Administration, Central Federal Lands Highway Division, in cooperation with Marin County and NPS, prepared the *Supplemental Environmental Assessment/Subsequent Initial Study (SEA/SIS) for Sir Francis Drake Boulevard Road Improvements* located in the park. Since issuance of the 2015 Finding of No Significant Impacts/Mitigated Negative Declaration, improvements have been proposed and evaluated under the SEA/SIS, including replacing the existing culverts under Sir Francis Drake Boulevard at Schooner Creek with a single-span bridge, and restoring and stabilizing approximately 710 feet of Sir Francis Drake Boulevard that has severely eroded. To compensate for permanent wetland impacts as a result of roadway improvements, part of the parking lot at the Drakes Beach will be restored to a wetland, and two ponds will be constructed within Home Ranch to provide California red-legged frog aquatic breeding habitat. Parking at the Drakes Beach lot will be reduced by approximately 70 to 80 spaces, but NPS plans to encourage better use of other lots by expanding shuttle stops and developing pay kiosks at these remote locations. The SEA/SIS meets the Central Federal Lands Highway Division's obligations as the lead agency for this project under the National Environmental Policy Act and Marin County's obligations under the California Environmental Quality Act. The project begins at the intersection with Pierce Point Road and continues south and west to the intersection with Chimney Rock Road. These activities will take two years to complete, with construction anticipated to begin in summer 2020.

In 2017, the Federal Highway Administration prioritized a similar project for Pierce Point Road for Marin County under the Federal Lands Access Program. This project will substantially improve Pierce Point Road in the next 5 to 10 years.

Pacific Gas & Electric Company Fire Prevention Projects

Pacific Gas & Electric (PG&E) manages multiple power line corridors through the park and planning area. PG&E is responsible for coordinating planning and compliance for maintenance activities through the park. Annually, PG&E conducts extensive vegetation management around the lines and for access to the poles. Pole clearing and pole replacement are also conducted on a case by case basis.

Corvid Management at Point Reyes National Seashore (Luckenbach)

Corvids, particularly ravens, have been documented to prey on threatened snowy plovers. NPS has coordinated with ranchers to limit raven access to supplemental feed and shelter, such as the large barns, which help support a large raven population on the outer peninsula. Specifically, the park has supported debris removal and worked with ranchers to install covered feed bins and redesigned calf huts to reduce corvid access to cattle feed. NPS places exclosures around snowy plover nests to keep the ravens and other nest predators out. The park also discourages raven activity in plover nesting areas by erecting bald eagle decoys and raven effigies to scare ravens away and removes ravens hunting within and near plover nesting areas when necessary. In addition to these efforts, NPS also maintains seasonal beach closures, pet restrictions, and runs an educational volunteer docent program during the nesting season to support the snowy plover.

Invasive Plant Management

A recent NRCA reviewed the status of invasive plants on Point Reyes-administered lands, including management prioritization (NPS 2019a). Many occur in the planning area (the document notes 74 in the pastoral zone), although some low-priority species are considered widespread and well-established in their respective plant communities. The NPS San Francisco Bay Area Network Inventory & Monitoring Program has an ongoing Invasive Plant Species Early Detection Program. Established in 2008, the program surveys roads and trails in the planning area for invasive plants, eradicates small new

infestations, and develops annual priority lists by park (https://www.nps.gov/articles/invasive-plant-species-priority-lists.htm).

The NPS Invasive Plant Species Early Detection Program is not able to survey most ranch areas; however, the Point Reyes' range program, vegetation management branch, Habitat Restoration Program, and ranch operators watch for new invasives and also map and manage certain park infestations. Relevant control techniques are employed within an IPM framework, and treatments are monitored for effectiveness and to document other potential effects, often in collaboration with other weed management professionals. Current activities surrounding Invasive Plant Species Early Detection Program priority 1 invasives in the planning area include researching control methods for rosy sand crocus on two ranches, treatment of fertile capeweed on two ranches, woolly distaff thistle on two ranches, Scotch broom on one ranch, medusahead on one ranch, yellow glandweed (*Parentucellia viscosa*) on one ranch, and European beachgrass control in the dunes adjacent to several ranches along the great beach.

Marin Resource Conservation District Grant Program

Marin Resource Conservation District's Permit Coordination Program, adopted in 2004, provides California Environmental Quality Act coverage for restoration projects that benefit water quality in the boundaries of specified watersheds in Marin County. From 2004 through 2014, the Permit Coordination Program incentivized 300 environmentally beneficial restoration projects on ranches outside the planning area by reducing costs and the timeframe of the environmental compliance process. The Permit Coordination Program continues to cover projects that minimize adverse impacts on water quality from ranch operations outside the planning area (Marin Resource Conservation District 2018).

SOILS

Methodology and Assumptions

The analysis of soil erosion and potential compaction for existing conditions is based on information in the web soil survey (USDA-NRCS 2014b). Soil fertility was taken from information from the web soil survey, the Soil Survey of Marin County (USDA-SCS 1985), and existing literature. To simplify the discussion of the existing conditions, generalized soil associations are used and summarized. The erosion hazard of the dominant soil map unit components within each generalized soil association are identified using "slight," "moderate," "high," and "very high" ratings.

Impacts on soil resources are evaluated based on the changes in land management of each alternative within the zoning framework compared to existing conditions. To assist in analysis and in the decision-making process, the erosion hazard map was overlaid onto the zoning framework map to identify areas where changes in land management would have the least and the most significant, adverse impacts on soil resources.

The analysis of impacts on soil resources assumes mitigation measures associated with ranching activities would be implemented to minimize adverse impacts. The area of analysis includes the boundaries of the planning area.

Alternative A

Ranch Management

Grazing. Under alternative A, NPS would continue to authorize beef and dairy cattle ranching on approximately 27,000 acres at generally the same intensity of use as existing conditions. Grazing and grazing-related activities, such as livestock trailing and trampling, would continue to dislodge soil particles, causing erosion. Under alternative A, grazing by approximately 2,400 AUs of beef cattle and 3,315 dairy animals would continue to directly affect soils in the planning area Within this area, 32% of the acreage is composed of soils with high erosion hazard, and 56% of the acreage is composed of soils with high compaction potential. Of the soils with high erosion hazard, only 11 acres occur within the

150 acres of high-intensity use areas; with the majority (10.5 acres) located on beef ranches. Soils with high compaction potential occur on 58 acres of high-intensity-use areas for both beef and dairy cattle.

As noted in chapter 2, NPS established standards and practices for environmental protection and rangeland monitoring protocols, including RDM monitoring to ensure that current grazing management is maintaining or improving soil resources, among other things, specifically to prevent soil erosion. Standards and practices, including deferring grazing on seasonally vulnerable areas and excluding livestock from damaged or especially vulnerable areas, would continue to minimize soil erosion in the planning area. Standards and practices would be updated as appropriate. Long-term, adverse impacts on soils from livestock grazing under alternative A would continue throughout the planning area, but the most severe impacts on soils would be limited to the high-intensity-use areas—approximately 150 acres, or less than 1% of the planning area. These high-intensity-use areas are more susceptible to erosion because they are typically highly compacted and lack vegetation. These areas include outdoor paddocks, water trough areas, feeding areas on dairy ranches, salt licks, and near ponds (NPS, Voeller, pers. comm. 2019e). Overall, the six dairies represent approximately 60% (86 acres) of the 150 acres of high-intensity-use areas; outside the developed ranch complexes, individual areas of cattle concentration are typically smaller than 1 acre.

NPS has worked with ranchers to site feeding areas away from steep slopes and sensitive areas on a case-by-case basis and would continue to do so under alternative A. On dairy ranches, these high-intensity-use areas are typically devoid of vegetation and would continue to contain high amounts of manure waste. Because of the lack of vegetation, these areas are subject to erosion of nutrient-laden sediments and compaction.

High-intensity-use areas in the developed complex must comply with the lease/permit and state regulations that include mitigation measures intended to protect water quality. Organic dairy operations must also comply with a monitoring and reporting program, develop and implement site-specific management plans, and locate concentration areas to minimize impacts on adjoining lands, as noted in chapter 2. These mitigation measures would continue to minimize runoff from these areas and sedimentation to waterways. Use of high-intensity-use areas would continue under this alternative, and erosion and compaction would continue in areas of concentrated use. Impacts on soil resources resulting from high-intensity-use areas would continue to be long term and adverse but would be limited to approximately 150 acres, or less than 1% of the planning area.

Diversification. A limited number of AUs for non-commercial, non-cattle livestock and other activities would be authorized under alternative A on a case-by-case basis; current permits authorize 111 AUs for non-commercial, non-cattle livestock grazing on 14 ranches. Grazing and the accumulation of manure waste from these livestock species would continue to affect soil resources in the same way that cattle in grazing lands and concentration areas do. Impacts on soils would be long term and adverse but would be limited in extent across the planning area.

Ranch Infrastructure. Fence repair and maintenance of existing fences for ranch operations and maintenance and repair of existing water systems would continue to be the responsibility of ranchers under alternative A. NPS would continue to review any new major fencing or water development project that causes ground disturbance. While installation and repair of fencing and water development projects would continue to cause short-term, adverse impacts on soils from ground disturbances and vehicle traffic, including all-terrain/utility vehicles, trucks, and at times heavier equipment to access and maintain the infrastructure, these impacts would be very localized and minimal across the planning area.

Road upgrades and decommissioning, waterway stabilization, stream crossings, and pond restoration would continue to be approved on a case-by-case basis. Generally, these actions must be designed to reduce overall erosion; however, construction activities would result in temporary soil erosion from disturbed sites. Erosion and sedimentation control measures would be required during construction to

prevent soil loss and polluted runoff. Ranch roads in the Lagunitas Creek watershed have been assessed and prioritized for treatment based on the potential to deliver sediment to the watershed.

Vegetation Management. Vegetation management practices would continue under alternative A, and new practices would be evaluated on a case-by-case basis. Seeding of perennial and self-sustaining vegetation would continue to be implemented in approved areas for erosion control, and prescribed grazing would be used to improve or maintain soil health and to reduce soil loss from erosion. Soil disturbances from tilling and grazing activities increase the likelihood of erosion and compaction, but with the vegetation management practices noted above, the impacts on soils would continue to be minimal and are beneficial in areas where these practices reduce erosion.

Forage Production. Under alternative A, up to 1,000 acres would continue to be used for forage production in authorized areas, which typically involve seeding, soil aeration, manure spreading, harvesting, and, at times, tillage, although many ranchers are not using tilling practices. The 1,000 acres do not contain soils with high erosion potential. These operations, especially tillage, increase soil disturbance that leads to soil erosion, and regular travel to and through fields by heavy equipment causes soil compaction. Soil aeration reduces compaction and increases water infiltration, resulting in less erosion. Forage production would continue to be managed under the current NPS management guidance, with standards for cultivation, including no tilling on slopes greater than 20%, establishing 200-foot buffers between cultivation and waterbodies, no tillage on land classified as highly erodible, leaving an adequate crop residue, and establishing a cover crop prior to the fall rains. These mitigation measures would minimize soil erosion, but impacts on soils from forage production would remain long term and adverse in these 1,000 acres.

Manure and Nutrient Management. Most manure would continue to be spread in forage production fields, but some would also be spread in pasture and rangeland. Manure is spread on about 2,500 acres, or about 9% of the planning area, over a period of years. It is spread as solids, liquids, or slurry and typically comes from livestock concentration areas, where it is stored in stockpiles and in ponds. Manure spreading alters the natural soil fertility by increasing soil nutrients, such as nitrogen, phosphorus, and potassium (McKenzie et al. 2003). Manure spreading is beneficial for increasing crop yields, but it can be detrimental to native plant communities because they are adapted to less-fertile soils, and nutrient additions can increase weedy species (McKenzie et al. 2003). Manure would be spread during dry conditions to minimize erosion and runoff. Manure spreading would continue to alter soil fertility in areas where it is spread. While it would be beneficial to forage production, impacts on soils from manure spreading would continue to be long term and adverse because native plant communities have adapted to less fertile conditions on approximately 9% of the planning area. Vehicle traffic from manure spreading would continue to compact soils in these 2,500 acres.

Elk Management

Under alternative A, continued elk management would have minimal impacts on soils in the planning area. Elk hazing, repairing and constructing fences, enhancing habitat, and conducting elk counts and observations could cause soil disturbances that lead to erosion and compaction. These short-term, adverse impacts would be localized in the planning area, occurring only in the vicinity of the Drakes Beach and Limantour herds.

Cumulative Impacts

Past, present, and reasonably foreseeable actions that would affect soil resources include fire prevention projects, road improvement projects, and cultural resource restoration projects. Fire prevention projects would involve prescribed burning and vegetation clearing to help prevent large wildfires. While impacts on soils from prescribed burning and vegetation clearing would be short term and adverse, fire management would reduce the potential for long-term impacts from wildfires, including severe soil erosion and sedimentation to waterways (Wohlgemuth et al. 2019). As such, fire prevention projects would benefit soils by reducing wildfire risk.

Road improvement and cultural resource restoration projects may temporarily disturb soils outside the existing roadway or building footprint, but these areas of disturbance would be reclaimed following project completion. Soil disturbance would increase erosion and runoff until vegetation stabilizes the surface, and standard road construction mitigation measures would be employed to help minimize soil erosion. Impacts on soil resources from road improvement and cultural resource restoration projects would be short term and adverse, but over the long term, these projects typically stabilize soils and would have beneficial impacts.

The ongoing salmonid restoration projects in Lagunitas Creek focused on winter habitat and floodplain enhancements would continue to have temporary, adverse impacts from increased sedimentation during construction activities (i.e., access routes through the riparian ecosystem). However, management activity standards and mitigation measures would be implemented to reduce the erosion potential of soil resources. In the long term, the reconnection of Lagunitas Creek to existing floodplains would reduce flooding and would have beneficial impacts on soil resources.

Overall, these past, present, and reasonably foreseeable future actions have and would continue to have beneficial cumulative impacts. Alternative A would continue to contribute noticeable long-term, adverse impacts on soils across the planning area from erosion, compaction, and altering the soil fertility, primarily from livestock grazing on 27,000 acres; 1,000 acres of forage production; 150 acres of high-intensity-use areas; and manure spreading on approximately 2,500 acres over a period of years. When the incremental impacts of alternative A are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on soils would remain adverse, with the incremental impacts of alternative A contributing most of the impacts. Overall, soil conditions would remain roughly the same as existing conditions.

Alternative B

Ranch Management

Under alternative B, NPS would authorize beef and dairy cattle ranching on approximately 26,100 acres. Roughly 2,400 beef cattle AUs would continue grazing in the planning area, and the number of authorized dairy animals would be slightly reduced to 3,130 animals, which is generally the number of dairy cattle currently on the landscape. However, alternative B would include implementation of the zoning framework to ensure that more intense land uses would occur in areas without sensitive resources throughout the planning area. As part of the zoning framework, approximately 1,200 acres would be excluded from ranching as part of the Resource Protection subzone, resulting in long-term, beneficial impacts on soils in those locations. This change would remove an additional 5% of high erosion potential soils from regular grazing. The Resource Protection subzone would also remove 3% of soils with high compaction potential from regular grazing. Implementation of the Range subzone would ensure that steep slopes would only be used for grazing.

In addition to the zoning framework, management activity standards and mitigation measures, as detailed in appendix D, would be implemented for all ranching activities discussed in the subsections below, which is expected to reduce overall impacts on soils. Mitigation measures specific to each ranch activity would be incorporated into individual ROAs, and adherence to mitigation measures would be a condition of lease/permits. The rangeland monitoring protocols would continue to be updated or revised as necessary to manage soil resources to limit adverse impacts. Site-specific monitoring may also be implemented, as needed, based on adaptive management tied to activities through ROAs. Overall, the management practices would directly benefit soil resources because intense uses would be located in areas less prone to erosion, and fewer acres would be subjected to impacts from livestock grazing.

Grazing. Under alternative B, the overall number of beef cattle AU would not change from alternative A and the overall number of dairy animals would be reduced slightly, but the distribution of AU and dairy animals across ranches could be adjusted adaptively based on monitoring data and existing conditions.

Diversification. Diversification of non-cattle livestock species would be allowed in the Pasture subzone at levels up to 10% of authorized AU, but no more than 10 AU per ranch. The overall authorized level of non-livestock AU would be approximately 7.5% of the total authorized AU (not to exceed 180 AU) under alternative B. The additional 111 AU authorized for non-commercial, non-cattle livestock production would be removed. Non-cattle livestock species would also be allowed in the Ranch Core subzone.

On the 18 occupied ranching operations where chickens may be authorized (if individual ranchers elected this form of diversification at up to 500 chickens per operation), chicken manure could adversely affect soil because of its high content of nutrients and heavy metals (Gerber, Opio, and Steinfeld 2007). In addition, excessive quantities of nutrients can exceed the needs of plants, and high nutrient levels typically tilt the competitive advantage to non-native, weedy species (McKenzie 2003). Like cattle manure, chicken manure can also be beneficial to crop and forage production if used as a fertilizer in appropriate application rates by supplying nutrients, improving soil structure, improving water-holding capacity, and reducing erosion (Rodic et al. 2011). Overall, while the number of ranches with chickens could be increased from the single operation identified under alternative A, the total number of chickens per ranch would be far less than what has been currently allowed under the single authorization. Pasture diversification would allow ranchers to consider various species, but the impacts on soil resources would be limited.

While more diversification activities may be authorized in the Ranch Core subzone under alternative B, the total area of Ranch Core subzone would be less than 1% of the total planning area, including all developed areas where ranch operations have occurred for more than a century. Given the limited areas that diversification activities in the planning area could affect, any additional adverse impacts on soils would be minimal.

Row crops would be authorized on up to 2.5 acres in previously disturbed areas in the Ranch Core subzone on the 18 developed ranches for ranchers who elect this form of diversification. Row crop cultivation could increase the potential for impacts from soil erosion and nutrient management; however, by spatially limiting row crops in extent (up to 45 acres) in already disturbed areas and establishing mitigation measures, minimal adverse impacts on soils from implementation of row-crop operations in the planning area are expected.

Ranch Infrastructure. Under alternative B, fencing and water development projects would be managed the same as they are under alternative A. Repair, maintenance, and redevelopment of water systems would also follow management activity standards and mitigation measures listed in appendix D, which would reduce impacts on soils. These impacts, although adverse, would be short term and limited in area.

Ranch infrastructure activities, such as road improvements and decommissions, stream crossing improvements, and water stabilization projects would be designed to reduce erosion and sedimentation. Infrastructure management activities would also be designed to protect areas heavily used by ranch operations to minimize erosion and runoff. These activities would have long-term, beneficial impacts on soil resources. Required mitigation measures described in appendix D would reduce short-term impacts on soils during any construction period.

Vegetation Management. Under alternative B, soil disturbance would be reduced by authorizing only hand broadcast seeding and no-till seed drill. In conjunction with other site-specific mitigation measures (i.e., time of year, local seed requirements, and grazing restrictions), the intensity of the impact is expected to be reduced. Seeding activities on high-impact areas could improve soil retention and reduce erosion potential. Compared to existing conditions, long-term, adverse impacts on soils would be reduced.

Forage Production. Under alternative B, forage production and the type and intensity of impacts on soils would be the same as those described for alternative A.

Manure and Nutrient Management. Impacts on soils from manure management authorized within the 9,000-acre Pasture subzone would be similar to those described for alternative A. Approximately 77 acres of high-intensity-use areas would remain in the Pasture subzone. Under alternative B, manure spreading

would be authorized only in the Ranch Core and Pasture subzones under an NPS-approved nutrient management plan. As part of this process, NPS would work with ranchers to document and ensure manure spreading is conducted on lands where these activities would minimize potential impacts on sensitive resources. As part of the planning process, NPS has identified some limited areas identified in the Range subzone where manure spreading has been conducted in the past. In those areas where manure spreading would no longer be authorized, soil fertility would return to more natural conditions over a number of years or decades. While the overall area of manure spreading would be similar to that identified in alternative A, implementation of manure spreading within designated areas under an approved plan would result in better protection of sensitive resources and soils. Other management activities may be necessary in these areas (i.e., herbaceous weed management) to meet management goals and objectives.

Public Use and Enjoyment

Expansion of hiking, biking, and equestrian trails; parking lots; and overnight camping areas could have adverse impacts on soils from localized erosion and compaction where new development occurs; however, any erosion would be minimal because most new trails would use existing administrative roads and new trail construction would be limited.

Elk Management

Under alternative B, impacts from nonlethal elk management actions would be the same as those described under alternative A. However, under alternative B, a limited level of trampling and vehicle use related to annual removal activities would increase the potential for soil erosion and compaction to occur. Possible removal activities in the Limantour herd could have similar impacts. These impacts would be very localized in both herd areas.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would continue to contribute noticeable long-term, adverse impacts on soils across the planning area from erosion, compaction, and altering the soil fertility, primarily from livestock grazing on 26,100 acres; 1,000 acres of forage production; 150 acres of high-intensity-use areas; and manure spreading on approximately 2,500 acres over a period of years. However, implementation of the zoning framework and management activity standards and mitigation measures for ranching activities would reduce the intensity of adverse impacts on soils across the planning area compared to existing conditions. Expansion of the trail network for public use and elk management activities would cause localized soil erosion and compaction in limited areas. When the incremental impacts of alternative B are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on soils would be adverse, with the incremental impacts of alternative B contributing most of the impacts. Overall, soil conditions would improve compared to existing conditions from the implementation of a zoning framework and management activity standards and mitigation measures.

Alternative C

Under alternative C, all ranch and vegetation management, diversification activities, and public use and enjoyment would have the same type and intensity of impact as described under alternative B.

Elk Management

Under alternative C, the Drakes Beach elk herd would be removed from the park by lethal removal methods. This removal would have the same types of impacts described under alternative B but could create a higher level of ground disturbance in the localized area of the Drakes Beach herd. Impacts on soils from elk management activities related to the Limantour herd would be the same as those described for alternative B.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative C would be the same as those described alternative B; however, the added ground disturbance from the removal of the Drakes Beach elk herd would contribute additional short-term impacts on soils in limited areas. When the incremental impacts of alternative C are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on soils would be adverse, with the incremental impacts of alternative C contributing a majority of impacts. Overall, soil conditions would improve compared to existing conditions from the implementation of a zoning framework and management activity standards and mitigation measures.

Alternative D

Under alternative D, 7,500 acres would be removed from ranching activities in the planning area. This would remove livestock grazing from approximately 29% of soils with high erosion potential and 28% of soils with high compaction potential. While the total number of cattle across the planning area would be reduced, the same intensity of impacts from grazing and management activities as described under alternative B would be expected on the 19,000 acres where ranching would be authorized. Impacts from diversification activities would be similar to those described for alternative B; however, no livestock other than cattle would be authorized in the Pasture subzone. As a result, impacts from other authorized livestock would be less intense than described under alternative B because they would occur only in the Ranch Core subzone, which is less than 1% of the total planning area. Across the 7,500 acres removed from ranching, beneficial impacts would occur, including decreased soil erosion and compaction from the elimination of livestock grazing. Prescribed grazing may be used in these areas as a management tool to meet NPS resource management goals and objectives but likely would not occur across the entire 7,500 acres. An additional 900 acres would also be removed from lease/permits for resource protection where no or limited prescribed grazing would be authorized, eliminating ranching impacts in these locations. This would protect an additional 4% of soils with high erosion potential and 2% of soils with high compaction potential. These 900 acres would be included in the Resource Protection subzone along with the 7,500 acres described above. Overall, changes in ranch management under alternative D would result in long-term, beneficial impacts on an additional 8,400 acres of soils in the planning area compared to existing conditions. The intensity and use of the remaining 19,000 acres would be similar to that described in alternative B.

Elk Management

Under alternative D, impacts on soils related to elk management would be of the same type and intensity as those described for alternative B. If new herds were established on lands eliminated from ranching, impacts on soils from elk management and monitoring would likely occur, including trampling and vehicle use as described under alternative A.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative D would contribute noticeable long-term, adverse impacts on soils across the planning area from erosion, compaction, and altering the soil fertility, primarily from livestock grazing on 19,000 acres; 1,000 acres of forage production; 150 acres of high-intensity-use areas; and manure spreading on approximately 2,500 acres over a period of years. However, implementation of the zoning framework and management activity standards and mitigation measures for ranching activities would reduce the intensity of adverse impacts on soils across the planning area compared to existing conditions. Alternative D would also contribute meaningful beneficial impacts on soils compared to existing conditions for the additional 8,400 acres included in the Resource Protection subzone because ranching-related soil impacts would cease in those areas. Expansion of the trail network for public use and elk management activities would cause localized soil erosion and compaction in limited areas.

When the incremental impacts of alternative D are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on soils would be adverse, with the incremental impacts of alternative D contributing a majority of the impacts. However, soil conditions would noticeably improve compared to existing conditions from the implementation of a zoning framework, management activity standards and mitigation measures, and, in large part, from cessation of ranching activities on 8,400 acres.

Alternative E

Ranch Management

Under alternative E, impacts on soils from dairy ranching would be eliminated from the planning area but would be replaced with impacts from beef cattle ranching. The total area available for ranching would be approximately 26,100 acres, the same as for alternative B. These acres would be managed the same as alternative B; however, there would be fewer areas of concentrated impacts associated with dairy ranching. On beef ranches, the type and intensity of impacts from grazing would be the same as described under alternative B. The intensity of impacts on soils across the planning area would be reduced, especially on the 6,200 acres that would be converted from dairy ranching to beef ranching. Conversion of the more intensive use dairy ranches to the less intensive use beef ranches would reduce erosion and compaction and allow for soil fertility to eventually return to natural conditions over several years or decades. Overall, the six dairies represent approximately 60% (86 acres) of the 150 acres of high-intensity-use areas. As such, the conversion of dairy to beef operations would result in a reduction of high-intensity-use areas.

Under alternative E, the lower AUs associated with the conversion of dairy ranching to beef ranching would have long-term, beneficial impacts on soil by reducing erosion rates and compaction. Impacts from beef ranching operations would be the same intensity as described under alternative B and would have the potential to occur across the entire 26,100 acres of areas authorized for ranching.

Under alternative E, eliminating 1,000 acres of forage production fields would reduce erosion, runoff, and compaction once other vegetation is established and would result in noticeable, long-term, beneficial impacts on soils. Similarly, because dairies would be eliminated, there would be no need for manure and nutrient management, and adverse impacts from manure spreading on 2,500 acres would cease. This action would have long-term, beneficial impacts on soil fertility because soil fertility would slowly (over decades) return to natural conditions.

Other ground-disturbing activities such as aeration would not be authorized, which would likely have some beneficial impacts on soils by reducing erosion, compaction, and other surface disturbances. However, seeding highly disturbed areas and soil aeration in areas with highly compacted soils can be beneficial by improving plant establishment, increasing water infiltration, reducing compaction and thus reducing erosion, and could be authorized to meet NPS resource goals and objectives.

Elk Management

Under alternative E, NPS would not manage the population and geographic extent of elk in Point Reyes, except to support NPS resource protection needs and management goals. Impacts on soil from limited management of elk herds would be the same as described for alternative A, with a slight reduction in the type and intensity of impacts because hazing would no longer be used as a management tool.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute noticeable long-term, adverse impacts on soils across the planning area from erosion, compaction, and alteration of soil fertility, primarily from livestock grazing on 26,100 acres. However, the zoning framework and establishment of management activity standards and mitigation measures for ranching activities would reduce the intensity of adverse impacts on soils

across the planning area. Alternative E would have noticeable beneficial impacts compared to existing conditions from the conversion of the six dairy ranches to beef operations, elimination of manure management practices, seeding, forage production, and diversification activities. Expansion of the trail network for public use and elk management activities could cause localized soil erosion and compaction in limited areas. When the incremental impacts of alternative E are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on soils would be adverse, with the incremental impacts of alternative E contributing most of the impacts. Overall, soil conditions would improve compared to existing conditions from the implementation of a zoning framework, management activity standards and mitigation measures, and conversion of dairy ranches to beef operations.

Alternative F

Ranch Management

Alternative F would eliminate ranching and remove all impacts associated with 2,400 AUs of beef cattle and 3,315 dairy animals from 27,000 acres of land. Cessation of ranching would decrease erosion rates and runoff in range and pasture lands and, once vegetation is reestablished, would stabilize the soil surface on livestock trails and other heavily used areas (Sugnet and Bartolome 1983). Soil compaction would decrease in these areas once plant roots penetrate the soil and increase soil porosity and water infiltration; however, severely compacted soils in the 150 acres of high-intensity-use areas may require active restoration such as mechanically breaking up compacted layers. The removal of livestock grazing under alternative F would result in noticeable, long-term benefits on soil resources. Prescribed grazing would be used only to meet NPS resource management goals and objectives and would have minimal impacts on soil resources compared to existing conditions. Removing forage production and high-intensity-use areas, and ceasing manure spreading would have long-term, beneficial impacts on soils, as described under alternative E. Soil erosion, runoff, and compaction would return to natural conditions once vegetation is established. Soil nutrient levels would adjust to more natural conditions, which would be more conducive to the establishment of native vegetation communities (McKenzie et al. 2003) but would require years or decades. Overall impacts on soils from the removal of ranching activities would be noticeable and beneficial.

Public Use and Enjoyment

Impacts from the expansion of hiking, biking, and equestrian trails; parking lots; and overnight camping areas would be similar to those described for alternative B but could affect a larger percentage of the planning area because of the removal of ranching from the park landscape. In areas of new construction, disturbance and the increased potential for erosion could result in short-term impacts on soils. Visitor use would likely be expanded into new areas of the planning area.

Elk Management

Impacts on soils from limited elk management under alternative F would be similar to those described for alternative E. Once ranching is phased out, no hazing and little elk management would occur, reducing the overall type and intensity of adverse impacts from elk management.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative F would contribute meaningful, long-term, beneficial impacts from the cessation of ranching, which would allow soil conditions to slowly return to natural conditions. Expansion of the trail network for public use and elk management activities could cause localized soil erosion and compaction in limited areas. When the incremental impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impacts on soils would be beneficial, with the incremental impacts of alternative F contributing most of the impacts.

WATER RESOURCES

Methodology and Assumptions

Each of the proposed alternatives would affect water quality and quantity in the planning area and vicinity, including changes in pollutant loading (i.e., pathogens, nutrients, sediment/turbidity, and other pollutants) and changes in amounts of water use.

Beef and dairy cattle ranching activities; horse grazing and trailing; manure deposition by cattle, elk, and horses; use of roads and trails; developed areas; and restoration, conservation, and construction activities all affect pollutant loading. These activities can lead to changes in erosion of soils, water infiltration, and stormwater runoff; changes in nutrient levels; disturbance to surface waters; and releases of other agricultural and mechanical pollutants (e.g., pesticides, herbicides, oil and gas, effluents and leachates, organic material). Elements of ranching operations that result in changes in pollutants include livestock grazing and trailing, manure deposition and storage, tillage, forage production, use of fertilizers, weed and shrub management, nutrient management, and cleaning of ranch facilities.

Surface water and groundwater are used throughout the planning area for ranch operations and by wildlife, including tule elk. Water used at beef operations is for drinking water for livestock, whereas water used at dairy operations is for drinking water for livestock, barn and equipment cleaning, and other minor uses. Dairy operations use more water than beef operations. Attributes of each of the alternatives with the potential to affect water use include the number of ranches, type of operations (dairy or beef), acreage of the ranches, number of livestock, and elk population level.

Analysis of water resources impacts is based on review of existing data, studies, reports, and information that is publicly available and/or provided by NPS. Water quality information included water quality standards and local water quality conditions. Impacts are qualitatively assessed in terms of the potential for increased or decreased disturbance in water quality, quantity, and use; water quality conditions were quantified to the extent possible. The analysis of impacts on water quality considers the change in the nature of the operations by alternative as well as mitigation measures that would be implemented with elements of the alternatives to minimize adverse impacts on water resources. The existing conditions serve as a baseline against which the impacts of each action alternative are compared. Water quantity information included data on general beef dairy and cattle water use requirements and water use by ranches in the planning area. Publicly available sources concerning groundwater quality and quantity in the planning area are limited to nonexistent; therefore, analysis of groundwater impacts was based on general knowledge of activities that affect groundwater and professional judgement.

The area of analysis includes the watersheds in the planning area and portions of surface waters that are downstream from the park's boundaries.

Alternative A

Ranch Management

Grazing and Manure Management. Under this alternative, the existing 6 organic dairy and 18 beef cattle operations would remain in operation on approximately 27,000 acres of land in the planning area. Several factors associated with ranch management can affect water quality. Impacts on water quantity (i.e., water use) would be similar to existing conditions because the number of AUs would not be reduced.

The 800 acres of exclusion areas established by the park and ranchers over the last 10 to 20 years would continue to protect approximately 6.2 miles of streams, 6.4 acres of ponds, and 199.4 acres of wetlands from direct impacts from cattle. Additional miles of streams would continue to be protected by the topography of the ranches, which prevents direct cattle access in certain locations. Under alternative A, the 800 acres of existing exclusion areas, would remain; however, cattle would continue to access other areas, which would be subject to direct disturbance leading to point and nonpoint pollution. A variety of organizations, including the NPS Inventory and Monitoring Program, NPS range program, Tomales Bay

Watershed Council, and San Francisco RWQCB, would continue to conduct water quality monitoring. Ranch operations in the Tomales Bay watershed and all dairies would remain subject to meeting the Conditional Waiver of Waste Discharge Requirements.

Cattle are attracted to the shade, green vegetation, and water provided in riparian zones and tend to concentrate in riparian areas; therefore, they would continue to cause direct and indirect damage to riparian vegetation in certain locations (Spiegal et al. 2016). Overuse by cattle can degrade riparian areas by reducing vegetative cover, affecting water quality, and damaging creek banks (Bush 2006).

Cattle grazing, especially in the coastal grasslands, would continue to result in lower vegetation height and more areas of bare ground compared with ungrazed sites, which can increase soil erosion and affect surface water (Hayes and Holl 2003; Skaer, Graydon, and Cushman 2013). Range management using the existing RDM standard would continue to minimize soil erosion and nutrient loss, which would minimize adverse impacts on surface water and groundwater quality from reduced sedimentation and pollutant (e.g., nutrients and pathogens) loading of surface water and groundwater resources.

The NPS range program monitoring would continue to focus on identifying site-specific issues and tracking water quality conditions before and after implementing projects intended to address water quality concerns. Continued identification and implementation of these projects and management activities would limit the timing and duration of grazing activities in specific areas and would provide filtration and uptake functions. Impacts on water quality would continue to be indirect, long term, and beneficial compared to existing conditions as a result of reduced sedimentation and pollutant (e.g., nutrients and pathogens) loading to surface water and groundwater. Continued range program monitoring would allow NPS to take actions to minimize or correct damage from livestock use, grazing, or other ranch activities. Such actions include changes to livestock numbers, grazing locations and schedules, exclusion fencing, erosion control, and water development. Fencing would continue to be used to limit the timing and duration of cattle grazing near streams and sensitive areas, which limits direct deposition of fecal material. In addition, fencing can limit potential erosion and compaction of susceptible soils and allow for recovery of riparian vegetation in areas that have a history of cattle use. These practices would have a beneficial impact on water resources compared to existing conditions by limiting sediment and nutrient runoff.

Under alternative A, adverse impacts on watersheds from ranching in the planning area would continue to be addressed on a case-by-case basis. A 2018 report summarizing more than 15 years of data for the Olema Creek watershed, which includes only beef ranches, documents a decreasing trend in concentration of fecal indicator bacteria over time, concurrent with the implementation of projects intended to improve water quality on ranch lands, including establishing or expanding exclusion areas and treating problem sites (Voeller et al. 2018).

Generally, dairy operations would likely continue to contribute higher levels of bacteria, nutrients, and sediments to surface and groundwater resources than beef ranches because dairy operations typically have high stocking densities where concentrated daily use leads to soil surfaces devoid of vegetation and the need to manage manure. Dairies would continue to manage manure spreading over approximately 2,500 acres over a period of years with spreading occurring on a portion of this acreage annually. All dairy operations are required to comply with state requirements under the Conditional Waiver of Waste Discharge Requirements, and by 2020, it is anticipated they will be operating under a General Waiver of Waste Discharge Requirements that will be overseen by the San Francisco RWQCB.

The Tomales Bay watershed is considered impaired under the Clean Water Act for nutrients, pathogens, and sedimentation/siltation, although activities in the planning area only contribute minimally to the impairment. While dairy grazing lands are in the watershed, the developed dairy complexes are not. Thus, the 1,060 acres of beef and dairy grazing in the Tomales Bay portion of the planning area only have the potential to contribute a small portion of the water constituents of concern that affect Tomales Bay (Ghodrati and Tuden 2005; Carson 2013). Although the dairy operations located in the Tomales Bay West Shore Drainage Area adversely affect water quality, the discharge, or flow rates, from this drainage area

are much lower than those of most of the sites in the larger Lagunitas and mainstem Walker Creek watersheds, resulting in lower loading rates to Tomales Bay even during severe runoff events (Carson 2013).

As noted in chapter 3 under "Water Resources," monitoring data from the 2005 Tomales Bay TMDL demonstrated that subwatersheds in the planning area (Lagunitas and Olema Creek) contributed some of the lowest fecal coliform loadings to the larger Tomales Bay watershed. The Olema Creek subwatershed was the second smallest fecal coliform contributor to Tomales Bay, with 1% of overall fecal coliform. The top three contributors of fecal coliform to the Tomales Bay watershed were the lower Walker Creek and Lower and Upper San Geronimo subwatersheds (Ghodrati and Tuden 2005), which are all outside the planning area. The Laguintas (Upper and Lower) and Olema Creek subwatersheds were ranked as the 5th, 6th, and 8th contributors, respectively, out of nine total subwatersheds that drain to Tomales Bay (Ghodrati and Tuden 2005).

Monitoring of water quality would continue in the planning area. Recent analyses, including data from the Giacomini Wetlands Restoration Project, and fecal coliform trends in the Olema Creek watershed demonstrate a long-term improvement (i.e., decreasing levels of water constituents of concern) in water quality in the planning area. Generally, it is anticipated that water quality in most of the watersheds in the planning area would continue to improve under alternative A.

Diversification. Diversification activities would continue to be authorized on a case-by-case basis. Separate from the grazing authorization, current permits authorize a total of 111 AUs for non-commercial non-cattle livestock grazing on 14 ranches. One authorized chicken operation allows up to 2,900 birds on pasture seasonally outside the rainy season and up to 1,500 birds on pasture during the rainy season, both limited to specific upland areas. One ranch has a small horse boarding operation within the developed complex. Continuation of these activities could potentially result in long-term, adverse impacts on water quality from the increased potential for pollutant loading to water resources from animal and operation wastes. However, the existing free-range chicken operation already incorporates stream buffers and other mitigation measures to limit impacts on water quality. Horse boarding, which is subject to the RWQCB waiver, generally involves the collection of manure waste and storage in piles. Managing horse manure piles and in some cases the drainage surrounding the buildings would continue to minimize potential adverse impacts. Keeping and feeding horses in small outdoor pastures or paddocks would have impacts similar to those described above for the cattle concentration areas.

Compared to existing dairy and grazing operations, authorized non-cattle livestock would have a minimal impact on water quantity. Daily water usage for chicken operations vary by flock age, but on average, a flock of 1,000 birds aged 1 to 18 days uses between 1 and 42 gallons of water per day (The Poultry Site 2009). Assuming a flock size of 2,900 birds, the largest authorized chicken operation would use around 46,000 gallons of water per year. The average horse intakes 5 to 10 gallons of water per day (PennState Extension 2014). Authorized horse boarding operations would contribute little to no impact on water quantity in the planning area.

Ranch Infrastructure. Off-stream water development has been shown to decrease cattle residence time near streams under cool weather conditions (Rawluk et al. 2014). Although fence construction, repair, and maintenance would temporarily disturb the ground surface during construction activities, nonpoint source pollution of water resources is not anticipated because of the limited nature of such activities. Installing exclusion fencing and developing new or redeveloping existing water infrastructure would continue to be implemented on a case-by-case basis, would reduce the direct disturbance of water sources by livestock, and is expected to decrease sediment, nutrient, and bacteria loading.

Best practices when maintaining ranch roads and stream crossings would continue to minimize the potential for sedimentation and transport of other pollutants. Ranch roads with erosion issues would also continue to be addressed on a case-by-case basis. New roads and trails would be designed to avoid runoff directly into a stream or other waterbody. Existing access roads could be relocated to provide a setback

from a stream corridor or to plant riparian vegetation as part of a restoration project. Relocated road segments would be sited on low slopes and constructed to follow natural contours to minimize disturbance of drainage patterns.

Generally, road upgrades and decommissioning would reduce erosion, and improved stream crossings would eliminate disturbances that result in turbidity. New stream crossings would be designed with enough capacity to convey the design flow and transported materials without altering the stream flow characteristics and would be protected so that flood flows safely bypass without damaging the crossing or eroding the streambanks. Ranch roads in the Lagunitas Creek watershed have been assessed and prioritized for treatment based on the potential to deliver sediment to the watershed. Operations and manure management practices, as well as upland, riparian, and waterway vegetation plantings, would improve infiltration and reduce polluted runoff. Upland erosion control and waterway stabilization measures; sediment basins; and development of alternative sources of water for livestock and exclusionary fencing to protect springs, wetlands, and waterways would improve water quality.

Authorization for four livestock operations—two beef and two dairy—to raise grass crops on approximately 1,000 acres to produce forage would continue. Existing mitigation measures such as preventing the use of sensitive lands and habitats (i.e., stream riparian zones) and requiring vegetated buffers would continue to minimize sedimentation of water resources from these activities.

Vegetation Management. Vegetation management practices would continue to be subject to mitigation measures to minimize or prevent adverse impacts associated with these practices. Using herbicides and biocides on cultivated or rangeland areas for purposes of weed management would continue to comply with NPS IPM regulations and procedures. Compliance with these regulations and procedures and applicable handling and disposal laws and the use of appropriate herbicide application methods (e.g., restrictions on spraying during windy or wet days) would minimize or prevent adverse impacts on surface water and groundwater quality.

Mowing is not anticipated to affect water quality. Seeding and aeration activities would initially disturb the ground surface but would ultimately provide soil stabilization, stormwater filtration, and uptake functions and result in beneficial impacts on water quality by reducing sedimentation and pollutant (i.e., nutrients and pathogens) loading to surface water and groundwater. Adherence to San Francisco RWQCB Waivers of Discharge Requirements would minimize nonpoint source pollution associated with animal manure, compost, and fertilizer and reduce adverse impacts on surface water and groundwater.

Ranch Complex Management. Cattle operations, including milking dairy cows, feeding and watering cattle, and cleaning ranch facilities and equipment, would continue to result in long-term, adverse impacts on surface water and groundwater quality and quantity (e.g., residential use) from the loading of nutrients, pathogens, sediment, and other pollutants to surrounding water resources and use of surface water and groundwater for ranch operations. Ranch complex management, including repair, rehabilitation, and maintenance of ranch roads; improvements and alterations to historic or non-historic structures, fences, and corrals; and new development/infrastructure would be performed in accordance with applicable planning, building, and environmental laws. Construction and other activities could disturb ground surfaces and result in an increased potential for sediment and other pollutant loading during construction; however, the use of mitigation measures would minimize and/or avoid these impacts. Using heavy equipment during construction or other ranch activities could increase the potential for accidental releases of fuel, oil, or other agricultural and mechanical pollutants. Adverse impacts from storing fuels, herbicides, and other chemicals in the ranch complex and associated structures are not anticipated because they would be guided by applicable regulations.

Visitor Use of Ranch Lands. Establishing new trails, roads, and other public use and enjoyment improvements on ranches throughout the planning area would continue to be very limited and result in limited ground disturbance and limited potential for soil erosion and sedimentation of local water resources. Visitor use of ranchlands would not affect water quantity.

Elk Management

Current elk management actions such as habitat improvements and periodic hazing would continue and would not affect overall water quality or water quantity.

Cumulative Impacts

The ongoing salmonid restoration projects in Lagunitas Creek focused on winter habitat and floodplain enhancements would continue to have temporary, adverse impacts from increased sedimentation during construction activities (i.e., access routes through the riparian ecosystem). However, management activity standards and mitigation measures would be implemented to reduce adverse impacts. In the long term, the reconnection of Lagunitas Creek to existing floodplains would reduce flooding, enhance salmonid habitat, promote water filtration, and improve water quality resulting in long-term, beneficial impacts on surface and groundwater.

Large-scale wildfires can affect water quality during active burning (e.g., ash falling on surface water resources) and for months and years (e.g., long-term runoff) after the fire has been contained (USGS 2018). The fire management program for Point Reyes and the north district of Golden Gate and the new NPS agreement with Marin County for wildland fire operations and response would include prescribed fire and mechanical treatments to minimize the chance for large wildfires in the park. Both techniques would remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily increase the potential for soil erosion and associated sedimentation of surrounding surface waters. Additionally, prescribed fire treatments can reduce the infiltration capacity of soil and lead to more surface water runoff during precipitation events (Robichaud 1999). Although impacts on water quality would be short term and adverse from mechanical and prescribed fire treatments, these short-term impacts would be outweighed by the long-term, beneficial impacts of avoiding large scale wildfires. Short-term effects on water quality would also be minimized or prevented through guidance and the implementation of mitigation measures provided in the *Fire Management Plan*. Similarly, PG&E fire prevention projects would remove overhanging tree limbs and shrubs directly above and around power lines and remove dead, dying, and falling trees from the ground surface around the power lines. Implementing BMPs during tree removal and use of heavy equipment would prevent adverse impacts on water resources.

Road improvement projects, including repairs to Sir Francis Drake Boulevard and all paved park roads, parking areas, and drainage features could disturb vegetation and soil associated with wetlands outside the existing roadway, resulting in short-term, adverse impacts on water resources from disturbance and pollutant loading. However, relocation of road facilities from the most sensitive riparian and aquatic habitats would have long-term benefits on water quality in these localized areas.

Invasive plant management in the park could involve vegetation clearing, which could affect water resources. Compliance with the NPS's IPM regulations and procedures and applicable state pesticide regulations would dictate appropriate herbicide application methods to minimize any adverse impacts on water quality. Herbicide treatments are not likely to enter surface waters by spray drift and runoff, and therefore not likely to adversely affect water quality.

Marin Resource Conservation District's Permit Coordination Program, adopted in 2004, provides California Environmental Quality Act coverage for restoration projects that benefit water quality in the boundaries of specified watersheds in Marin County. From 2004 through 2014, the Permit Coordination Program incentivized 300 environmentally beneficial restoration projects on ranches outside the planning area by reducing costs and the timeframe of the environmental compliance process. The Permit Coordination Program continues to cover projects that minimize adverse impacts on water quality from ranch operations outside the planning area (Marin Resource Conservation District 2018).

Additional activities, including ranching and general development within watersheds, but outside the planning area have, and would continue to contribute adverse impacts on water quality. Overall, these

past, present, and future actions, primarily ranching and development outside the planning area, have and would continue to result in adverse cumulative impacts.

Alternative A would continue to contribute adverse impacts on water resources in the planning area from beef and dairy cattle ranching, nutrient management, and water use consumption related to ranching activities. When the incremental impacts from alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on water resources would continue to be adverse, with the incremental impacts of alternative A contributing slight to noticeable impacts, depending on the watershed. The primary driver of cumulative impacts would continue to be actions related to ranching and development outside the planning area. While the Tomales Bay watershed would continue to be impaired under the Clean Water Act, activities in the planning area under alternative A would continue to be a very small contributor to that impairment, as described above.

Alternative B

Ranch Management

Under alternative B, while adverse impacts on water resources like those described for alternative A would continue, NPS would implement a zoning framework of Resource Protection, Range, Pasture, and Ranch Core subzones within the Ranchland zone. The 2,600-acre Resource Protection subzone would include 800 acres of existing exclusion areas, 600 acres in the planning area that are not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd and an additional 1,200 acres of resource protection exclusion areas, where ranch activities would be discontinued or limited to focused prescribed grazing, thereby protecting additional water resources. More intensive ranching activities, including diversification activities and vegetation management, would be authorized in the Pasture and Ranch Core subzones. However, these subzones contain previously disturbed lands and little to no water resources. Water quality monitoring would continue as described in chapter 3, and ranch operations in the Tomales Bay watershed and dairies would remain subject to meeting the Conditional Waiver of Waste Discharge Requirements. The number of dairy cattle and the type and intensity of impacts on water quality and water quantity associated with dairies would remain consistent with existing conditions. Individual ROAs would include ranch-specific management activity standards and mitigation measures (see appendix D) that would be required when implementing ranching activities to minimize impacts on water quality or quantity.

Grazing and Manure Management. The 1,200 acres that are currently ranched but would be included in the Resource Protection subzone under alternative B would protect approximately 5.9 miles of streams, 1.9 acres of ponds, and 172.7 acres of wetlands from active ranching, thereby preventing direct disturbance and direct deposition of fecal matter by livestock (i.e., by preventing livestock from entering stream channels). These 1,200 acres, plus the existing 800 acres of exclusion areas under alternative A, would protect a total of 12.1 miles of streams, 8.3 acres of ponds, and 372.1 acres of wetlands from direct impacts from cattle. The Range subzone would contain nearly all the remaining surface water resources in the lands still available for ranching. Except for very limited prescribed grazing identified through the ROAs, no ranching activities would be authorized in the Resource Protection subzone, reducing potential pollutants from directly entering surface waters. The exclusion areas would provide the same protection, filtration, and uptake functions as described for alternative A, but the acreage of exclusion areas on ranchlands under alternative B would increase from 800 to 2,000 acres, resulting in long-term, beneficial impacts on water quality compared to existing conditions from reduced nonpoint source pollution to surface water and groundwater. The number of dairy cattle and the type and intensity of impacts on water quality and water quantity associated with dairies would remain consistent with existing conditions. Individual ROAs would include ranch-specific management activity standards and mitigation measures (see appendix D) that would be required when implementing ranching activities to minimize impacts on water quality or quantity.

The most land-intense activities, including vegetation management, diversification activities, and forage production would be prohibited in the Range subzone, where most water resources are located. This would reduce the potential for pollutant loading to surrounding water resources; water quality is expected improve under alternative B compared to existing conditions. Under alternative B, cattle would have direct access to those ponds (for drinking water) and wetland and riparian habitat areas that remain outside exclusion zones. Although ranching activities authorized in the Range subzone would be limited to grazing, grazing would continue to result in potential loading of nutrients, pathogens, sediment, and other pollutants to surrounding water resources through stormwater runoff and result in the use of surface water and groundwater. Like alternative A, under alternative B, range management guidelines, including adherence to the 1,200 pounds/acre RDM standard, would minimize adverse impacts by maintaining vegetation cover to limit erosion potential. Adverse impacts from nonpoint source pollution from grazing and operations would continue to occur as described for alternative A.

Diversification. Opportunities for diversification would be allowed in the Ranch Core (pigs, chicken, sheep, and goats) and Pasture subzones (goats, chickens, and sheep). Diversification that includes non-cattle livestock would not exceed 10 AUs for any ranch and would not increase the total authorized AUs for any ranch because these animals would be considered part of the total authorized AUs. While the presence of up to 180 AUs of non-cattle livestock (approximately 7.5% of total authorized AUs) could result in limited long-term, adverse impacts on water quality by concentrating the number of non-cattle livestock in a specific area, the locations would be managed through the zoning framework.

On the 18 occupied ranching operations where chickens could be authorized (at up to 500 chickens per operation), chicken manure could increase nutrient loading to the soil. The location of these activities in the Pasture subzone would limit the overall impact associated with these activities. When compared to existing conditions, the number of ranches could be increased from the single operation; however, the total number of chickens per ranch would be far less than what has been currently allowed under the single authorization. Diversification using other livestock in the Ranch Core subzone would require meeting waste management regulations and the mitigation measures outlined in appendix D prior to implementation, which would minimize or prevent adverse impacts. Changes to impacts on water quantity are not anticipated from other livestock diversification because of the limited number of animals involved, the requirement to follow water quality regulations in the Ranch Core subzone, and the lack of water resources in the Pasture subzone.

Other diversification uses, including farm stays, farms tours, small-scale processing of dairy products, sales of local agricultural products, and additional horse boarding in the Ranch Core subzone could increase water usage to some extent, resulting in long-term, adverse impacts on water quantity from increased groundwater pumping. As discussed under alternative A, horse boarding in the Ranch Core subzone would require the storage and handling of manure and contaminated bedding materials and could increase the potential for pollutant loading. Implementation of mitigation measures, as described in appendix D, would continue to minimize adverse impacts from horse boarding.

Row crops, other than forage crops, would be authorized on up to 2.5 acres of previously disturbed areas in the Ranch Core subzone. Row crops 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 mitigation measures would minimize or prevent adverse impacts. Row crop production would not affect water quantity because only crops that do not require irrigation would be authorized.

Ranch Infrastructure. Impacts on water resources associated with road upgrade and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as those described under alternative A. Under alternative B, 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 fencing on ranch lands to meet wildlife and visitor goals. Construction of temporary fencing (i.e., electric fencing) would be authorized under alternative B 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. 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.

Vegetation Management. Under the zoning approach proposed under alternative B the Pasture subzone would not contain any sensitive resources eliminating any direct impacts on water resources. Ranching operations would continue to affect surface water and groundwater quality through potential nonpoint source pollution. The deposition of pollutants from vegetation management activities such as manure spreading could adversely affect smaller swales or undocumented surface water resources.

Vegetation management practices under alternative B would reduce the impacts on water resources as described under alternative A. Weed and shrub management activities would be similar to those described under alternative A. Required activity standards and mitigation measures for vegetation management activities (e.g., tilling, aeration, seeding, and mowing), forage production, nutrient management, shrub and weed management, and other livestock would further protect water resources by reducing potential nonpoint source pollution and would reduce adverse impacts over the long term. Required activity standards and mitigation measures would also minimize or prevent any short-term, adverse impacts from implementation of activities (e.g., fence construction and water development projects).

Ranch Complex Management. The Ranch Core subzone includes approximately 0.1 mile of streams, 0.6 acre of ponds, and 5.2 acres of wetlands. No construction or activities would be authorized on the 5.2 acres of wetlands that exist in the Ranch Core subzone. Under alternative B, disturbance to or deposition of pollutants to surface waters would not change compared to existing conditions. However, with livestock diversification, additional structural measures to manage waste and protect water quality may be needed in the Ranch Core subzone.

Ranch complex management, including actions related to cultural resources and historic structures, would have the same short-term, adverse impacts on water resources from the increased potential for sediment and other pollutant loading during construction, demolition, and other activities as alternative A. In addition to being performed under the same applicable laws as described for alternative A, the maintenance, improvement, and alteration to historic and non-historic structures and new development/infrastructure actions would be subject to NPS standard practices specifications as described in appendix D and incorporated into individual ROAs. New buildings would generally be restricted to the Ranch Core subzone to reduce the potential for impacts related to pollutant loading and runoff from additional impervious surfaces. Any proposed building outside the Ranch Core subzone would have to undergo separate environmental review and be approved by NPS.

Public Use and Enjoyment

Development of new or expanded trails and roads, trailheads, and parking lots would be considered under alternative B. Ground disturbance and associated soil exposure would be limited because most trails would use existing administrative routes, and accommodations for day and overnight use would reuse existing ranch complex buildings and previously disturbed areas. Mitigation measures would be implemented during construction to minimize impacts from stormwater, erosion and sedimentation, and hazardous materials. Therefore, new development related to public use and enjoyment would result in short-term, adverse impacts on water quality during construction. Long-term impacts are not anticipated.

Visitation levels under alternative B are not expected to increase compared to alternative A. Therefore, additional impacts to water quantity (i.e., reduction in water levels) are not expected.

Elk Management

Non-lethal elk management actions such as hazing and habitat improvements would continue as described under alternative A (e.g., fence repair and construction of elk crossings) and would not affect water

quality or quantity. The lethal annual removal of 10 to 15 individuals from the Drakes Beach herd annually also would not affect water quality or quantity under alternative B.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would continue to contribute adverse impacts on water resources in the planning area from beef and dairy cattle ranching, nutrient management, and water use consumption related to ranching activities. However, implementation of a zoning framework and specifically the Resource Protection subzone would protect water resources and reduce direct disturbance of livestock grazing. New development related to public use and enjoyment would result in short-term, adverse impacts on water resources during construction. When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on water resources would be adverse, with alternative B contributing slight to noticeable impacts, depending on the watershed. The primary driver of cumulative impacts would continue to be actions related to ranching and development outside the planning area. While the Tomales Bay watershed would continue to be impaired under the Clean Water Act, alternative B would be a very small contributor to that impairment, as described above. Overall, water resources would improve compared to existing conditions from the implementation of a zoning framework.

Alternative C

Actions under alternative C would be the same as those described for alternative B with the exception of elk management. Removal of the Drakes Beach herd would be a one-time event, occurring over approximately six months. However, this action would not adversely affect water quality or quantity. Therefore, the direct, indirect, and cumulative impacts of alternative C would be the same as those described for alternative B.

Alternative D

Ranch Management

Alternative D would remove 7,500 acres (27% of the ranched lands in the planning area) from ranching, placing them in the Resource Protection subzone, leaving 19,000 acres for active ranching operations. Alternative D would also add an additional 900 acres of resource protection exclusion areas to the Resource Protection subzone. Thus, the Resource Protection subzone under alternative D would protect 9,800 acres within the planning area, including approximately 23.5 miles of perennial stream, 22.8 acres of ponds, and 791.6 acres of wetland. This is 17.2 miles of perennial stream, 16.4 acres of ponds, and 592.2 acres of wetland more than is currently protected under existing conditions. For the 19,000 acres that remain as active ranches, implementation of the zoning framework and associated guidance for authorized ranching activities would result in impacts similar to those described for alternative B. Ranching operations would continue to be required to meet the 1,200 pounds per acre RDM standard; however, the total number of livestock on the landscape would be reduced, which would reduce impacts on watersheds compared to existing conditions.

As described for alternative B, monitoring studies show that water quality in the planning area has improved over time because of NPS and ranchers implementing management activities, establishing buffers, and treating problematic sites (NPS 2016a; Parsons and Ryan 2015; NPS 2017a; Voeller et al. 2018; SWRCB 2013). Based on observed trends in water quality constituents of concern and the actions proposed under alternative D, it is anticipated that water quality would continue to improve, especially in the Drakes Estero and Tomales Bay watersheds, where 5,500 acres of ranching would be eliminated. As discussed in chapter 3, the planning area under existing conditions contributes a low amount of water quality constituents to the Tomales Bay watershed. Therefore, water quality improvements in the Tomales Bay watershed related to a reduction of active ranching operations in the planning area would be limited.

Alternative D would also result in long-term, beneficial impacts on water quantity because of a reduction in the amount of authorized livestock. With the removal of 7,500 acres of ranching, approximately 1,700 AUs of beef cattle and 3,130 dairy animals would be authorized. Compared to existing water usage in the planning area (with a maximum of 124 million gallons per year for both beef and dairy operations), maximum water usage under alternative D would be around 83 million gallons per year.

Grazing and Manure Management. Removing acreage from grazing and other ranching activities, limiting intensive ranch activity to certain zones, and implementing updated vegetation management and mitigation measures would reduce or eliminate adverse impacts (e.g., nonpoint source pollution) on and protect most surface water resources in the planning area and prevent disturbance and direct deposition of fecal matter by livestock.

Diversification. Diversification activities in the Ranch Core and Pasture subzones would be the same as described for alternative B with the exception that no livestock (sheep, goats, or chickens) other than cattle would be authorized in the Pasture subzone. Eliminating non-cattle livestock from the Pasture subzone is unlikely to affect water quality because cattle could be grazed at the same AU authorization in this subzone. Although nonpoint source pollution from diversification activities would result in the same long-term, adverse impacts on water quality, these impacts would be minimized or prevented by complying with water quality regulations and implementing activity standards and mitigation measures. Long-term, adverse impacts on water quantity could result from increased water usage by the other diversification uses (farm stays, farms tours, small-scale processing of dairy products, sales of local agricultural products, and additional horse boarding) in the Ranch Core subzone.

Ranch Infrastructure. Impacts on water resources associated with road upgrade and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as those described under alternative A.

Elk Management

Under alternative D, elk management would be the same as under alternative B and would not impact overall water quality and water quantity.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative D would continue to contribute adverse impacts on water resources in the planning area from beef and dairy cattle ranching, nutrient management, and water use consumption related to ranching activities. However, implementation of a zoning framework, specifically the Resource Protection subzone would protect water resources and reduce direct disturbance of livestock grazing. Alternative D would also contribute beneficial impacts on water resources compared to existing conditions on the 7,500 acres removed from ranching because ranching-related impacts would cease in those areas. New development related to public use and enjoyment would result in short-term, adverse impacts on water resources during construction.

When the incremental impacts from alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on water resources would be adverse, with alternative D contributing a slight to noticeable increment, depending on the watershed. The primary driver of cumulative impacts would continue to be actions related to ranching and development outside the planning area. The Tomales Bay watershed would continue to be impaired under the Clean Water Act; however, ranching in the planning area would be a very small contributor to that impairment, as described under alternative A. Overall, water resources would improve compared to existing conditions from the implementation of a zoning framework and cessation of ranching on 7,500 acres.

Alternative E

Ranch Management

Implementation of a zoning framework and associated guidance for authorized ranching activities would be similar to alternative B. However, under alternative E, all dairy operations would be phased out over a five-year period, and operators would be given the option to convert to beef cattle grazing. Assuming all dairy ranches convert to beef ranches, approximately 3,150 AUs of livestock would be authorized under alternative E. The total acres available for ranching (26,100 acres) and acres of resource protection areas (1,200 acres) would be the same as for alternative B. The water resources contained within the 1,200 acres of resource protection areas under alternative E would also be the same as those described for alternative B with most of water resources in the planning area contained in the Range subzone.

As described for alternative B, monitoring studies show that water quality in the planning area has improved over time because of NPS and ranchers implementing management activities, establishing buffers, and treating problematic sites (NPS 2016a; Parsons and Ryan 2015; NPS 2017a; Voeller et al. 2018; SWRCB 2013). Based on current water quality trends and the actions proposed under alternative E, water quality in the planning area is expected to continue to improve under alternative E.

Alternative E would also result in long-term, beneficial impacts on water quantity because the number of authorized livestock would be reduced. Assuming all dairy ranches convert to beef ranches, approximately 3,150 AUs of livestock would be authorized. Compared to existing water usage (with a maximum use of 124 million gallons per year for beef and dairy operations), the maximum water usage under alternative D, following complete dairy conversion, would be about 20 million gallons per year.

Grazing and Manure Management. Although managed under the dairy waiver program, greater livestock congregation and concentrated manure in locations near milking barns could have more adverse impacts (e.g., higher nutrient and sediment loading rates) on water resources from nonpoint source pollution compared to grazing operations. Once dairies are converted to beef operations, adverse impacts (e.g., nonpoint pollution runoff) on surface water resources in the planning area associated with dairy ranching activities (e.g., manure spreading) would be eliminated. In addition, the elimination of dairy ranches would reduce impacts related to water quantity (e.g., higher surface and groundwater withdrawals for higher number of animals and washing activities associated with milking).

Diversification. Diversification activities in the Ranch Core and Pasture subzones, including existing commercial chicken and horse boarding operations would not be authorized under alternative E. In addition, forage crop production would not be authorized anywhere in the planning area, resulting in minimal long-term, beneficial impacts from reduced potential nonpoint source pollution.

Ranch Infrastructure. Under alternative E, ranches in the park would continue to use residential units, barns, and other structures. The types of agricultural structures and utility services on beef cattle ranch complexes would be the same as those described for alternative A. Adaptive reuse or decommission/deconstruction of unoccupied structures or complexes would be developed as described for alternative B; however, the transition from dairy to beef cattle ranching operations would change the use of some contributing structures, such as milking barns, and some buildings may no longer have a use to support these operations. Impacts on water resources associated with road upgrade and decommissioning, infrastructure management, livestock water supply, pond restoration, and waterway stabilization would be the same as those described for alternative A.

Vegetation Management. The existing beef cattle operations and the dairy ranches converted to beef operations would continue with the same grazing practices and treatments (e.g., weed management) used in the available Pasture subzone, as described for alternative B. Although the number of authorized beef cattle would increase across the planning area, ranchers would still be required to meet the minimum RDM of 1,200 pounds/acre, so impacts are expected to be the same intensity as alternative B.

Elk Management

Under alternative E, NPS would not manage the elk population. Ongoing monitoring as described under alternative A would continue and would not affect water resources.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute noticeable adverse impacts on water resources in the planning area from beef and dairy cattle ranching, nutrient management, and water use consumption related to ranching activities. However, implementation of a zoning framework, specifically the Resource Protection subzone would protect water resources and reduce the direct disturbance from livestock grazing. The cessation of the existing dairy operations over a five-year period would eliminate all adverse impacts related to dairies, as described above, resulting in beneficial impacts compared to existing conditions. New development related to public use and enjoyment would result in short-term, adverse impacts on water resources during construction.

When the incremental impacts from alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact of alternative E on water resources would be adverse, with alternative E contributing a slight to noticeable increment depending on the watershed. The primary driver of cumulative impacts would continue to be actions related to ranching and development outside the planning area. The Tomales Bay watershed would continue to be impaired under the Clean Water Act; however, ranching in the planning area would be a very small contributor to that impairment. Overall, water resources would improve under alternative E compared to existing conditions from the implementation of a zoning framework and cessation of dairy operations.

Alternative F

Ranch Management

Under alternative F, ranching operations would be discontinued, and visitor opportunities would be expanded across the planning area. Existing grazing practices and treatments, as described under alternative A, would continue on each ranch until ranching operations are phased out after five years or when the two life estates terminate; prescribed grazing would occur only as a resource management treatment as needed. Shrub and weed management and seeding would occur only for resource management purposes, thus the scale of these activities and any associated impacts would be reduced.

Eliminating ranching in the planning area would have long-term, beneficial impacts on water quantity. Based on the number of authorized cattle in the planning area, the amount of water saved by eliminating all ranching activities would be similar to the water usage values presented in table 4 in chapter 3. Eliminating dairy operations would eliminate the use of around 127,000 to 300,000 gpd; eliminating beef operations would eliminate the use of around 9,192 to 39,985 gpd for an estimated total water use reduction of 50 million gallons to 124 million gallons per year.

Grazing and Manure Management. Direct disturbance to and pollution of water resources from ranch operations as well as nonpoint source pollution and water use would decrease as grazing-only operations are closed after one year. Impacts on water use and most nonpoint runoff pollution from manure spreading and other ranch activities would be fully eliminated after five years. Shrub and weed management, seeding, and prescribed grazing, if necessary after the closure of all ranches, could have minimal adverse impacts on water quality. Eliminating dairy ranch operations and removing grazing would result in long-term, beneficial impacts on water quality compared to existing conditions.

Diversification. Like alternative E, diversification activities, including existing activities and forage production, would not be authorized anywhere in the planning area, which would have long-term, beneficial impacts from reduced potential nonpoint source pollution and water use.

Ranch Complex Management. NPS would implement a strategy to minimize impacts on the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District by prioritizing specific ranch buildings, structures, and landscapes for preservation based on their relative historic significance and identifying opportunities for adaptive reuse. The reuse or demolition of existing structures would result in short-term, adverse impacts on water quality by increasing the potential for sediment and other pollutant loading. However, construction mitigation measures (e.g., sediment barriers at construction site edges) and managing runoff from existing buildings would limit adverse impacts on water quality. Following the demolition of non-historic ranch complex structures, the previously disturbed areas would be restored to natural conditions, resulting in long-term, beneficial impacts on water resources (e.g., increased hydrologic connectivity).

Public Use and Enjoyment

Under alternative F, NPS would consider new visitor opportunities in former ranch complexes and additional trail linkages. The overall quantity of additional amenities and opportunities would be similar to all other action alternatives because they would be driven by NPS's capacity to build and maintain these trails. Short-term, adverse impacts on water quality could occur from the potential for sediment and other pollutant loading during construction activities. These impacts would be similar in type and intensity to alternative B but could affect a larger percentage of the planning area because of the removal of ranching from the park landscape.

Elk Management

Under alternative F, ongoing monitoring such as annual counts and Johne's disease monitoring would continue and would not affect water resources.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative F would contribute noticeable long-term, beneficial impacts because cattle ranching would be phased out across the planning area, although implementation of new visitor opportunities would contribute some adverse impacts to water quality and quantity. When the incremental impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on water resources would be adverse. However, alternative F would contribute a meaningful beneficial increment to water resources, and the overall condition of water resources would improve compared to existing conditions. The primary driver of cumulative impacts would continue to be actions related to ranching and development outside the planning area. While the Tomales Bay watershed would continue to be impaired under the Clean Water Act, with the removal of ranching in the planning area, ranching activities under alternative F would no longer be a contributor to that impairment.

VEGETATION, INCLUDING FEDERALLY LISTED SPECIES

Methodology and Assumptions

Potential impacts on vegetation in the planning area are evaluated based on resource expert knowledge and professional judgment; communication with park staff; and a review of available research, reports, and data.

The forage production model developed by the park was used to produce grazing capacity and stocking rate estimates under the alternatives. The estimates help quantify the range of plant biomass change. California grassland ecosystems are complex, and their dynamics are driven to a large degree by abiotic factors such as annual weather patterns, soils, and topographic site characteristics (Jackson and Bartolome 2002; Spiegal et al. 2016). The abiotic factors that drive the dynamics of California grassland ecosystems were considered when quantifying the change in biomass. Long-term park conditions and trends and RDM data from ungrazed, beef cattle-grazed, and dairy-cattle grazed plots are also compared

to evaluate potential differences in biomass and species composition, including invasive species, under the alternatives.

The use of limited prescribed grazing is considered under alternatives with no or reduced livestock grazing because this would mitigate some undesirable impacts of grazing reduction or removal. The analysis of impacts on vegetation assumes mitigation measures would be implemented to minimize adverse impacts. The area of analysis includes the vegetation (including communities of concern, non-native plant species, and other special-status plant species) in the boundaries of the planning area.

Alternative A

Under alternative A, continued ranching as currently practiced would result in continued adverse and beneficial effects on vegetation in the planning area. Because cattle grazing affects vegetation habitats in different ways, effects on vegetation from continued ranch management are generally addressed by habitat type.

Ranch Management

Grazing. Grazing by large herbivores, such as cattle, involves three primary processes—defoliation of vegetation, trampling, and nutrient redistribution (Jackson and Bartolome 2007). Each of these processes, individually and in combination, directly affects the plant communities where grazing occurs. Impacts on vegetation can be beneficial, neutral, or negative, depending on a complex set of factors and their interactions (Diaz et al. 2007), including timing, duration, intensity of grazing, and management goals. Research that links these grazing processes directly to plant and plant community responses are limited for California vegetation types (Jackson and Bartolome 2007).

Under alternative A, the same level of cattle grazing on approximately 27,000 acres would perpetuate altered vegetation structure, species composition, and biomass production. Dairy herd sizes in the planning area are larger than beef cattle herd sizes, so their impacts on vegetation would continue to be greater, especially in areas closer to the developed complexes because dairy cows on the milking string are brought into the dairy barns twice a day for milking. This process leads to greater livestock congregation and concentrated manure in locations near milking barns. Dairy cattle spend less time in areas farther away from the developed ranch complex. Dairy cattle would continue to have higher nutritional demands than beef cattle and require supplemental feed, especially during the dry season. Beef cattle typically are more widely spread over the landscape of a ranch, and grazing effects are consequently more dispersed over the landscape than on a dairy ranching operation.

Livestock operation-related impacts, including a horse boarding operation and one chicken operation, would continue to occur. Holding paddocks, corrals, and areas such as those surrounding water troughs; feeding areas; or sites with mineral supplements such as salt licks or molasses barrels typically receive heavy use and are likely to have limited or no vegetation and contribute to the 150 acres of high-intensity-use areas in the planning area. Management activities, such as using sufficient fencing and/or water troughs to improve distribution, could be implemented to minimize adverse impacts on vegetation to the extent possible.

Under alternative A, NPS would continue to employ range management guidelines and require a minimum RDM of 1,200 pounds/acre remaining after the grazing season to protect soil resources and optimize vegetative production (Bartolome et al. 2006, 2015).

Forage production would continue, consistent with lease/permit terms, on approximately 1,000 acres. These activities involve seedbed preparation, manure spreading, seeding, and harvest mowing, which affect vegetation in the locations where forage production occurs. Because this vegetation is largely non-native, impacts on native plants would be limited.

Vegetation management activities such as seeding and aeration would continue under alternative A, affecting plant species composition and biomass production. These activities largely occur in locations

with predominantly non-native, seeded agricultural, or invasive species, which limits their impacts on native species.

Manure and nutrient management on dairies, including the application of compost and fertilizer, would also continue under alternative A. As described in the "Soils" section, manure spreading increases soil nutrients, which increases forage species production but may have adverse impacts on native grassland plant species, some of which are less abundant in fertilized soils (Weiss 1999; Gea-Izquierdo, Gennet, and Bartolome 2007). Like forage management activities, manure spreading largely occurs in vegetation with predominantly non-native species such as pastureland and annual grassland, thereby limiting impacts on native species.

Wetlands. Limited information on livestock grazing effects in California wetlands is available (Jackson and Bartolome 2007). In Sierra foothills wetlands, light livestock grazing did not appear to cause notable changes in vegetation cover and species richness (Allen-Diaz et al. 2004), nor did livestock grazing appear to affect wetlands composition in East Bay grasslands, although grazing may affect vegetation structure in wetlands with willows (Allen-Diaz et al. 2001). In the Sierra foothills study, long-term, moderate to heavy grazing intensity reduced plant cover, although occasional moderate grazing did not affect plant cover (Allen-Diaz et al. 2004). Livestock grazing under alternative A would be moderate. In collaboration with ranchers, NPS has implemented protective measures around approximately 199.4 acres of wetlands in the planning area to improve water quality and ecological function, including fencing to control the timing and duration of grazing, reducing impacts.

Riparian Areas. Cattle are attracted to the shade, green vegetation, and water provided in riparian zones and tend to concentrate in riparian areas, resulting in direct and indirect damage to riparian vegetation (Spiegal et al. 2016). Overuse by cattle can degrade riparian areas by reducing vegetative cover, affecting water quality, and damaging creek banks (Bush 2006). Under alternative A, fencing would continue to exclude cattle from grazing approximately 800 acres of land under lease/permit, which contains some riparian areas. As noted in chapter 3, approximately 1% of the planning area is riparian, and the most highly sensitive riparian areas in the planning area would continue to be protected from livestock use. Unprotected riparian areas would continue to be potentially susceptible to overuse by cattle.

Grasslands. California coastal grassland ecosystems are complex, and their dynamics are driven to a large degree by abiotic factors such as annual weather patterns, soils, and topographic site characteristics (Jackson and Bartolome 2002; Spiegal et al. 2016). In general, at landscape scales, grazing effects in California grasslands are limited; abiotic factors are more important driving forces (Jackson and Bartolome 2002; D'Antonio et al. 2002). However, livestock grazing can have localized impacts on vegetation and on specific plant species.

Grasslands make up 48% of the planning area and are the vegetation type in which most grazing impacts are likely to occur. Under alternative A, cattle grazing of coastal grasslands in the planning area would continue to result in lower litter depth and vegetation height and greater area of bare ground compared to ungrazed sites (Hayes and Holl 2003; Skaer, Graydon, and Cushman 2013). Soil pH, organic matter content, total nitrogen, cation exchange capacity, phosphorus, potassium, calcium, and magnesium levels would likely not be affected in beef cattle-grazed areas (Hayes and Holl 2003). As described above, in the dairy pastures, cattle waste products are likely to be more concentrated, resulting in increased soil nutrient levels, which may have adverse impacts on native plant species. In general, limited or no information exists regarding grazing effects on specific species in the coastal grasslands. Impacts on plant functional groups would continue.

In an observational study of cattle grazing impacts in 25 coastal grassland sites, Hayes and Holl (2003) reported that native annual forb species richness and cover were greater in grazed sites, as were non-native annual forbs and some non-native annual grasses. This relationship between grazing and higher annual forb and grass richness and cover may result because grazing reduces vegetation height and litter biomass, which, in turn, opens up microsites favorable to short-statured plants (Hayes and Holl

2003). In contrast to the annuals, the study found that native perennial forb cover and species richness were higher in ungrazed sites, perhaps because tall perennial forbs do not reproduce well when clipped, although in general, cattle prefer to eat grasses than forbs (Larson, Barry, and Bush 2015). Under alternative A, these adverse impacts on native perennial forbs from cattle grazing would continue.

Hayes and Holl (2003) also found that species richness and cover of native perennial grasses taken as a functional group, as well as sedges and rushes, were not affected by cattle grazing. A Monterey County coastal grassland study also did not find any grazing effects on native perennial grasses (Skaer, Graydon, and Cushman 2013). These functional groups would likely remain unaffected under alternative A.

The limited information available suggests that individual native perennial grass species vary in their response to grazing. California oatgrass (*Danthonia californica*), a coastal prairie indicator species, had twice as much cover in grazed sites as in ungrazed sites (Hayes and Holl 2003). These findings for California oatgrass have been corroborated by Hayes and Holl (2011) in subsequent experimental work that showed that at a Santa Cruz County site with abundant California oatgrass, cover of California oatgrass declined in plots that were not grazed (or clipped, a proxy for the defoliation component of grazing) but remained the same or increased in plots that were grazed or clipped. In contrast, Point Reyes' recent NRCA (NPS 2019a), which analyzed 51 coastal grassland plots in Point Reyes grazed by cattle from 1988 through 2013, found that California oatgrass declined in frequency on 24 of the 37 transects on which it occurred. However, the sampling design did not include any ungrazed comparison plots and was not representative of all the park's coastal grasslands, so the role of cattle grazing in this decline was not clear. Under alternative A, California oatgrass would likely continue to benefit from cattle grazing, even though the current trend indicates a decline in the grass, because grazing is not likely the cause of the decline; rather, the studies by Hayes and Holl (2003, 2011) imply that in the absence of grazing, the decline might be even greater.

Coastal Dunes. Cattle are currently excluded from most coastal dunes at Point Reyes, but when cattle inadvertently gain access to dunes, they may eat dune plants. No coastal dunes are located on the Golden Gate ranches. Cattle would continue to be excluded from most of the coastal dunes directly adjacent to the ocean in the planning area; therefore, ranching under alternative A would continue to have limited impacts on coastal dunes. Native dunes are mobile, and in some areas are documented to encroach on actively ranched lands. In those areas, NPS has worked with ranchers to adjust fencing to keep cattle within the permitted lands.

Coastal Scrub. Livestock do not generally browse coastal scrub dominated by coyote brush, although they will graze the herbaceous understory in stands with sparse canopies. Livestock travel through coastal scrub and may damage vegetation with trailing and trampling. By defoliating and trampling coyote brush seedlings in the shrub-grassland ecotone and in open grassland, cattle slow the expansion of coastal scrub into open grassland (Ford and Hayes 2007). Under alternative A, continued cattle grazing would maintain existing grassland-shrubland boundaries, and the rate of shrub encroachment into grasslands would likely not accelerate. The NRCA (NPS 2019a) analysis of cattle-grazed coastal grassland plots from 1988–2013 found that during the period sampled, coyote brush occurred in 23 of the 51 plots. It increased in cover on 10 of those plots—6 of them to a major degree—and decreased in cover on 8, although in some plots, cattle grazing had ceased. Continued cattle grazing would continue to slow coyote brush encroachment into coastal prairie; however, 97% of coastal scrub in the planning area is already dominated by coyote brush. Once a coyote brush stand has established, grazing would continue to be of limited use in eliminating the shrubs in favor of grassland vegetation.

The NRCA suggests that shrub encroachment could continue to increase without additional management actions (NPS 2019a). Under alternative A, NPS would continue to authorize mechanical treatment (e.g., mowing) of shrubs on a case-by-case basis to reduce encroachment into grassland and improve forage for livestock and wildlife, which would result in short-term impacts on non-target vegetation but would maintain coastal prairie habitat in treated areas.

Invasive Plants. Ranching would continue to both adversely and beneficially affect control of invasive plants. When livestock are properly managed, grazing can be an effective method to control some invasive plants (Spiegal et al. 2016). Hayes and Holl (2003) reported that their study's ungrazed sites averaged as much as four times more common velvetgrass cover, one of the most common perennial grass weeds in the coastal prairie and widespread at Point Reyes, than their grazed sites. Under alternative A, some invasive species, including velvetgrass, would continue to be controlled to some degree by cattle that eat the new growth. Cattle grazing would also continue to control, to some degree, the ubiquitous, naturalized, non-native annual grasses that can outcompete native plants (Hayes and Holl 2003, 2011; Skaer, Graydon, and Cushman 2013). In addition, ranchers would continue to provide stewardship services in controlling invasive species and may be the first to observe and report any new infestation.

Ranching operations can also introduce and spread invasive species (Spiegal et al. 2016). Under alternative A, ranching operations, including ranch vehicle movement, supplementary feeding, and manure spreading, would continue as potential pathways for the introduction and/or spread of invasive plants. Livestock movement could also spread invasive species in the planning area. Concentrated livestock use would continue to result in exposed soil on approximately 150 of acres of high-intensity-use areas, providing favorable germination sites for weeds. In addition, cattle fecal pats concentrate nutrients and can serve as weed establishment sites or as sources of weed as seeds can pass through cow's digestive system and subsequently germinate (Chuong et al. 2016). Under alternative A, areas of heavy livestock use would continue to provide conditions favorable to invasive plants. In the 2,500 acres in which dairy manure is spread, the higher soil fertility would continue to result in greater abundance of weed species.

Skaer, Graydon, and Cushman (2013) suggest that weed infestation could continue to increase without additional management actions. As noted above, minimum RDM standards would limit bare ground caused by grazing and trampling (Bartolome et al. 2015). Mowing and other forms of weed control would continue under alternative A. Unlike grazing by herbivores, mowing is indiscriminate and removes all vegetation above the mow-line. If invasive species are not mowed when they are phenologically vulnerable, their growth and reproduction can be encouraged (DiTomaso et al. 2013). Similarly, native plants may be adversely affected if mowed at the wrong phenological stage, for example during reproduction. Unless cut vegetation is removed, mowing also increases dead surface biomass that can result in thick thatch layers, inhibiting germination of some species. Mowers and other ranch vehicles, trucks, and equipment can also disperse weed seeds into uninfested areas if the machinery, undercarriages, and tires are not carefully cleaned. The use of mitigation measures would continue to minimize the impacts associated with mowing on a case-by-case basis.

Plant Biomass. Grazing animals consume plant biomass and damage it through trampling; therefore, grazed vegetation typically has lower levels of biomass, although compensatory growth of grazed plants can mitigate the loss of biomass to varying degrees (Jackson and Bartolome 2007). In grasslands dominated by non-native, highly productive annual grasses, using grazing animals to remove biomass can benefit native plants (and the wildlife species that rely on them); as noted above, Hayes and Holl (2003) and Johnson and Cushman (2007) suggest that reduced biomass in grazed plots in their studies likely accounted for the higher levels of native annual forbs in the grazed plots. Under alternative A, the benefits of biomass reduction to native annual plants would continue.

Under alternative A, using livestock grazing to reduce vegetative fuel loading would continue. In the absence of grazing, vegetative fuel loads are likely to increase, which can increase wildfire hazard and impacts. An increase in fire frequency and intensity on the landscape could result in changes in vegetation (Fites-Kaufman et al. 2006). Where coastal scrub encroaches into grassland in the absence of grazing, vegetative biomass can increase substantially. Russell and McBride (2003) reported that coyote brush-dominated shrublands in the San Francisco Bay Area had more than 12 times more biomass than grasslands. Continued grazing under alternative A would help control shrub fuel loads.

Grazing impacts, both beneficial and adverse, on rare plants are often difficult to determine, and some species in the planning area experience more adverse impacts from competition with invasive species than

from grazing. Species that would continue to be adversely affected by cattle grazing or trampling include beach layia, coastal marsh milkvetch (*Astragalus pycnostachyus*), swamp harebell (*Campanula californica*), Point Reyes ceanothus (*Ceanothus gloriosus*), Marin checker lily (*Fritillaria lanceolata* var. *tristulis*), North Coast phacelia (*Phacelia insularis* var. *continentis*), and Point Reyes checkerbloom (*Sidalcea calycosa ssp. Rhizomata*).

For several of the state listed/state rare plants, like the Mount Vision ceanothus (*Ceanothus gloriosus* var. *porrectus*), cattle grazing likely would continue to reduce competition from non-native annual and perennial grass species or maintain preferred habitat characteristics. In addition, several of the state listed/state rare plants do not occur in habitat likely to be used by cattle or occur in areas in which cattle are already excluded (e.g., coastal dunes, riparian areas); range management activities would not affect those species.

Ranch Infrastructure. Road upgrades and decommissioning, stream crossings, livestock water supply, pond restoration, waterway stabilization, and upland and riparian vegetation management/planting would continue to be approved on a case-by-case basis. Generally, these actions would result in short-term impacts on vegetation from removal, trampling, or crushing of vegetation from equipment and foot traffic during construction activities. Upland and riparian vegetation management would help improve vegetation by supporting perennial or self-sustaining vegetation (e.g., grasses, forbs, legumes, shrubs, and trees). Preconstruction surveys would be required prior to work in applicable habitats to determine if special-status plant species are present at or near construction areas, and if present, avoidance or applicable mitigation measures would minimize any potential impacts.

Federally Listed Plants. Beach layia occurs on sparsely vegetated open areas of semi-stabilized coastal sand dunes. Most known occurrences[9] are in coastal dunes outside the planning area (63%) or within 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, F, and AT&T Ranches, where cattle could directly affect plants through trampling, as well as indirectly via increased weeds associated with grazing disturbance. Livestock trampling was indicated as a threat when beach layia was listed (57 FR 27848); however, in 2002, after reviewing the status of beach layia in the park and the potential effects of ranch activities and other cumulative effects, USFWS (2002a) determined that ranching in the park is "not likely to jeopardize" the continued existence of the species. 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 2019f). Although beach layia occurrences have increased in areas where coastal dune restoration has occurred (NPS 2019f), those subject to grazing have declined in abundance since 2004 (NPS, Parsons, pers. comm. 2019b). Alternative A would continue to prevent cattle from accessing dune habitats because the majority of known beach layia occurrences are found outside grazed pastures or in existing resource protection exclusion areas, but adverse impacts on approximately 20% of known beach layia occurrences could occur (NPS 2014f).

Six occurrences of Marin dwarf flax have been documented in the planning area on serpentine soils at Nicasio Ridge on the Cheda, McIssac, and Zanardi Ranches (NPS 2001b). Trampling by livestock is a potential threat to individual Marin dwarf flax plants, although NPS did not list this activity as a threat to the species (NPS 2019g). Encroachment by larger plants and shrubs, including natives but especially non-native grasses and annual species, are likely the greatest threat. Alternative A could help Marin dwarf flax plants to grow by reducing taller competing plants because grazing reduces the build-up of thatch from previous year's herbage and could suppress the growth of Marin dwarf flax (NPS 2001b). The impact of livestock grazing on Marin dwarf flax was unknown at the time of its listing under the ESA (USFWS 1998), but the effect of livestock grazing on rare plant populations on serpentine soils is

[9] 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.

generally beneficial via decreased accumulation of nitrogen that promotes annual grass invasions (Weiss 1999; Beck et al. 2015). In 2002, after reviewing the status of Marin dwarf flax in the park and the potential effects of ranch activities and other cumulative effects, USFWS (2002a) determined that ranching in the park is "not likely to jeopardize" the continued existence of the species. Grazing under alternative A would adhere to appropriate RDM standards recommended by Bartolome et al. (2015), which would limit potential direct impacts on Marin dwarf flax from tramping or herbivory.

No published literature is available to determine whether grazing has a positive, negative, or neutral effect on Tiburon paintbrush at Nicasio Ridge. The effect of livestock grazing on rare plant populations growing on serpentine soils is generally beneficial because grazing can help reduce the accumulation of nitrogen and increase opportunities for Tiburon paintbrush to grow (Weiss 1999; Beck et al. 2015). In 2002, after reviewing the status of Tiburon paintbrush in the park and the potential effects of ranch activities and other cumulative effects, USFWS (2002a) found that ranching in the park is "not likely to jeopardize" the continued existence of the species. Because alternative A would continue ranching in the planning area like existing conditions, its implementation would not adversely affect Tiburon paintbrush.

As of 2016, Jeffery (2016) reports that a subset of reintroduction sites in the cattle-grazed area had the highest number of flowering heads, suggesting positive impacts of livestock grazing. Showy Indian clover was not addressed by NPS's previous consultation (2001b) with USFWS (2002a) for ranching in the planning area because it was extirpated from the park at that time. The listing rule for the species (62 FR 54791) suggests that grazing could have eliminated some historical locations. However, livestock grazing did not affect the one known natural population at Dillon Beach at the time of listing or at the time of the first five-year review (USFWS 2007). Gopher activity was a primary source of plant mortality, and other native herbivores (deer, rabbits, voles, snails, slugs, and insects) could have deleterious impacts on showy Indian clover plants (USFWS 2012). The species was reintroduced in the planning areas on D Ranch, and while future monitoring is needed to determine if this reintroduced population will persist, preliminary studies suggest that grazing could increase the species' reproduction (Jeffery 2016). Therefore, continued ranching under alternative A would not impact showy Indian clover in this location, nor would increasing numbers of elk.

Over- or under-grazing may be detrimental to Sonoma alopecurus (USFWS 2010a, 2011a). All known occurrences of Sonoma alopecurus in the park occur in the pastoral zone where cattle grazing has occurred since the 1830s. Today, this species competes with non-native annual grass and forb species (Parsons and Ryan 2019a). USFWS reported in the listing rule for Sonoma alopecurus in 1997 (62 FR 54791) that some grazing may be necessary for the species to survive in the face of competition from other plants. Substantial evidence suggests that grazing is important in maintaining habitat for this species, with two historic populations in the park extirpated shortly after grazing was removed (Gennet 2004). The adverse effects of grazing are associated with heavy, poorly managed livestock grazing, which can adversely affect plant growth and reproduction (Parsons and Ryan 2019a). However, adverse impacts would be avoided under alternative A from continued adherence to appropriate RDM standards recommended by Bartolome et al. (2015). In 2002, after reviewing the status of Sonoma alopecurus in the park, the potential effects of ranch activities, and other cumulative effects, USFWS (2002a) determined that ranching in the park is "not likely to jeopardize" the continued existence of the variety of the species in the planning area. Ryan and Parsons (2014) completed a study to evaluate how Sonoma alopecurus responds to different grazing regimes and to the elimination of grazing. They found that seasonal grazing may be the optimal grazing strategy to maintain and enhance Sonoma alopecurus populations, and subsequently NPS constructed a seasonal grazing exclusion at the Abbotts Lagoon population (Ryan and Parsons 2015). Because alternative A would continue to reduce competition with other wetland plants, its implementation would allow Sonoma alopecurus populations to persist or increase.

Sonoma spineflower appears to be unpalatable to cows, and herbivory has rarely been observed during monitoring. Livestock herbivory reduces competition with other plants, providing for increased Sonoma spineflower reproduction, survival, and population size (Davis and Sherman 1992; USFWS 1998, 2010a).

Insufficient grazing or no grazing in spring may allow non-native or native species to outcompete spineflower for resources or reduce spineflower numbers indirectly through shading (Parsons and Ryan 2019b). Sonoma spineflower appears to be adapted to a moderate grazing regime; therefore, damage caused by livestock trampling is outweighed by the benefits of grazing (Davis and Sherman 1992). The original extant population of Sonoma spineflower in the planning area (when listed) is in a pasture that has been grazed for more than a century (57 FR 27848), and almost all of the introductions attempted by the NPS have occurred in areas subject to grazing because grazing appears to be important to the continued persistence and long-term viability of this species. At the time of listing, NPS had excluded most of this population from grazing, and although plants in the exclosure grew taller than unprotected plants, the overall effect of cattle grazing on Sonoma spineflower was unknown (NPS 2001b). In 2002, after reviewing the status of Sonoma spineflower in the park and the potential effects of ranch activities, and other cumulative effects, USFWS (2002a) determined that ranching in the park is "not likely to jeopardize" the continued existence of the species. Because ranching under alternative A would continue and allow NPS to manage the timing and intensity of grazing, its implementation would not adversely impact Sonoma spineflower.

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 1998). Approximately 50% of known Tidestrom's lupine occurrences are in coastal dunes outside the planning area and another 35% are in 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 affect plants through trampling and indirectly affect them via increased weeds associated with grazing disturbance. Because of the invasion of non-native European beachgrass and iceplant and associated indirect seed predation by deer mice (*Peromyscus maniculatus*), a recently completed population viability analysis showed most of the park's Tidestrom's lupine populations are headed toward extinction (Dangremond, Pardini, and Knight 2010). During this study, researchers 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, because most of the population of this species is either outside the planning area or inside exclusion areas, the lupine's population decline is mainly a result of non-native plant invasion and mice. While adverse impacts from ranching would continue under alternative A, the largest population, located southwest of Abbotts Lagoon, is stable with more than 200,000 plants and is excluded from grazing areas (Parsons 2018). In 2002, after reviewing the status of Tidestrom's lupine in the park, the potential effects of ranch activities, and other cumulative effects, USFWS (2002a) determined that ranching in the park is "not likely to jeopardize" the continued existence of the species. Under alternative A, cattle trampling could affect a small number of known Tidestrom's lupine occurrences within grazed pastures on F Ranch. Also, although cattle would continue to be excluded from coastal dunes, they could infrequently trample beach layia when cattle occasionally breach pasture fences and loaf in coastal dunes (NPS, Parsons, pers. comm. 2019b).

Cumulative Impacts

NPS would continue coastal dune restoration in the park to eliminate non-native European beachgrass and iceplant, resulting in long-term, beneficial impacts on coastal dunes. Dune restoration projects would have long-term benefits on beach layia and Tidestrom's lupine by eliminating the primary threat to the recovery of both endangered plants and allowing their populations and other state- and CNPS-listed rare plant species to expand.

The ongoing Lagunitas Creek salmonid habitat restoration projects would have temporary, adverse impacts on riparian vegetation during construction activities. Access routes through the riparian ecosystem could degrade habitat. However, management activity standards and mitigation measures would be implemented to reduce adverse impacts. These projects would have long-term, beneficial impacts on riparian vegetation from the restoration of riparian habitat.

Corvid management at Point Reyes includes the installation of riparian fencing, which could damage vegetation, resulting in localized short-term, adverse impacts; however, BMPs would likely be implemented to minimize adverse impacts. In the long term, additional riparian fencing would protect riparian vegetation from adverse impacts of livestock grazing.

The fire management program for Point Reyes and for the north district of Golden Gate and the new NPS agreement with Marin County for wildland fire operations and response would include prescribed fire and mechanical treatments. Both techniques would remove vegetation. The short-term, adverse impacts from mechanical treatments and prescribed fire would be minimized through guidance and mitigation measures provided in the plan. PG&E fire prevention projects would remove vegetation to reduce fire hazards. The implementation of BMPs during tree removal would minimize adverse impacts on vegetation. Overall, fire management would reduce fuel load and help prevent large, intense fires on the landscape, benefiting vegetation (Fites-Kaufman et al. 2006).

Cultural restoration projects would temporarily adversely affect vegetation during construction, but they would have no long-term impacts on vegetation.

The road improvement project could introduce weeds and pathogens such as *Phytophthora* along a road that crosses through much of the planning area. Weeds use disturbance to propagate and spread, and road corridors are a major source of disturbance. The project would disturb soils and native habitats along the road corridor and could introduce new weeds or increase the abundance of established weeds through unclean equipment, vehicles, tools, and boots of construction workers, and bringing in soils or gravels that could be contaminated. *Phytophthora* and other pathogens, once introduced, can spread underground and affect native habitats. NPS would work with the Federal Highway Administration to develop mitigation measures to reduce the spread of invasive species, but avoidance may be impossible because of the large amount of ground disturbance, resulting in long-term, adverse impacts.

The NPS Inventory and Monitoring program surveys roads and trails in the planning area for invasive plants, eradicates small new infestations, and develops annual priority lists by park (NPS 2018a). The control of invasive plants by NPS includes mechanical and chemical methods within an IPM framework. Control methods could damage non-target vegetation, with short-term, adverse impacts, but compliance with NPS IPM regulations and procedures and the use of appropriate herbicide application methods would minimize adverse impacts. In the long term, early detection and elimination of new invasive species and the control of existing invasive plant populations would benefit native plants and vegetation communities, including federally listed plants.

Overall, these past, present, and reasonably foreseeable future actions have and would continue to have both beneficial and adverse cumulative impacts, with the road improvement project having the potential to contribute a large portion of adverse impacts. Alternative A would contribute beneficial and adverse impacts from continued grazing and ranching activities, especially in grasslands, as described above. When the incremental impacts from alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on vegetation would remain adverse to some species and beneficial to others, depending on a number of factors, as described above, and the incremental impacts of alternative A would continue to contribute a majority of the overall cumulative impacts.

Alternative B

Under alternative B, ranching activities in the planning area would be managed by a new zoning framework that would only authorize higher intensity activities, including vegetation management and diversification, in areas without sensitive resources. Table 11 lists the percentage of each vegetation type in the planning area and how much of each type is located in the four subzones.

TABLE 11: PERCENT OF VEGETATION TYPES IN THE PLANNING AREA AND SUBZONES

Vegetation Type	Percentage of Planning Area (Total)	Percent of Type in Range Subzone	Percent of Type in Pasture Subzone	Percent of Type in Ranch Core Subzone	Percent of Type in Resource Protection Subzone
Bishop Pine	1%	1%		1%	4%
Coastal Dunes	2%	1%		0%	10%
Coastal Scrub	18%	21%	11%	2%	33%
Douglas-fir/ Coast Redwood	5%	8%		1%	6%
Grassland, Annual	44%	43%	54%	14%	14%
Grassland, Perennial	4%	4%	3%	0%	4%
Hardwood Forest	8%	11%	0%	0%	15%
Herbaceous Wetlands	4%	4%	1%	0%	8%
Other	1%	0%	1%	66%	0%
Pastureland	12%	4%	29%	15%	1%
Riparian Forest/ Shrubland	1%	1%	0%	0%	4%

Ranch Management

Continuing existing beef and dairy cattle ranching operations would have similar types of impacts on vegetation as described for alternative A; however, the inclusion of an additional 1,200 acres of resource protection exclusion areas would result in beneficial impacts to riparian vegetation and other sensitive species compared to existing conditions. Effects of grazing activities, such as slowing coastal scrub encroachment into open grassland, reducing abundance of some perennial grass weeds, reducing the biomass of highly competitive non-native annual grasses and forbs, and removing vegetative fuel, would continue under alternative B. Management activity standards and mitigation measures to limit impacts associated with these activities would be required and would be included in each ROA. Grazing activities would occur in the Range and Pasture subzones. Vegetation management and diversification activities would not be permitted in the Range subzone. The Pasture subzone would be predominantly annual grassland (54%), pastureland (29%), and coastal scrub (11%). As described in chapter 3, *pastureland* is an agricultural vegetation type (Keeler-Wolf, van der Leeden, and Schirokauer 2003; Pawley and Lay 2013), comprising naturalized non-native species, including seeded grass and legume forage species. Vegetation management and diversification activities would be permitted in the Pasture and Ranch Core subzones. Vegetation management and diversification activities would predominantly affect annual grasslands, pastureland, and coastal scrub, which make up 94% of the Pasture subzone. In the Pasture subzone, coastal scrub would decline with mowing, and seeding would change vegetation composition. In the Range subzone, vegetation change is not expected because livestock grazing would continue to be the predominant authorized activity.

Diversification. Under alternative B, the introduction of additional livestock species into the Pasture and Ranch Core subzones would result in the potential for different forage and landscape use. The Pasture subzone could become a more intensively managed landscape compared to existing conditions, with the introduction of vegetation management and new livestock species. Goat and sheep numbers would not be

permitted to exceed 10% of the total authorized AU for an individual ranch. Only ranches with an occupied residential complex would be authorized to diversify livestock.

While cattle prefer to eat grass rather than forbs or shrubs, sheep eat both grass and forbs and can eat shrubs, and goats eat shrubs, forbs, and grass and have a wide tolerance for plants that are toxic or too thorny/spiny for other ungulates (Larson, Barry, and Bush 2015). The addition of sheep and goats into the Pasture subzone could increase the consumption of forbs and shrub species.

Limited research exists about sheep and goat impacts in the coastal prairie in general, and none exists for most plant species of concern. Because sheep and goats tend to be corralled in small areas, their grazing impact can be managed and kept away from sensitive plant populations. Because sheep and goats would only be permitted in the Pasture and Ranch Core subzones (about 30% of the planning area), both of which are primarily agricultural areas with limited native plants, the potential adverse impacts of sheep and goat grazing and browsing under alternative B would be limited. Sheep preference for forbs could result in adverse impacts on native forbs. Therefore, NPS could implement mitigation measures, such as herding or corralling sheep away from areas with of native forbs.

Under alternative B, pigs and chickens may also be allowed to roam and feed in the Ranch Core subzone, which falls outside the natural vegetation areas of the planning area. Because the Ranch Core subzone is already highly disturbed, no impacts on vegetation are expected. Chickens would also be permitted in the Pasture subzone; the impacts of chickens and their associated mobile huts would likely primarily affect the non-native agricultural vegetation that predominates in the Pasture subzone. As described in the "Soil Processes, Erosion and Compaction" section, chicken manure is especially high in nutrients. A substantial increase in soil nutrients from chicken manure would increase biomass production but could have adverse impacts on native grassland plant species, some of which are less abundant in fertilized soils (e.g., Weiss 1999; Gea-Izquierdo et al. 2007), although, as noted, non-native agricultural vegetation predominates in the Pasture subzone.

Vegetation Management. The NRCA and other studies suggest that shrub encroachment and weed infestation could continue to increase without additional management actions (NPS 2018a; Skaer, Graydon, and Cushman 2013). Although coyote brush is a native species and coastal scrub is a native habitat type, in the absence of fire, grazing, or mowing, it encroaches into open grassland and reduces grassland habitat values. Mowing would be considered in up to 50% of the Pasture subzone in a given year to manage weeds and remove shrubs. If invasive species are not mowed when they are phenologically vulnerable, their growth and reproduction can be encouraged (DiTomaso et al. 2013). Because mowing would only be permitted in the Pasture and Ranch Core subzones, both of which are primarily agricultural areas with limited presence of native vegetation, the potential adverse impacts on native plants would be limited. Under alternative B, weed management would be site-specific and would depend on NPS resource management goals and objectives and the extent of the infestation.

Forage Production. Forage production would result in the same type and intensity of impacts as described for alternative A.

Federally Listed Plants. Under alternative B, the types of beneficial impacts to Marin dwarf flax, showy Indian clover, Sonoma alopecurus, Sonoma spineflower, and Tiburon paintbrush would be the same as those described for alternative A. A moderate level of grazing, consistent with the requirement to maintain an average RDM of 1,200 pounds/acre at the end of the grazing season, would create favorable conditions by selectively reducing annual grasses, preventing thatch accumulation, mechanically breaking down the litter, and reducing competition from other species. The intensity of adverse impacts under alternative B would be reduced compared to existing conditions because the zoning framework would ensure that cattle grazing would be the only potential disturbance, if any, to the seven federally listed plants. New resource protection exclusion areas on F and E Ranches would protect approximately 22% of known beach layia occurrences that are currently exposed to grazing under existing conditions. This would limit potential impacts of cattle trampling under alternative B to approximately 12% of all known

beach layia occurrences, from populations 1, 5, 8, 11, and 12, and located on the B, C, E, and AT&T Ranches (NPS 2019g). The new resource protection exclusion area on F Ranch would protect all 15% of known Tidestrom's lupine occurrences that are potentially impacted by grazing under existing conditions. Beach layia and Tidestrom's lupine occurrences in the Resource Protection subzone could still be adversely affected, although impacts would be infrequent, only occurring when cattle breach fences and loaf in unauthorized areas like coastal dunes. The BA (appendix K) further details these potential impacts.

Tule Elk Management

Management of the Drakes Beach herd could result in limited damage to vegetation in the vicinity of Drakes Beach caused by trampling and vehicle use in the fall during removal efforts. These impacts would occur on an annual basis and would be highly localized.

Public Use and Enjoyment

Expansion of the trail network would not likely result in adverse impacts on vegetation because existing administrative trails would be used. Visitor use of new trails could result in higher probability of inadvertent introduction of non-native and invasive plants and plant pathogens. New trails would be added to the NPS Inventory and Monitoring program for early detection surveys that would help detect invasive plant introductions and impacts on vegetation. The impacts of increased visitor use would likely be small in comparison to current overall impacts of ranching and visitor activities because visitor use levels are not expected to change under alternative B.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would contribute beneficial and adverse impacts from continued grazing and ranching activities, depending on the species, especially in grasslands where grazing would occur.

Alternative B would implement a zoning framework that would focus the most intense uses associated with ranching operations in areas that are already highly disturbed and/or altered and remove areas from ranching to protect sensitive species, resulting in beneficial impacts on vegetation compared to existing conditions, especially in riparian areas. Expanding development for public use and elk management activities would cause localized adverse impacts in limited areas. When the incremental impacts from alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on vegetation would be adverse to some species and beneficial to others, as described above. The incremental impacts of alternative B would contribute a majority of the overall cumulative impacts.

Alternative C

Impacts from ranch management and visitor use and enjoyment under alternative C would be the same as those described for alternative B.

Actions to remove the Drakes Beach herd may have a direct, short-term impact on vegetation in the general location of the herd from the four to six months of removal activities, including trampling and vehicle use, but impacts on vegetation would not be considerably different than those described for alternative B over the long term.

Adverse impacts under alternative C resulting from removal of the elk herd's contribution to grazing impacts, primarily in the coastal grassland, could include small increases in plant biomass, a possible reduction in native annual forbs and California oatgrass cover, increases in invasive species, especially velvetgrass, and encroachment of coastal scrub species such coyote brush (Johnson and Cushman 2007; Ender et al. 2017). Potential beneficial impacts from removal of the elk herd include a possible small increase in native perennial forbs (Johnson and Cushman 2007) and a reduction in impacts on vegetation in areas where elk congregate, including riparian habitat, primarily on C Ranch and D Ranch.

Federally Listed Plants. Under alternative C, the impacts on beach layia, Marin dwarf flax, showy Indian Clover, Sonoma alopecurus, Sonoma spineflower, Tiburon paintbrush, and Tidestrom's lupine would be the same as described for alternative B. The removal of the Drakes Beach herd would not impact any federally listed plants.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative C would be the same as those described for alternative B, but the additional ground disturbance from the removal of the Drakes Beach herd could contribute short-term impacts on vegetation from trampling in the vicinity of the herd during removal activities. When the incremental impacts from alternative C are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on vegetation would be adverse to some species and beneficial to others, as described above. The incremental impacts of alternative C would contribute a majority of the overall cumulative impacts.

Alternative D

Under alternative D, ranching activities would cease on 7,500 acres, approximately 27% of the planning area; beef and dairy cattle would continue to graze the remaining area as described in alternative B. Alternative D would also add an additional 900 acres of resource protection areas to the Resource Protection subzone. Impacts from public use and enjoyment and elk management would be the same as described under alternative B. Additionally, impacts from diversification activities would be the same as alternative B, except goats, sheep, and chickens would be limited to the Ranch Core subzone. The overall composition of vegetation in the remaining acres available for ranching in each subzone would be similar to alternative B. In the 19,000 acres where cattle would continue to graze, beneficial and adverse impacts would be similar to those described for alternative B.

Cessation of ranching activities would change vegetation composition in the 7,500 acres. Native annual forb abundance and species richness would likely decline as plant biomass and vegetation height increase and accumulate in the absence of livestock grazing (Hayes and Holl 2003; Skaer, Graydon, and Cushman 2013). Cover of the coastal prairie indicator species, California oatgrass, would also likely decline substantially (Hayes and Holl 2003, 2011). Some invasive species, especially velvetgrass, are likely to increase (Foin and Hektner 1986; Hayes and Holl 2003). Coastal scrub is likely to encroach into open grassland; complete conversion of coastal prairie to coyote brush-dominated coastal scrub could take place within 15 to 25 years (Ford and Hayes 2007), resulting in loss of grassland habitat and substantially increasing woody vegetative fuels and the probability of large, intense wildfires. Those state-listed/other rare plant species (i.e., Mount Vision ceanothus) that benefit from cattle grazing would suffer adverse impacts from the removal of livestock grazing as well as from the increase in fire hazard.

Prescribed livestock grazing and an increase in mechanical and chemical control of shrubs and invasive plants could help to reduce the adverse impacts of removing cattle grazing on grassland species.

Federally Listed Plants. Under alternative D, the beneficial impacts of ranching on federally listed plants would be similar in type to those described for alternative A. Like alternative B, adverse impacts would be reduced by implementation of a zoning framework. The cessation of ranching on 7,500 acres of the planning area could negatively affect several species. Sonoma alopecurus and Sonoma spineflower could experience adverse impacts because both species benefit from moderate grazing, and populations on the AT&T ranch could decline due to a reduction in grazing. The cessation of grazing on the F Ranch would eliminate the potential threat of cattle trampling to all 15% of Tidestrom's lupine occurrences that are not currently excluded from grazing. Likewise, removing grazing on the Cheda Ranch could negatively affect populations of Marin dwarf flax and potentially suitable habitat for Tiburon paintbrush. Both populations of rare plants in serpentine soils have been shown to benefit from moderate levels of grazing and soil disturbance by cattle. While these plants do not require grazing to persist, the lack of grazing on the Cheda Ranch portion of Nicasio Ridge could reduce plant vigor or reproduction because of

competition with other plants. NPS could use prescribed grazing to offset any documented adverse impacts of eliminating grazing, but prescribed grazing would occur at a smaller scale than cattle grazing under existing conditions. On the other hand, the closure of the AT&T, F, and K Ranches under alternative D could have beneficial impacts on beach layia and Tidestrom's lupine by reducing the potential for cattle to trample plants within grazed pastures or infrequently breach pasture fences and trample plants within coastal dunes.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative D would contribute beneficial and adverse impacts from grazing and ranching activities, depending on the species, especially in grasslands on 19,000 acres where grazing would occur. Alternative D would implement a zoning framework that would focus the most intense uses associated with ranching operations in areas that are already highly disturbed and/or altered and remove areas from ranching to protect sensitive species, resulting in beneficial impacts on vegetation compared to existing conditions, especially in riparian areas. Alternative D would also contribute meaningful beneficial and adverse impacts on vegetation, depending on the species, for the 7,500 acres removed from ranching because ranching-related vegetation impacts would cease in those areas. Within these areas, vegetation would change, but removing cattle grazing may not result in overall beneficial impacts on vegetation compared to existing conditions because invasive annual and perennial species such as thistles and grasses may increase, native forb species abundance and richness would likely decrease, shrub would encroach into areas currently characterized as coastal prairie, and invasive perennial grasses would increase. Expansion of the trail network for public use and elk management activities would cause localized adverse impacts in limited areas. When the incremental impacts from alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on vegetation would be adverse for some species and beneficial for others, as described above. On the 7,500 acres where ranching would cease, the incremental impacts of alternative D would contribute most of the cumulative impacts.

Alternative E

Under alternative E, all dairy ranches would be phased out during a five-year period and would convert to beef ranches. As described in chapter 2 and for alternative A, dairy herds are larger than beef cattle herds in the planning area, and most of the dairy cattle remain closer to the developed complexes than beef cattle because dairy cattle are brought into milking barns twice daily. Consequently, livestock herbivory, trampling, and nutrient inputs from fecal deposits are concentrated, resulting in adverse impacts on vegetation in some locations. As noted for alternatives A and B, mitigation measures can limit these adverse impacts to some extent. As a result, phasing out dairy ranches and converting them to beef ranches under alternative E is expected to reduce the acreage of high-intensity-use areas by roughly 75% on those ranches. These locations would experience the biggest change in use and subsequent beneficial impacts under alternative E, although the increase in vegetative cover is likely to be predominantly non-native and potentially invasive. The natural vegetation of the proposed Range subzone would be subjected to limited use by the milking cows, and dairy ranchers currently use the area that would be the Range subzone primarily to graze replacement heifers, which have impacts similar to those of beef cattle. Therefore, the transition to beef ranching in the Range subzone would result in impacts similar in type and intensity to those that currently exist with dairy ranching in these locations.

Under alternative E, spraying and spreading of concentrated dairy cow manure on pastureland would cease. Manure application changes plant species composition (often in favor of weedy species) and increases biomass production, so eliminating this activity would reduce those impacts compared to existing conditions. The removal of manure spreading would occur primarily in the proposed Pasture and Ranch Core subzones, however, so affected plant species would be predominantly non-native, seeded agricultural, or invasive species.

Once the six dairy ranches have converted to beef cattle operations, smaller herds typical of the planning area's beef cattle operations would be dispersed across the Range and Pasture subzones, and general livestock grazing effects would be similar to those described for alternative B. Vegetation in the approximately 86 acres of high-intensity-use areas on former dairies would see appreciable beneficial impacts near developed areas on the former dairy ranches compared to existing conditions, although the increase in vegetation is likely to be predominantly non-native and potentially invasive. An increase in livestock use of the Range subzone may occur, depending on the size of an operation's beef cattle herd compared to the previous dairy operation's replacement heifer herd. The authorized AUs would be consistent with maintaining RDM of 1,200 pounds/acre, so while the intensity of grazing may increase slightly, overall impacts in the Range subzone would be the same type as described under alternative B.

Under alternative E, livestock diversification, including the introduction of sheep, goats, or chickens would not be permitted. Current horse boarding and the chicken operation would no longer be authorized. Removing horse and chicken grazing would allow vegetative biomass to increase, including woody vegetation, which would increase fuel loads and may result in changes in species composition. The areas currently grazed by horses and chicken are near ranch buildings or in annual grass and pastureland vegetation types, so the impacts of grazing removal would primarily affect non-native vegetation; benefits to native vegetation would be limited.

Under alternative E, forage production would be discontinued for all livestock operations, removing these activities from 1,000 acres of the planning area. This would be beneficial for naturally occurring vegetation in the Pasture subzone because these activities involve seedbed preparation, manure spreading, seeding, and harvest mowing; however, the affected plant species would likely be predominantly non-native and potentially invasive, so benefits to native vegetation would be limited. Stopping forage production would be unlikely to result in notable increases in native vegetation without active management intervention because of the abundant agricultural plant and weed seedbank from years of forage production.

Federally Listed Plants. Under alternative E, the beneficial impacts of ranching on federally listed plants would be similar in type to those described for alternative A. Like alternative B, adverse impacts would largely be avoided due to the zoning framework that would only allow livestock grazing, and not high-intensity uses, in the Range subzone where federally listed plants occur. The cessation of dairy ranching and conversion to beef cattle on approximately 6,200 acres under alternative E could impact known occurrences of beach layia and Tidestrom's lupine. For beach layia, approximately 13% of known occurrences are found on the dairies (B and C Ranches), of which half are and would continue to be protected from cattle trampling by existing resource protection exclusion areas; thus, only about 5% of all known beach layia occurrences could be affected under alternative E. Also, although 21% of known Tidestrom's lupine occurrences are found on dairies (A and B Ranches), all are within existing resource protection exclusion areas that would continue to be in place under alternative E, so the only potential impact could occur if cattle breach pasture fences and loaf in coastal dunes where they are unauthorized. Potential impacts from changes in the type of cattle under alternative E would be reduced or minimized through the application of additional mitigation measures to reduce or eliminate impacts as necessary.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute beneficial and adverse impacts from continued grazing and ranching activities, depending on the species, especially in grasslands where grazing would occur. Alternative E would implement a zoning framework that would focus the most intense uses associated with ranching operations in areas that are already highly disturbed and/or altered and remove areas from ranching to protect sensitive species, resulting in beneficial impacts on vegetation compared to existing conditions, especially in riparian areas. In addition, the conversion of the six dairy operations to beef cattle operations would reduce the adverse impacts of concentrated livestock use and continue the same types of adverse and beneficial impacts from beef cattle grazing as described above. Expansion of the trail

network for public use and elk management activities would cause localized adverse impacts in limited areas. When the impacts from alternative E are combined with the incremental impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on vegetation would be adverse on some species and beneficial on others, as described above. The incremental impacts of alternative D would contribute most of the cumulative impacts.

Alternative F

Impacts under alternative F would be similar to those described for the 7,500 acres where ranching would cease under alternative D, but these impacts would extend across the entire planning area. Alternative F would eliminate the ongoing adverse impacts of ranching on vegetation. This means that adverse impacts in the 150 acres of high-intensity-use areas such as holding pastures, water troughs, and mineral supplement sites would cease, and some native plant species are likely to benefit from grazing removal. Currently unprotected riparian areas and those wetlands that are heavily grazed may also benefit from the removal of livestock grazing. Over the long term, however, the cessation of ranching may not result in overall beneficial impacts, especially in grasslands, which constitute 48% of the planning area. Rates of shrub encroachment into grasslands, invasive perennial grasses, vegetative fuels (both herbaceous and woody), and the consequent risk of large, intense wildfires are all likely to increase, resulting in adverse impacts on vegetation.

As noted for alternative D, beneficial impacts of terminating ranching include an initial increase in abundance of native perennial forbs (Hayes and Holl 2003) and a reduction in bare ground and livestock fecal pats that can serve as weed germination sites. In addition, ranching operations would no longer be a pathway for the introduction and spread of invasive species. Cattle grazing or trampling would no longer affect the state listed/other rare plant species—coastal marsh milkvetch, swamp harebell, Point Reyes ceanothus, Marin checker lily, North Coast phacelia, and Point Reyes checkerbloom—although increased wildfire and shrub encroachment into their habitats may attenuate the benefits of livestock removal. Cessation of other ranching activities such as livestock diversification and forage production would increase vegetative cover and biomass. The non-native plants species dominating the areas where these activities occur and the high-intensity-use areas would likely experience the greatest increases. Removing livestock grazing may not substantially increase native grass and forb populations. In a study of livestock grazing removal in Sonoma County coastal prairie, Foin and Hektner (1986) conclude that even after more than a decade with no livestock grazing, native herbaceous perennials had not appreciably increased; rather, invasive perennial species, including velvetgrass, had come to dominate much of the study site. Skaer, Graydon, and Cushman (2013) also found that removing cattle grazing from a Monterey County coastal grassland for three years did not increase native species abundance or richness.

Likely adverse impacts of livestock removal and cessation of other ranching activities such as harvest mowing for forage production under alternative F include substantial increases in plant biomass and vegetation height (Skaer, Graydon, and Cushman 2013). Native annual forb abundance and species richness would decline as a result (Hayes and Holl 2003). An additional adverse impact of an increase in plant biomass with the removal of livestock grazing and ranching activities would be the accumulation of vegetative fuel and the subsequent increase in potential wildfire hazard. Cover of the coastal prairie indicator species, California oatgrass, would also likely decline substantially (Hayes and Holl 2003, 2011). Some invasive species, especially velvetgrass, are likely to increase (Foin and Hektner 1986; Hayes and Holl 2003). Coastal scrub is likely to encroach into open grassland; complete conversion of coastal prairie to coyote brush-dominated coastal scrub could take place within 15 to 25 years (Ford and Hayes 2007), not only resulting in loss of grassland habitat but also substantially increasing vegetative fuels and the probability of large, intense wildfires. Those state-listed/other rare plant species, such as Mount Vision ceanothus, which benefit from cattle grazing would suffer adverse impacts from the removal of livestock grazing and the increase in fire hazard.

Limited prescribed grazing and mowing to maintain parts of the cultural landscape and control weeds could mitigate some adverse impacts of removing livestock operations. Prescribed grazing treatments

often necessitate grazing intensity, animal distribution, and grazing periods different from standard, light- to moderate-intensity grazing associated with ranching. Prescribed grazing would only be used in small portions of the planning area and would not offset the removal of grazing across the planning area.

Under alternative F, NPS envisions providing even more diverse recreational opportunities than those described for alternative B, including development of additional trail linkages and the potential for adaptive reuse of all ranch complexes, including development to support day use and overnight accommodations linked by trails. Most of the hiking, biking, and equestrian route expansion would use pre-existing administrative roads, so new route construction would be limited, similar to alternative B, but could affect a larger percentage of the planning area because of the removal of ranching from the park landscape. Day use and overnight accommodations in the planning area would focus on previously disturbed areas, such as former ranch complexes. Consequently, disturbance to vegetation is likely to be minimal because the expansion of recreational opportunities would result in little new construction. Impacts from expanded visitor opportunities would be similar to those described under alternative B but would increase in intensity across the entire planning area. Increased potential for the introduction and spread of invasive species is the most likely impact.

Overall, alternative F would likely have both beneficial and adverse impacts on vegetation in the planning area, the limited use of prescribed grazing could mitigate some adverse impacts of removing the livestock operations. Once ranching activities have ceased, prescribed grazing would not replace the effects of cattle grazing over the entire planning area.

Federally Listed Plants. The termination of ranching would adversely affect several federally threatened and endangered plants because grazing is the most effective tool for promoting their persistence. Specifically, Sonoma alopecurus could decline because livestock grazing is an important factor for maintaining its habitat through the reduction of competition with other plants (Gennet 2004). Cessation of livestock grazing could also adversely affect the Tiburon paintbrush and Marin dwarf flax on Nicasio Ridge, but these plants are less dependent on grazing than Sonoma alopecurus, and increased elk grazing could potentially offset the adverse impact by reducing competitive plants. Likewise, Sonoma spineflower benefits from a moderate grazing regime and the absence of livestock grazing could adversely impact this species (Parsons and Ryan 2019b). Only a portion of the reintroduced population of showy Indian clover in the planning area is grazed by livestock, but preliminary monitoring data (Jeffery 2016) suggests that the cessation of grazing would adversely affect the species. Prescribed livestock grazing could be used to reduce the adverse impacts that would follow the removal of cattle grazing but would be small scale and would not fully mitigate the adverse impacts to the populations of these species in the planning area. In contrast, beach layia and Tidestrom's lupine would likely benefit under alternative F because existing occurrences on relict dune features within grazed pastures would no longer be subject to trampling by cattle. Also, the potential for livestock to escape designated pastures and trample coastal dunes vegetation would be eliminated.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Impacts under alternative F would be similar to those described for the 7,500 acres where ranching would cease under alternative D, but these impacts would extend across the entire planning area. In the planning area, vegetation would change, and removal of cattle grazing may not result in overall beneficial impacts on vegetation compared to existing conditions because invasive annual and perennial species, such as thistles and grasses may increase, native forb species abundance and richness would likely decrease, shrub would encroach into areas currently characterized as coastal prairie, and invasive perennial grasses would increase. When the incremental impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on vegetation would be adverse to some species and beneficial to others, as described above. The incremental impacts of Alternative F would contribute most of the cumulative impacts.

WILDLIFE, INCLUDING FEDERALLY LISTED SPECIES

Methodology and Assumptions

The impact analysis for wildlife focuses on changes to the presence and distribution of animal species and their habitat from expected changes in grazing and pasture management and ranch diversification. Direct and indirect impacts are qualitatively described in terms of the duration and relative intensity of impact using expert knowledge, professional judgement, scientific research, and communication with park and cooperating agency staff. The analysis considers conservation practices and resource protection measures that would be implemented to minimize adverse impacts under each alternative. Furthermore, impacts are evaluated based on changes in management activities in each subzone (Range, Pasture, and Ranch Core) compared to existing conditions without this zoning framework.

Potential impacts on individuals and populations of special-status species are specifically evaluated. Impacts would depend on the relative sensitivities of individual species because not all species respond the same way to grazing and ranch activities. A species' response to ranching practices is usually also habitat-specific, meaning that not only does each species respond differently to the same activity, but also that a single species may respond differently to the same activity in different vegetation associations or site conditions (Krausman et al. 2011). The overall impacts on a species are evaluated in comparison to its population status in the planning area, focusing on: (1) the alternative's impact(s) on individual animal behavior and the implications for their survival and reproduction; and (2) the alternative's impact(s) on the species' population and the implications on its distribution and abundance.

The area of analysis for impacts on wildlife includes the planning area and other park lands affected by proposed management activities, such as areas of surrounding contiguous habitats that are used by wildlife potentially affected by proposed management activities.

The impact analysis for listed species focuses on potential changes to the presence and distribution of threatened and endangered species and their habitat that could result from actions proposed in the GMP Amendment. Species that were carried forward for detailed analysis due to potential impacts include: (1) California red-legged frog, (2) western snowy plover, (3) California coastal Chinook salmon, (4) Central California coastal steelhead, (5) Central California coast coho salmon (6) California freshwater shrimp, (7) Myrtle's silverspot butterfly, (8) Sonoma alopecurus, (9) Sonoma spineflower, (10) Tiburon paintbrush, (11) Marin dwarf flax, (12) beach layia, and (13) Tidestrom's lupine. For this analysis, the listed salmonids (3, 4, and 5) and California freshwater shrimp are grouped together because of shared habitats; likewise, Myrtle's silverspot butterfly is grouped with the listed plants (8, 9, 10, 11, 12, and 13).

Potential effects on habitat required by listed species are evaluated using maps of existing vegetation communities (i.e., grasslands, coastal dune, coastal scrub, riparian areas and wetlands, and forests and woodlands), in combination with predicted changes in ecosystem processes resulting from proposed agricultural practices and elk management under each alternative. In addition to the effects of habitat disturbance, impacts on individual animals and populations of listed species are evaluated based on predicted changes in competition for resources on ranches and dairies, such as potential changes to inter- and intra-species interactions (e.g., predation, herbivory, and symbiosis).

Alternative A

Under alternative A, wildlife habitat would be subject to grazing at levels similar to existing conditions across 27,000 acres. Impacts on wildlife would continue to result from habitat modification, food web alterations, changes in nutrient cycling, and disturbance. The grazing system, number of cattle, ranch management practices employed, and affected habitats would determine the intensity of impacts. Ranch management activities such as forage production would also continue to affect wildlife.

Mammals

Alternative A would not affect any mammals listed under the ESA because these mammals are absent from the planning area.

Cattle grazing would continue to be subject to RDM standards of Bartolome et al. (2015). This moderate level of grazing on park ranches would maintain habitat for most native mammals. Variable patterns of cattle grazing (i.e., forage utilization) would also continue to promote habitat heterogeneity and species diversity (Payne and Bryant 1994; Vavra 2005). Continued cattle grazing under alternative A would maintain habitat for mammals that prefer relatively short vegetation structure, such as the black-tailed jackrabbit and deer mice but would reduce habitat for those that prefer relatively tall and dense vegetation (Fellers and Pratt 2002). Germano, Rathbun, and Saslaw (2001) reported a general trend of greater abundance of small vertebrates with decreasing levels of RDM in arid grasslands in the San Joaquin Valley of California, suggesting that introduced grasses and forbs create impenetrable thickets for small mammals and that livestock grazing is the best tool for decreasing dense cover (i.e., thatch) created by non-native annual grasses. On the other hand, trampling and soil compaction by cattle could reduce habitat quality for other small to mid-size mammals, including the special-status American badger and Point Reyes jumping mouse (*Zapus trinotatus orarius*) (Collins 1998; Bylo, Koper, and Molloy 2014). Because of the lack of vegetative cover resulting from concentrated livestock use, impacts could also occur in and adjacent to approximately 150 acres of high-impact areas; however, these areas make up approximately 0.5% of the planning area, and no population-level impacts would occur for any mammals at these locations.

Forage production would continue to limit the availability of native habitat on approximately 1,000 acres. Mammals that use these fields could be injured or killed by harvest mowing. Impacts from mowing could reduce species diversity and abundance in pasturelands; however, grasses, forbs, and grains grown on these fields would continue to provide feeding opportunities for Columbian black-tailed deer and numerous small mammals (NPS 1990b). This impact is also discussed below under “Birds.”

Ranchers in the park occasionally use brush control (e.g., mowing), authorized by NPS on a case-by-case basis, to improve livestock forage. Brush control could have short-term impacts on small mammals by injuring or killing animals or destroying habitat for some species but would only be authorized outside spring and summer breeding seasons. However, brush control serves to minimize the encroachment of shrubs into grasslands and enhances habitat for grassland species. Maintaining sufficient acreage of grasslands is important for numerous species native to coastal grassland ecosystems (Ford and Hayes 2007).

Many ranching activities may increase the spread of invasive plants (see discussion under “Vegetation”), which could reduce the quality and availability of wildlife habitat by outcompeting important forage resources and altering habitat structure, especially around high-impact areas. Continued range monitoring and treatment of invasive plant populations would minimize the potential impacts of invasive plants.

Stock ponds would continue to be maintained and provide water sources for mammals, including several special-status bats (i.e., the pallid bat [*Antrozous pallidus*], Townsend’s big eared bat [*Corynorhinus townsendii*], and western red bat [*Lasiurus blossevillii*]). Continued grazing could increase invertebrate prey for bats; studies have reported bats preferentially foraging over cattle because flying insects are attracted to them (Ancillotto et al. 2017). However, agricultural fields and grasslands would fragment habitat for mammals that rely on coastal scrub habitat, such as the special-status Point Reyes mountain beaver (*Aplodontia rufa phaea*) (Bolster 1998). In addition, entanglement and collisions with barbed-wire pasture fences could injure or kill mammals as maintenance activities continue and construction of new fences is authorized. Problem fences include ones that are too high to jump over, too low to crawl under, are difficult to see, or have wires that are loose or too close together (Paige 2012). Under alternative A, wildlife-friendly fencing would be encouraged but not required, and impacts from fences would be

mitigated on a case-by-case basis. As a condition of existing grazing permits, ranchers would be required to remove and dispose of abandoned fences, as directed by NPS.

Temporary disturbance to mammals would continue to result from livestock management activities that include herding, vehicular travel, and use of machinery and heavy equipment on rangelands, pastures, and the ranch complexes. In addition, visitor use on trails and elsewhere in the planning area would continue to temporarily disturb and displace some mammals (Gutzwiller 1995). Impacts on individual mammals would be temporary but could affect animal fitness or reproduction during periods when they are most vulnerable, such as during spring and summer breeding seasons, or the development of young, especially if disturbance occurs multiple times. Overall impacts from human activities on wildlife in the Ranch Core subzone would be minimal because these activities would occur in relatively small areas of residential and agricultural buildings where wildlife habitat is limited, and the species found there are generally habituated or tolerant of disturbance. However, domestic cats around ranch complexes could injure or kill small mammals, an impact discussed further below under "Birds."

Birds, Including Western Snowy Plover (Federally Threatened)

Western Snowy Plovers. Infrequent impacts on nesting western snowy plovers could occur as a result of nest trampling or flushing of adults if cattle were to escape pasture fences and trespass onto beaches and coastal dunes, though snowy plover nest protection measures would continue. NPS would continue to require pasture fences be inspected annually and maintained to minimize the likelihood of cattle on beaches. Continued ranching would also affect western snowy plovers by supporting higher numbers of predatory species, especially common ravens that prey on eggs and chicks (Roth et al. 1999). Forage mowing on approximately 1,000 acres supports increased numbers of ravens by inadvertently killing birds and small mammals that provide carrion for ravens to feed on (Roth et al. 1999). Under alternative A, ranch activities would continue to support increased raven numbers, especially around dairies where ravens may feed on grain provided to cattle (Kelly, Etienne, and Roth 2002). USFWS (2002a) found that because of the indirect impacts associated with increased raven numbers, renewal of permits for ranches in the planning area "may affect, is likely to adversely affect" the western snowy plover. To mitigate potential increased numbers of ravens resulting from agricultural diversification, NPS, in coordination with ranchers, would continue to take actions to reduce feeding opportunities for ravens at ranches and dairies, such as covering feed troughs, cleaning up waste grain around troughs, removing and placing troughs in enclosed structures, and storing harvested crops in enclosed structures. Despite mitigation measures that would reduce raven numbers, alternative A could contribute indirectly to their predation on western snowy plovers.

Other Birds. Livestock grazing in California grasslands maintains habitat values for numerous grassland birds by creating and maintaining a heterogeneous structure and increased native plant diversity in grasslands dominated by non-native annual grasses (Derner et al. 2009; Bartolome et al. 2014; Gennet et al. 2017). DiGaudio, Humple, and Gardali (2015) found that grazed areas in coastal grasslands support more grassland bird species than similar ungrazed areas. Habitat for grassland birds would be maintained as a result of continued livestock grazing via a reduction of shrubs, reduced accumulation of thatch from previous year's herbage, and increased bare ground (DiGaudio 2010). Grazed pastures are important to many species that prefer short vegetation, such as California horned lark (Bylo, Koper, and Molloy 2014), and serve as foraging and roosting sites for shorebirds and waterfowl when winter high tides inundate tidal flat foraging areas (Hickey et al. 2003). Some species found in taller grasslands in the planning area—savannah sparrow, western meadowlark, grasshopper sparrow, and red-winged blackbird (*Agelaius phoeniceus*)—would also respond positively to moderate levels of cattle grazing in these locations (Bock et al. 1993). Vegetation grazing in agricultural fields to less than 15 centimeters could improve foraging habitat for tricolored blackbirds (Tricolored Blackbird Working Group 2007). Continued grazing under alternative A would also maintain habitat for several raptors, including the burrowing owls and ferruginous hawks that generally respond positively to grazing as a result of increased habitat availability due to short, grazed vegetation, or increased prey such as deer mice (Dechant et al. 2002). White-tailed

kites (*Elanus leucurus*), however, are usually found in ungrazed portions of grasslands (HSU Wildlife 2004), presumably because their preferred prey of California meadow voles is usually more abundant in dense, taller vegetation characteristic of ungrazed or lightly grazed areas (Fehmi and Bartolome 2002). As discussed for mammals, the introduction of invasive plant species through ranching activities could reduce available bird habitat.

Ground nests of grasshopper sparrow, northern harrier, and other ground-nesting birds would be susceptible to livestock trampling under alternative A (Jensen, Rollins, and Gillen 1990; Paine et al. 1996; Sharps et al. 2017). Cattle grazing in rangelands could affect species that prefer riparian areas, including the special-status yellow warbler (*Setophaga petechia*), olive-sided flycatcher (*Contopus cooperi*), and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) (Holmes et al. 1999). However, the potential for this type of impact is reduced due to the presence of fencing that prohibits grazing along most perennial streams in the planning area, as discussed below under "Fish." Lastly, as discussed above in the "Mammals" section, bird collisions with barbed wire fences could occasionally injure or kill birds, especially young-of-the-year migratory waterfowl and raptors (Allen and Ramirez 1990). Lastly, domestic cats would continue to be present around ranch complexes. Domestic cats injure or kill numerous birds, and this would be detrimental to species with small population sizes or limited ranges.

Alternative A would maintain food resources for numerous birds that feed on exposed invertebrates and waste seeds from the continued harvest mowing of forage crops (Peach et al. 2011; DiGaudio, Humple, and Gardali 2015). However, mowing, harvesting silage, or occasional tillage during the nesting season could also destroy nests and eggs, kill fledglings, or cause adult birds to abandon their nests (Mitchell, Smith, and Malecki 2000; Tews, Bert, and Mineau 2013). Nesting habitat for ground-nesting birds could also be reduced because birds may not nest on early-cut fields (Diemer and Nocera 2016). Vegetation management activities could eliminate cover for birds that become seasonally dependent on the food and cover provided by forage. DiGaudio, Humple, and Gardali (2015, 2016) measured a decrease after mowing to both the number of breeding bird species detected and the relative abundance of the northern harrier, savannah sparrow, grasshopper sparrow, song sparrow, and red-winged blackbird. Harvest mowing of approximately 1,000 acres in the planning area during the nesting season, March 15 through July 31, would continue to impact birds over the long term. Ongoing dairy ranching activities would continue to promote an unnatural abundance of corvids, European starlings, and brown-headed cowbirds that compete with, prey upon, and parasitize nests of native birds, resulting in continued impacts to birds over the long term.

Fish, Including Coho Salmon (Federally Endangered), Steelhead (Federally Threatened), and Chinook Salmon (Federally Threatened)

Salmon and Steelhead. Continued ranching under alternative A could affect aquatic habitat used by coho salmon, steelhead, and Chinook salmon from soil erosion and sediment and pollutants transported in stormwater runoff from grazed rangelands, pastures, and ranch complexes, which could contribute to sedimentation delivery and stream pollution. Sediment inputs into streams could affect potential salmon and steelhead habitat by reducing pool depths, increasing gravel embeddedness, and creating wider, shallower stream channels. Sediment-laden runoff could indirectly affect fish via reduced foraging and potential gill clogging (Berg and Northcote 1985; Newcombe 1994). However, cattle are excluded from direct access to Lagunitas and Olema Creeks, the two most significant streams occupied by coho salmon, steelhead, and Chinook salmon in the planning 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 that support salmon or steelhead. Forage production would continue to be authorized on approximately 190 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. Water quality has been improving in Lagunitas and Olema Creeks for the past two decades (Voeller et al. 2018) and is expected to continue to improve from

the implementation of management activities and mitigation measures such as reducing cattle numbers, using exclusionary fencing, relocating water sources away from sensitive resources, deferring grazing during specific critical or vulnerable periods (e.g., spawning), and keeping cattle off saturated soils on a case by case basis. Impacts from stormwater runoff would be avoided or minimized through continued application of the RDM standard.

NPS consulted with NMFS prior to the previous renewal of lease/permits in the planning area, and NMFS (2004) concluded that ongoing ranching activities would "not likely jeopardize" the continued existence of coho salmon, steelhead, and Chinook salmon and would not likely "destroy or adversely modify" coho salmon critical habitat. Although the impacts on coho salmon, steelhead, and Chinook salmon described above would generally continue under alternative A, ranchers would continue to identify and implement management activity standards and mitigation measures (see appendix D) to reduce impacts on water quality and fish habitat.

Other Fish. Continued ranching under alternative A could affect other fish indirectly via sediment and pollutants transported in stormwater runoff from grazed rangelands, pastures, and ranch complexes, as described above for salmon and steelhead (see "Water Resources" section). However, impacts on fish would be mostly avoided or minimized via management activity standards and mitigation measures (see appendix D) where applicable to authorized activities. Cattle grazing in riparian areas, which would only occur along a small portion of perennial streams under alternative A, could reduce riparian vegetation that provides important cover and shade for fish and habitat for invertebrate prey. In localized areas, reduced plant cover could cause elevated water temperatures to a level unsuitable for native fishes because warmer water holds less dissolved oxygen (Belsky, Matzke, and Uselman 1999). Other ranch activities that could indirectly affect fish include manure spreading on beef and dairy ranches, nutrient management at dairies, and other ground disturbance from ranch activities. Manure spreading, mostly associated with dairy operations, would occur on approximately 2,500 acres over a period of years with spreading occurring on a portion of this acreage annually. Little if any manure spreading would occur in the Tomales Bay watershed. In proximity to pastures where manure could be spread as fertilizer, potential runoff of nutrients could continue to cause long-term, adverse impacts on aquatic wildlife; however, manure application would only occur during dry conditions to minimize erosion and runoff.

Reptiles and Amphibians, Including California Red-legged Frog (Federally Threatened)

California Red-Legged Frogs. Cattle grazing under alternative A would continue within California red-legged frog habitat, impacting habitat via removal of emergent vegetation important for cover and anchoring egg masses or via trampling of individuals or eggs (USFWS 2002b). Cattle grazing could also reduce habitat for invertebrates that provide prey to juveniles and adults. Bank trampling by cattle could cause sedimentation and thereby decrease the pond depth of approximately 120 ponds that potentially support California red-legged frog breeding, but NPS would continue to perform pond restoration by removing sediment on a case-by-case basis (see appendix D). Adult California red-legged frogs can move miles from breeding habitat into upland areas, and the most suitable breeding ponds dry out during late summer or fall. California red-legged frogs sheltering in upland locations would be at risk from livestock trampling or habitat alteration throughout most of the planning area. Lastly, nutrient inputs from cattle manure could affect the primary productivity of ponds and streams and affect California red-legged frogs (USFWS 2002b). However, 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 by preventing emergent vegetation such as cattails or bulrushes from becoming dominant or by limiting the growth of dense annual grasses around ponds, which reduce both the amount of open water habitat and the duration of pool inundation (USFWS 2002b; Huntsinger, Bartolome, and D'Antonio 2007). Despite potential adverse impacts, there are no known population declines due to ranching in the park, and USFWS (2002a) reported that grazing in the planning area is generally "compatible with sustaining California red-legged frog populations and habitat suitability." Thus, USFWS (2002a) concluded during previous consultation that the renewal of grazing

lease/permits in the planning area "may affect, is likely to adversely affect" the California red-legged frog and was "not likely to jeopardize" the continued existence of the species. Although USFWS (2002a) also found that continued grazing could disturb critical breeding habitat in some stock ponds, USFWS determined that those effects would be temporary and short term and that renewal of lease/permits would "not likely destroy or adversely modify" designated California red-legged frog critical habitat in the planning area. Habitat conditions for California red-legged frog have not noticeably changed since 2002. Therefore, continued ranching under alternative A would result in similar adverse impacts on individual California red-legged frogs but would be unlikely to cause any population declines or adversely modify critical habitat.

Other Reptiles and Amphibians. Under alternative A, ranchers would continue to maintain approximately 120 stock ponds in the planning area that provide essential breeding habitat for several amphibians, including the special-status coast range newt (*Taricha torosa*). Impacts on other amphibians from cattle use of these waterbodies would be similar to those described above for California red-legged frog.

Direct impacts to known occurrences[10] of western pond turtle could occur near several ponds in the planning area from trampling of adults and nests (Hayes et al. 1999; Fidenci 2000), although other evidence suggests that moderate grazing practices would not substantially reduce habitat suitability for this aquatic turtle (East Contra Costa County Habitat Conservancy 2006). Continued grazing would maintain habitat for some reptile species via disturbance that increases invertebrate abundance, as observed by Reinsche (2008) where lizard density was significantly greater in grazed areas than ungrazed annual grasslands in Alameda and Contra Costa Counties. Lizard densities decreased with increased vegetation height and thatch density (RDM levels). Similarly, Jones (1981) found that western fence lizard (*Sceloporus occidentalis*) populations averaged three times greater density in grazed grasslands compared to ungrazed grasslands and concludes that seasonal, managed grazing by moderate cattle densities in California's annual grasslands tends to create favorable conditions for the western fence lizard and western skink (*Plestiodon skiltonianus*). However, based on previous studies in the planning area (Fellers and Pratt 2002), grazing could reduce the abundance of northern alligator lizard (*Elgaria coerulea*). Fellers and Pratt (2002) also reported that western terrestrial garter snakes (*Thamnophis elegans*) were less abundant in a heavily grazed site than in a moderately grazed site.

As described above in the "Fish" section, ranch activities could potentially affect reptiles and amphibians via pollutants in storm runoff. However, ranchers would avoid or minimize impacts on wetlands and riparian areas by continuing to exclude cattle from most riparian areas and implementing management activity standards and mitigation measures to comply with state and federal clean water regulations.

Invertebrates, Including Myrtle's Silverspot Butterfly (Federally Endangered) and California Freshwater Shrimp (Federally Endangered)

Myrtle's Silverspot Butterflies. Most documented occurrences of Myrtle's silverspot butterflies in the planning area are in pastures grazed by cattle. At the time of the species' listing, USFWS believed that cattle grazing significantly decreased habitat quality for the Myrtle's silverspot butterfly. However, USFWS's five-year status review found that a moderate grazing regime, which would be provided under alternative A by continued application of the minimum RDM standards of Bartolome et al. (2015), does not adversely affect the distribution of Myrtle's silverspot butterfly (USFWS 2009a). Cattle 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 in localized areas (Murphy and Launer 1991). Inadvertent trampling by cattle of the host plants, the western dog violet, could be a

[10] Occurrences document the areas surveyed for threatened and endangered animals in which a species is, or was, present. In many cases, an occurrence represents several observations of multiple individuals or multiple visits at a given location.

relatively minor threat, although the impacts of grazing on the persistence of host plants is unknown (Adams 2004). However, the presence of host plants alone does not reliably predict the presence of the Myrtle's silverspot butterfly (Launer et al. 1992), and USFWS (2009a) recommends further studies on the effects of grazing on the violet host plant. Other ranch activities could have adverse impacts on Myrtle's silverspot butterflies as well, such as collisions with vehicles, tractors, or other ranch equipment, or vehicles causing excessive dust from ranch roads on host and nectar sources or larvae development (USFWS 2002a). Lastly, ranching activities could cause ground disturbance and affect the distribution and abundance of nectar sources, including the potential spread of non-native nectar sources such as bull thistle (*Cirsium vulgare*) and Italian thistle (*Carduus pycnocephalus*) (USFWS 2002a). After reviewing the status of the Myrtle's silverspot butterfly in the park and potential impacts on it from ranch activities, the USFWS (2002a) determined that ranching "may affect, is likely to adversely affect" the Myrtle's silverspot butterfly due to potential "harassment to all Myrtle's silverspot butterflies inhabiting 13,510 acres on the B, C, D, E, F, G, I, J, N, and the Home Ranch." Although there have not been formal Myrtle's silverspot butterfly surveys in the park in recent years, NPS (2019h) has recorded occurrences on B, D, E, F, G, J, N, and K Ranches. Overall habitat conditions for Myrtle's silverspot butterfly and the impacts of ranching are largely unchanged since 2002. Under alternative A, potential adverse impacts on the species would be offset by managed grazing at moderate levels that promotes the availability of nectar sources, thereby maintaining suitable habitat for Myrtle's silverspot butterfly.

California Freshwater Shrimp. Under alternative A, California freshwater shrimp would continue to experience localized, short-term impacts associated with the indirect effects of grazing and ranch activities on water quality, as described above under "Salmon and Steelhead." Erosion would be minimized from grazed lands through application of RDM standards and management activity standards and mitigation measures to reduce sediment- or pollutant-laden stormwater runoff from ranches. No direct impacts on aquatic habitat occupied by California freshwater shrimp would occur because cattle are excluded from grazing along Lagunitas and Olema Creeks, except infrequently if cattle breach pasture fences. As a result of the limited potential for impacts, USFWS (2002a) determined that the renewal of ranching lease/permits "may affect, is not likely to adversely affect" California freshwater shrimp. The long-term population trend of California freshwater shrimp is increasing in the planning area (USFWS 2011b). Although numbers of California freshwater shrimp collected during salmonid monitoring in the Lagunitas Creek watershed do not show a detectable trend (MMWD 2017a), the species has increased in Olema Creek in recent years (Serpa 2016). Because continued ranching would not generally affect the riparian and instream habitat features required by California freshwater shrimp (see Martin, Saiki, and Fong 2009), alternative A would have no long-term, adverse impacts on the species.

Other Invertebrates. Under alternative A, the plant diversity of rangelands would generally remain in its current state or increase (Hayes and Holl 2003; Johnson and Cushman 2007), potentially resulting in improved habitat for invertebrates. There is little published research on insects in California prairie ecosystems (Holstein 2011). As described for other taxa, adverse impacts on many invertebrates could occur in the 150 acres of high-intensity-use areas from heavy grazing (Debano 2006; Louis 2016) but would be minimized by adherence to minimum RDM standards at the end of the growing season (Bartolome et al. 2015). Disturbance by cattle grazing creates a varied vegetation structure that provides a mosaic of habitat conditions suitable for a large array of grasshoppers and butterflies (Jerrentrup et al. 2014), ground-dwelling beetles, ants, and likely other native invertebrate species. Cattle manure would also continue to support a diversity of specialist dung fauna. Lastly, by consuming non-native annual grasses, cattle grazing would promote the growth of native forbs required by flying insects that feed on flowering plants, including sawflies, wasps, bees, and ants (Order: Hymenoptera) and butterflies and moths (Order: Lepidoptera) (USFWS 2009b, Holstein 2011; Barry et al. 2015).

Cumulative Impacts

Coastal dune restoration projects could have temporary, adverse impacts on wildlife that inhabit coastal dunes, including small mammals and shorebirds, via temporary displacement or disturbance of

individuals from noise or the presence of humans. Raptors that forage in dune habitat could also be temporarily affected. Removing non-native dune species and converting to native dune habitat, however, would have long-term benefits for most wildlife species. Dune restoration projects are scheduled after the shorebird nesting season but could potentially disturb western snowy plover fledglings or adults during fall or winter. NPS would minimize the potential for disturbance by conducting plover surveys during the breeding season to locate plover nests and broods and would establish a minimum 500-foot buffer between an active nest and restoration activities (NPS 2015b). The removal of invasive plants from coastal dunes would have long-term benefits for snowy plovers and other nesting shorebirds by creating suitable nesting habitat and reducing dense cover for some predators.

The Lagunitas Creek habitat enhancement projects would have temporary impacts on aquatic wildlife, including fish, reptiles, and amphibians via sediment inputs into streams during construction activities. Access routes through the riparian ecosystem would also disturb wildlife and degrade habitat, which would affect birds, small mammals, and amphibians. However, management activity standards and mitigation measures would be implemented to reduce adverse impacts. These projects would have overall long-term, beneficial impacts on aquatic wildlife from enhanced aquatic habitat, improved water quality, and restored natural ecosystem processes. Instream and floodplain habitat restoration would have long-term benefits on federally listed coho salmon, Chinook salmon, steelhead, California red-legged frog, and California freshwater shrimp. Access routes would be cleared of non-native plants that may invade the disturbed areas and replanted with native riparian species, eventually allowing wildlife habitat in the riparian zone to recover to pre-construction conditions.

The park's fire management program and agreement with Marin County for wildland fire operations and response would include prescribed fire and mechanical treatments. Both types of fire operations would remove vegetation and organic matter on the surface and expose the soil to erosive processes, which could temporarily destroy habitat for wildlife, including federally listed species. For example, increased sedimentation in creeks and/or persistent turbidity following wildland or prescribed fires could affect habitat used by coho salmon, steelhead, Chinook salmon, California red-legged frog, and California freshwater shrimp. The short-term, adverse impacts from wildfire or fire suppression activities would depend on the fire's extent and severity and would be minimized by guidance and mitigation measures provided in the NPS (2004b) plan. However, native species are adapted to periodic fire and would thus recover over the long term, and wildfire could benefit wildlife by providing a greater diversity of habitats, stimulating seed germination, or improving habitat for prey species.

Road improvements projects at Point Reyes include repairs to roads, parking areas, and drainage features, all of which could disturb vegetation and temporarily increase sediment or pollutant runoff, resulting in short-term, adverse impacts on wildlife, including federally listed Myrtle's silverspot butterfly, California red-legged frogs, and western snowy plover. This project would also disturb soils and increase potential soil erosion and sedimentation of nearby surface waters but would benefit aquatic wildlife through improved water flow that would enhance habitat in the long term. NPS would employ appropriate mitigation measures to minimize any potential short-term impacts on wildlife during construction.

Corvid management in the park includes removing debris, covering feed bins, and installing riparian fencing. Corvid management would benefit the federally threatened western snowy plover and other birds that nest in the planning area by reducing the abundance of ravens, which predate on nests and chicks.

Invasive plant management in the park could involve vegetation clearing, which could affect wildlife such as invertebrates, including the federally listed Myrtle's silverspot butterfly. Compliance with the NPS's IPM regulations and procedures and applicable state pesticide regulations would dictate appropriate herbicide application methods to minimize any adverse impacts on fish, amphibians, and aquatic invertebrates. Herbicide treatments are not likely to enter surface waters by spray drift and runoff, and therefore not likely to adversely affect aquatic wildlife, including the federally listed coho salmon, steelhead, Chinook salmon, California red-legged frog, and California freshwater shrimp.

Overall, these past, present, and reasonably foreseeable future actions have and would continue to have adverse and beneficial impacts on wildlife, depending on the species. As described above, adverse impacts would occur from disturbance associated with ranching activities and altered habitat conditions, while beneficial impacts related to maintaining key habitats such as grasslands and stock ponds would continue. When the incremental impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions in the planning area, the overall cumulative impact on wildlife would continue to be adverse or beneficial, depending on the species, as described above. The incremental impacts of alternative A would continue to contribute most of the overall cumulative impacts. Overall, impacts on wildlife would remain consistent with existing conditions.

Alternative B

NPS would establish a zoning framework of Resource Protection, Range, Pasture, and Ranch Core subzones that would limit impacts on wildlife from authorized activities such as ranch diversification. The 1,200 acres added to the Resource Protection subzone would remove grazing from sensitive resources such as riparian areas, surface waters, and federally listed wildlife habitat. Impacts on wildlife would also continue to be avoided, minimized, or mitigated through the implementation of mitigation measures for authorized activities on ranches (see appendix D). Additional details regarding the potential impacts on federally listed species under alternative B are included in the BAs (appendices K and L) under "Section 8: Effects to Evaluated Species and Determinations."

Mammals

Alternative B would not affect any mammals listed under the ESA because these mammals are absent from the planning area.

Cattle grazing under alternative B would continue at similar levels as existing conditions. However, grazing would be the only authorized activity near riparian areas and other sensitive habitats, and the additional 1,200 acres of resource protection areas would protect riparian areas and surface waters that are critical to mammals. The potential impacts of fences on mammals would be reduced because the installation of any new permanent or temporary fencing would generally be required to be "wildlife friendly," unless otherwise approved by NPS, in accordance with proven methods (e.g., Karhu 2008; Paige 2012).

Impacts on small mammals from harvest mowing would still occur on approximately 1,000 acres, and manure spreading would continue on approximately 2,500 acres, or 9% of the planning area over a period of years, with application on a portion of this acreage annually. Impacts would be reduced because those areas would be restricted to the Pasture subzone, which does not contain habitat for special-status species. Also, pastures would no longer be tilled, providing crop residue for food, cover, and shelter for small mammals (USDA-NRCS 2013). The additional allowance of 2.5 acres of no-till row crops other than forage in previously disturbed areas in the Ranch Core subzone could increase or decrease food and cover for mammals, depending on the crops planted and the adjacent habitats.

Under alternative B, continued grazing would help control the encroachment of shrubs and herbaceous fuel loads (i.e., annual grasses) and maintain habitat for mammals that depend on grasslands but reduce habitat for species that prefer coastal scrub. Within the Range subzone, ranchers could request to manage shrubs to maintain or enhance grasslands for forage production using mechanical removal (e.g., mowing) after additional site review. If approved, specific areas would be identified in the ranch ROA and mitigation measures would be incorporated to reduce threats to wildlife by avoiding brush control during the nesting season. Further details about specific mitigation measures can be found in appendix D.

Under alternative B, impacts from authorizing sheep and goat grazing in the Pasture subzone as a diversification activity would be limited because the Pasture subzone would be approximately 34% of the planning area and because sheep would not exceed 10% of the authorized AUs for each ranch and would be managed with no permanent fencing. The authorization of other livestock up to 10% of permitted AUs

in the Pasture subzone would be part of a ranch's total authorized AUs, so impacts from cattle grazing would be reduced concurrently in the Range subzone. Sheep and goat grazing could generally benefit mammals in the Pasture subzone by providing another method for controlling noxious weeds that reduce wildlife habitat.

The types of impacts on mammals from existing ranch activities in the Ranch Core subzone under alternative B would be the same as those described for the ranch complexes for alternative A. Because of the diversification activities under alternative B, the magnitude could be greater as a result of disturbance from the newly authorized activities (see chapter 2). However, potential impacts would be limited in scale because the Ranch Core subzone would be less than 1% of the planning area, contains poor quality habitat, and is used by mammals that generally tolerate human disturbance. In addition to sheep and goats, pigs and chickens could be allowed in the Ranch Core subzone, which could reduce habitat for small mammals. Human activity in the Ranch Core subzone could also increase from the authorization of farm stays, farm tours, small-scale processing of dairy products, horse boarding, and sales of local agricultural products. Because the Ranch Core subzone would be small and contain little habitat, the effects on native mammals from such activities would be minimal.

Development of new or expanded trails and roads, trailheads, and parking lots would be considered under alternative B. Temporary impacts from construction activities could occur, and visitor use on trails and elsewhere in the planning area would continue to temporarily disturb and displace some mammals. However, new impacts would be limited because most trails would use existing administrative routes, and accommodations for day and overnight use would reuse existing ranch complex buildings where species are likely adjusted to human disturbances. Therefore, new development related to public use and enjoyment would result in short-term, adverse impacts on wildlife resources during construction. Long-term impacts are not anticipated.

Birds, Including Western Snowy Plover (Federally Threatened)

Western Snowy Plovers. Impacts on nesting or overwintering western snowy plovers under alternative B would be similar to those described under alternative A. The potential for unauthorized livestock on beaches would be reduced by two new resource protection areas to protect coastal watersheds on the E and F Ranches, approximately 20 and 120 acres in size, respectively. Mitigation measures, described under alternative A, would reduce potential impacts from increased numbers of ravens associated with agricultural diversification. Other food sources would remain available to ravens in the planning area, so it is uncertain whether alternative B would reduce indirect impacts of ravens. Over the long term, ranch activities that support the continued unnatural abundance of ravens could still indirectly affect western snowy plovers. The BA (appendix K) further details these potential impacts.

Other Birds. The types of impacts to birds from continued ranching under alternative B would be the same as those described under alternative A, but impacts could be reduced by additional mitigation measures for certain authorized activities. As described above under "Mammals," forage production would continue on approximately 1,000 acres, continuing potential impacts on birds from harvest mowing. Where necessary, NPS, in coordination with ranchers, would take actions to reduce impacts from harvest mowing to avoid or minimize impacts on ground-nesting birds (see Ochterski 2006). Apart from silage harvest, harvest mowing would be scheduled outside the nesting season, from August 1 through October 15. The additional allowance of 2.5 acres of no-till row crops other than forage in previously disturbed areas in the Ranch Core subzone could increase or decrease bird habitat and provide food resources for some species, depending on the crops planted and the adjacent habitats. Ongoing dairy ranching activities would continue to promote an unnatural abundance of corvids, European starlings, and brown-headed cowbirds that compete with, prey upon, and parasitize nests of native birds, resulting in continued impacts to birds over the long term.

Fish, Including Coho Salmon (Federally Endangered), Steelhead (Federally Threatened), and Chinook Salmon (Federally Threatened)

Salmon and Steelhead. The types of impacts on coho salmon, steelhead, and Chinook salmon under alternative B would be the same as those described for alternative A. Short-term impacts on water quality in streams could also occur from the construction of new trails and roads, other classes of livestock grazing in the Pasture and Ranch Core subzones, ranch diversification activities, and any new construction, development, or increased human activity in the Ranch Core subzone. However, the scale and intensity of these impacts would be reduced compared to alternative A by implementing the zoning framework, applying mitigation measures from appendix D for standard ranching activities, and new resource protection areas that would exclude cattle from approximately 2.4 miles of perennial streams in the Lagunitas and Olema Creek watersheds. The new resource protection areas added to the Resource Protection subzone include riparian exclosures on the Stewart, Percy, Zanardi, McFadden, Cheda, and Giacomini ranches. New resource protection areas would also prevent cattle grazing along 1.6 miles of streams in the Drakes Estero watershed, on Home Ranch Creek, and in the tributary to Creamery Bay. Under alternative B, diversification activities, such as new types of livestock in the Ranch Core and Pasture subzones and row crops and horse boarding in the Ranch Core subzone, could have indirect impacts on water quality in streams potentially occupied by coho salmon, steelhead, and Chinook salmon. However, impacts would be reduced compared to existing conditions through the implementation of mitigation measures that would minimize or prevent adverse impacts and by additional acreage of potential habitat in the Resource Protection subzone. The BA (appendix L) provides further detail about these potential impacts.

Other Fish. Livestock grazing under alternative B would have the same types of impacts on fish habitat as described under alternative A, but zoning, including the Resource Protection subzone and the application of mitigation measures for newly authorized ranch activities would ensure that impacts are avoided or minimized. Furthermore, the Range subzone, where only grazing would be authorized, contains nearly 99% of the streams, ponds, and wetlands still available for ranching under alternative B, minimizing impacts on fish that could result from the more intensive agricultural activities authorized in the Pasture and Ranch Core subzones. The Resource Protection subzone would protect approximately 544 acres in the Drakes Estero watershed, approximately 315 acres more than under existing conditions, including resource protection areas to prevent cattle grazing along the Drakes Estero shoreline in portions of Creamery Bay, Schooner Bay, and Home Bay. New exclusion areas would also prevent grazing and provide riparian buffers along approximately 1.35 miles of perennial streams, including Schooner Creek between the D. Rogers and M Ranches, lower Home Ranch Creek and the adjacent Home Bay tributary, and the inlet of Creamery Bay. In the Olema Creek watershed, new resource protection areas would restrict grazing from approximately 1.9 miles of riparian habitat that covers approximately 33 acres. 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 areas would be implemented along other reaches of important aquatic habitat. These changes would provide beneficial impacts compared to existing conditions.

Grazing by other types of livestock authorized in the Ranch Core and Pasture subzones could indirectly impact fish via reduced water quality from increased sediment or pollutants in stormwater runoff. Increased ground disturbance from diversification activities could also indirectly impact fish habitat from erosion and sediment transported in stormwater runoff. However, such impacts from nonpoint source pollution would be mostly avoided because no aquatic resources, including surface waters, occur within the Pasture and Ranch Core subzones, and mitigation measures (see appendix D) would be implemented to meet the SWRCB regulations for waste management. Additionally, application of commercially produced compost and fertilizer would not be authorized, and manure spreading on approximately 2,500 acres in the planning area would require an NPS-approved nutrient management plan.

Reptiles and Amphibians, Including California Red-legged Frog (Federally Threatened)

California Red-Legged Frogs. The types of impacts on California red-legged frogs under alternative B would be the same as those described for alternative A. The zoning framework would reduce adverse impacts by authorizing the most intensive agricultural practices only in the Pasture and Ranch Core subzones, where habitat for California red-legged frogs is limited. All breeding habitat would fall in the Range subzone, where only cattle grazing would occur, which would provide a beneficial impact compared to existing conditions. California red-legged frogs that disperse into uplands after breeding could occur in all subzones and would be vulnerable to trampling by other classes of livestock, vehicle collision, or other increased human activity associated with ranch diversification. However, only 10% of known California red-legged frog occurrences are found in the Pasture or Ranch Core subzones and mitigation measures associated with management activity standards (see appendix D) would be implemented to avoid or minimize impacts. Applicable mitigation measures would be required for any authorized diversification practices, which could include harvest mowing, except silage, between August 1 and the first autumn rains; performing pre-construction surveys of suitable wetland habitat and adjacent uplands surveys for projects in potential California red-legged frog habitat; and monitoring ground-disturbing activities within 300 feet of suitable habitat and halting work activities that may adversely affect California red-legged frogs until they no longer occupy the project area (see appendix D). Further detail about these potential impacts is found in the BA (appendix K).

Other Reptiles and Amphibians. The types of impacts on reptiles and amphibians under alternative B would be the same as those described for alternative A, but the intensity of the adverse impacts would be reduced through the protection of several wetlands and riparian areas as part of the additional 1,200 acres of resource protection areas. For example, harvest mowing, except for silage, would only occur during dry periods, which would minimize soil disturbance and machinery-related mortality of amphibians and reptiles. Beneficial impacts would continue for several species of lizards and snakes that prefer grazed annual grasslands due to the reduction of thatch. Also, as described above under "Fish" and in the "Water Resources" section, alternative B could adversely affect water quality and indirectly affect amphibian habitat, but ranch mitigation measures would minimize impacts.

Invertebrates, Including Myrtle's Silverspot Butterfly (Federally Endangered) and California Freshwater Shrimp (Federally Endangered)

Myrtle's Silverspot Butterflies. The types of impacts on Myrtle's silverspot butterfly under alternative B would be the same as those described for alternative A. Overall, grazing would continue to benefit the species by removing vegetation that may compete with Myrtle's silverspot butterflies' host and nectar plants and minimizing vegetative cover, which could increase nectar sources and improve the ability of butterflies to detect host and nectar plants (Adams 2004). Applicable mitigation measures would be specified in ROAs and reviewed annually to minimize the potential impacts of ranching on Myrtle's silverspot butterfly habitat. For any authorized projects, NPS biologists would conduct surveys to determine if suitable habitat is present for Myrtle's silverspot butterflies in the project area, including larval host plants or nectar sources. Host plants would be protected with a clearly demarcated 20-foot buffer zone. Potential changes in visitor use, especially along trails, could cause ground disturbances that would affect the distribution and abundance of nectar sources, including the potential spread of non-native nectar sources such as bull thistle. Potential impacts are detailed further in the BA (appendix K).

California Freshwater Shrimp. Under alternative B, the indirect impact of ranching on water quality in streams potentially occupied by California freshwater shrimp would be similar to that described for alternative A, and the types of impacts on California freshwater shrimp from continued ranching under alternative B would be the same as those described for alternative A. Although ranch diversification practices could increase potential ground disturbance within the Pasture and Ranch Core subzones compared to existing conditions, mitigation measures would be implemented to minimize the intensity of any impacts related to erosion and sediment-laden stormwater runoff. The BA (appendix K) provides further details about potential impacts.

Other Invertebrates. The types of impacts on invertebrates from continued ranching under alternative B would be similar to those described for alternative A but could be reduced by not authorizing the application of commercially produced compost and fertilizer. Adverse impacts on invertebrates could occur in localized areas, and while there are no specific mitigation measures for invertebrates, impacts on invertebrate habitat would be avoided or minimized by mitigation measures focused on other resources monitored by NPS.

Cumulative Impacts

The impacts on wildlife from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would reduce some potential adverse impacts of grazing and other ranch activities compared to existing conditions because the establishment of the Resource Protection subzone as part of the zoning framework would improve habitat values for many species, especially those that use riparian areas and coastal dunes. When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impacts on wildlife, would remain beneficial or adverse, depending on the species, as described above. The incremental impacts of alternative B would contribute a majority of the overall cumulative impacts. Overall, adverse impacts on wildlife would decrease compared to existing conditions from the implementation of a zoning framework.

Alternative C

Under alternative C, impacts on wildlife from cattle grazing and other ranch activities would be the same as those described for alternative B with the exception of elk management. Removal of the Drakes Beach herd would be a one-time event, occurring over approximately six months. However, this would not have a noticeable impact on other wildlife. Therefore, the direct, indirect, and cumulative impacts of alternative C would be the same as described for alternative B.

Alternative D

The types of impacts on wildlife under alternative D would be similar to those described under alternative A, but the intensity would be different because ranching would not occur on approximately 7,500 acres of the planning area where beef cattle ranching would cease. On the remaining lands under lease/permit, the implementation of a zoning framework would reduce impacts on wildlife because activities with the potential for the greatest impacts would be focused in areas that are already highly disturbed and/or altered and do not contain sensitive species or habitat.

Mammals

Alternative D would not affect any mammals listed under the ESA because these mammals are absent from the planning area.

The types of impacts on mammals from cattle grazing in the Range subzone would be similar to that described under alternative A, but impacts would occur on approximately 7,500 fewer acres, reducing the acres impacted to 19,000. On the 7,500 acres where ranching would no longer be authorized, mammals that prefer shrublands, such as the Point Reyes mountain beaver, would benefit from the encroachment of shrubs and increased habitat. Habitat would be reduced relative to existing conditions for mammals that prefer relatively short vegetation structure, such as the black-tailed jackrabbit and deer mice (Fellers and Pratt 2002). On areas where ranching is authorized, grazing would continue to benefit small mammals that prefer grassland habitat with less dense vegetation (i.e., reduced thatch). In addition, large-ranging mammals would benefit from the habitat heterogeneity provided by variable grazing intensities, and an increased mosaic of grazed and ungrazed habitats across the planning area (Fuhlendorf and Engle 2004). Impacts of human disturbance on mammals from ranching activities in the Ranch Core subzone would remain the same or increase, depending on the agricultural diversification activities authorized. However, the Ranch Core subzone would be less than 1% of the planning area and contains poor quality habitat used by species that generally tolerate human disturbance. Furthermore, the implementation of applicable

mitigation measures for authorized ranch diversification activities, provided in appendix D, would prevent or minimize adverse impacts on mammals.

Birds, Including Western Snowy Plover (Federally Threatened)

Western Snowy Plovers. Impacts of ranching on western snowy plover would be similar to those described for alternative B. Although the cessation of ranching on approximately 7,500 acres would reduce ranch practices that promote an unnatural abundance of common ravens, it is uncertain whether it would reduce impacts on western snowy plovers compared to existing conditions because raven predation can result from a small number of individuals. Mowing of forage on approximately 1,000 acres would continue to provide a potential food source of carrion from dead birds and small mammals. The potential impacts of livestock infrequently escaping pasture fences, trespassing onto beaches, and inadvertently trampling western snowy plover nests would be reduced compared to existing conditions because cattle would be removed from 2 of 10 ranches (AT&T and F) that abut snowy plover habitat on the Pacific coast beaches. Furthermore, the potential for unauthorized livestock on beaches would be slightly reduced by a new, approximately 20-acre resource protection area to protect coastal watersheds on the E Ranch.

Other Birds. As described for alternative A, many grassland songbirds depend on grazing to reduce thatch, increase habitat heterogeneity, or improve foraging conditions. However, ungrazed grasslands in the planning area tend to have a higher avian richness and diversity (Holmes et al. 1999), so numerous species would likely increase on the 7,500 acres of the planning area where livestock would be removed under alternative D. On these lands, there could be an increased availability of seed-producing plants, increased shrubs for perching, and increased cover to evade predators for species of birds that prefer habitats other than grasslands, such as wrentit, orange-crowned warbler, Bewick's wren, spotted towhee, and western scrub-jay. On 19,000 acres where ranching would be authorized, the types of impacts on birds would be similar to those described under alternative A, including forage mowing on 1,000 acres. Ongoing dairy ranching activities would continue to promote an unnatural abundance of corvids, European starlings, and brown-headed cowbirds that compete with, prey upon, and parasitize nests of native birds, resulting in continued impacts to birds over the long term. Adverse impacts would be avoided or minimized through the implementation of a zoning framework and applicable mitigation practices (see appendix D), as described for alternative B.

Fish, Including Coho Salmon (Federally Endangered), Steelhead (Federally Threatened), and Chinook Salmon (Federally Threatened)

Salmon and Steelhead. Habitat for coho salmon, steelhead, and Chinook salmon in the Lagunitas Creek watershed would be subject to lower levels of sediment and pollutants transported in stormwater runoff compared to existing conditions because ranching would cease on approximately 3,000 acres in the Olema Creek and Lagunitas Creek watersheds, including approximately 1,500 acres on the Cheda and Percy Ranches that have steep slopes (see figure 40 in appendix A) and high soil erosion hazard ratings (see figure 41 in appendix A). Impacts would be minimized because livestock would continue to be excluded from direct access to most streams potentially occupied by salmon and steelhead, including Lagunitas and Olema Creeks. The addition of 900 acres of resource protection areas would further protect approximately 5.1 miles of perennial stream, 1.6 acres of ponds, and 130.6 acres of wetlands in the planning area compared to existing conditions. The continued use of mitigation measures would avoid or minimize adverse impacts on salmon and steelhead from livestock grazing and ranch management.

Other Fish. The types of impacts on fish under alternative D would be similar to those described under alternative A, but the intensity of impacts would be reduced compared to existing conditions from the cessation of ranching on approximately 7,500 acres and new resource protection areas. Indirect impacts on fish via reduced water quality could continue to occur downstream of pastures where forage production and manure spreading would be authorized. Beneficial impacts would be greatest in the Drakes Estero and Tomales Bay watersheds, where 5,300 acres of ranching would be eliminated. Indirect impacts on fish from grazing on the remaining 19,000 acres could occur in localized areas via decreased

water quality from polluted ranch runoff during storm events (e.g., sediment and coliform bacteria), but fish habitat would improve from the reduced geographic extent of ranching. Additional mitigation measures (see appendix D) would avoid or minimize potential impacts of authorized activities within the Pasture and Ranch Core subzones.

Reptiles and Amphibians, Including California Red-legged Frog (Federally Threatened)

California Red-Legged Frogs. The types of potential impacts from ranching on California red-legged frogs described under alternative A could also occur under alternative D, but impacts would be on a reduced scale because of the cessation of ranching on approximately 7,500 acres, of which approximately 4,100 acres are within designated critical habitat. Of the approximately 136 known occurrences of California red-legged frog in the planning area, alternative D would eliminate livestock grazing on ranches that support approximately 23% of occurrences, which are mostly associated with stock ponds (NPS 2019h). In the Olema Creek watershed, these locations are associated with stock ponds and riparian areas on the E. Gallagher, C Rogers and McFadden Ranches. On the Point Reyes Peninsula, ranching would no longer have the potential to affect California red-legged frog occurrences associated with stock ponds on the N and K Ranches, Creamery Bay Creek on the F Ranch, and the coastal drainages on the F and AT&T Ranches. Removing grazing from areas around these stock ponds and creeks would benefit individual frogs by reducing direct impacts of cattle trampling but could have overall adverse impacts on individuals by eliminating the beneficial impacts of livestock grazing on preventing emergent and shoreline vegetation cover from becoming overly dense.

Other Reptiles and Amphibians. The types of impacts of ranching on reptiles and amphibians under alternative D would be similar to those described under alternative A but at a reduced scale from the cessation of ranching on 7,500 acres. The implementation of a zoning framework, as described under alternative B, would serve to limit the impacts of more intensive ranch activities, such as cattle concentration areas, ranch diversification activities, and vegetation management, to within approximately 25% of the planning area in the Pasture and Ranch Core subzones. Mitigation measures for authorized ranch practices (see appendix D) and 900 acres of additional resource protection areas would also serve to avoid or minimize impacts to aquatic habitats used by breeding amphibians and protect other sensitive habitats occupied by reptiles and amphibians (e.g., riparian areas and coastal dunes).

Invertebrates, Including Myrtle's Silverspot Butterfly (Federally Endangered) and California Freshwater Shrimp (Federally Endangered)

Myrtle's Silverspot Butterflies. The types of impacts on Myrtle's silverspot butterfly under alternative D would be the same as those described for alternative A. However, the cessation of grazing on approximately 7,500 acres could reduce the abundance of essential nectar sources used by Myrtle's silverspot butterflies (Adams 2004) across approximately 3,800 acres with known occurrences (NPS 2019h). Adverse impacts would be concentrated on the F and AT&T Ranches, which host 70% of known occurrences and would be removed from ranching under alternative D. Grazing would continue to benefit Myrtle's silverspot butterflies on approximately 6,000 acres of potentially occupied habitat, as defined by known occurrences (NPS 2019h; Launer et al. 1992). On these lands, continued grazing in compliance with appropriate RDM standards would continue to promote the density of nectar sources via reduced competition from grazed plants.

California Freshwater Shrimp. Under alternative D, the indirect impact of ranching on water quality in streams potentially occupied by California freshwater shrimp would be similar to that described for alternative A. Impacts could occur via reduced water quality in suitable freshwater shrimp habitat in Olema and Lagunitas Creeks but would be avoided or minimized through the application of the same mitigation measures described under alternative B. The discontinuation of ranching on approximately 3,000 acres in the Olema Creek and Lagunitas Creek watersheds would further reduce impacts on water quality, and by extension California freshwater shrimp. This would result in a beneficial impact compared to existing conditions.

Other Invertebrates. The impacts of continued ranching on invertebrates under alternative D would be similar in type to those described for alternative A but would differ on approximately 7,500 acres where cattle grazing would no longer occur. However, in general, cattle grazing on 19,000 acres where ranching would be authorized would enable the persistence of native forbs used by pollinating insects, while changes in soil structure, variation in ground cover, and vegetation height could affect other invertebrates.

Cumulative Impacts

The impacts on wildlife from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. On lands where ranching continues, alternative D would contribute beneficial and adverse impacts, depending on the species. As described above, adverse impacts would occur from disturbance associated with ranching activities and altered habitat conditions, while beneficial impacts related to maintaining key habitats such as grasslands and stock ponds would continue. Establishment of the Resource Protection subzone as part of the zoning framework would also improve habitat values for many species, especially those that use riparian areas and coastal dunes. Cessation of grazing across 7,500 acres of the planning area would remove the primary source of wildlife disturbance on that land and allow grassland habitats to transition into shrubland habitats, which would increase habitat for some wildlife but decrease it for others. When the incremental impacts of alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on wildlife would be beneficial or adverse, depending on the species, as described above. The incremental impacts of alternative D would contribute most of the overall cumulative impacts. Overall, on the land where ranching continues, impacts on wildlife would be reduced compared to existing conditions from the implementation of a zoning framework. On the 7,500 acres where ranching would cease, impacts on wildlife would increase or decrease depending on the species because of changed habitat conditions.

Alternative E

The cessation of dairy ranching and conversion to beef cattle on approximately 6,200 acres under alternative E would eliminate impacts of forage production and manure spreading and reduced ground disturbance around milking and loafing barns and feeding areas compared to existing conditions. The addition of 1,200 acres for resource protection areas would further reduce the extent of impacts on wildlife via protection of riparian areas and surface waters, as described under alternative B. All ranches would continue to follow specified RDM standards to minimize overgrazing. A zoning framework and applicable mitigation measures, as described under alternative B, would also reduce impacts. Continued grazing by beef cattle under alternative E would provide habitat conditions suitable for many species of wildlife that prefer grasslands.

Mammals

Alternative E would not affect any mammals listed under the ESA because these mammals are absent from the planning area.

Ranching under alternative E would generally affect mammals as described for alternative B. However, the context and intensity of impacts on wildlife would change across approximately 6,200 acres where six dairy operations would be converted to beef cattle ranches. In these areas, favorable conditions for mammals that prefer taller, more, dense vegetation, such as the American badger, could increase from the reduced intensity of cattle grazing in areas currently subject to dairy cattle use around milking and loafing barns and feeding areas. On the remaining beef cattle ranches, the impacts of ranching would be similar to alternative B, but impacts on small mammals from harvest mowing would be eliminated on 1,000 acres, resulting in a beneficial impact compared to existing conditions. Populations of some small mammals, such as deer mice, could decrease on rangelands from increased density of vegetation that would result from no dairy ranching; however, the viability of the species would not be affected.

Birds, Including Western Snowy Plover (Federally Threatened)

Western Snowy Plovers. Generally, the types of adverse impacts from livestock grazing and ranch management would be the same as described for alternative B. However, the elimination of six dairies where raven numbers are highest (Kelly 2001), encompassing approximately 6,200 acres, would reduce adverse impacts on western snowy plovers because livestock feeding and vegetation management practices that promote an unnatural abundance of common ravens would cease on these lands. Although beef cattle ranching would be authorized on these lands, forage production would be discontinued on approximately 1,000 acres, further reducing potential raven food sources. However, impacts of raven predation on snowy plover nests can result from a small number of individual ravens, so conversion of the six dairies to beef operations would not completely diminish this threat to snowy plovers. Snowy plover nest protection actions would continue.

Other Birds. Under alternative E, many native birds would benefit from the removal of dairy ranch activities that promote an unnatural abundance of corvids, European starlings, and brown-headed cowbirds that compete with, prey upon, and parasitize nests of native birds. Bird injury or mortality from harvest mowing for forage production would also be eliminated, which would benefit birds that nest in those fields. Beneficial impacts of grazing on grassland species would still occur, but continued ranching would reduce overall avian diversity in the planning area. Brown-headed cowbirds, the only nest-parasitic bird in the planning area, could decrease from the reduced concentration of dairy cattle feeding areas (Holmes et al. 1999).

Fish, Including Coho Salmon (Federally Endangered), Steelhead (Federally Threatened), and Chinook Salmon (Federally Threatened)

Salmon and Steelhead. The types of impacts on coho salmon, steelhead, and Chinook salmon under alternative E would be the same as those described for alternative A, but impacts would be minimized by implementation of a zoning framework and resource protection areas, as described under alternative B. Because none of the dairies that would close are within watersheds occupied by salmon or steelhead (i.e., Lagunitas and Olema Creeks or the Drakes Estero watershed), impacts would remain as described for alternative B. Most potential adverse impacts would continue to be reduced by using mitigation measures. Livestock would continue to be excluded from direct access to most streams potentially occupied by salmon and steelhead, and the addition of 1,200 acres of resource protection areas would include protections for several stream reaches that provide salmon and salmon habitat, as described under alternative B, resulting in a beneficial impact compared to existing conditions.

Other Fish. The cessation of dairy ranching would reduce pollutant-laden runoff compared to existing conditions by eliminating forage production and manure spreading in the Drakes Bay Drainages, Abbotts Lagoon watershed, Kehoe Drainage, and the Pacific Drainages (see figure 43 in appendix A). Water quality and habitat for fish in streams could also improve from the reduction in sediment transported from 86 acres of high-impact areas, where dairy cattle cause erosion around milking and loafing barns and feeding areas. Also, the addition of 1,200 acres of resource protection areas would improve fish habitat as described under alternative B. Overall, impacts on fish from ranching under alternative E would be reduced compared to existing conditions, resulting in a beneficial impact because water quality would continue to improve in the planning area, and additional wetlands and riparian areas would be protected from livestock impacts.

Reptiles and Amphibians, Including California Red-legged Frog (Federally Threatened)

California Red-Legged Frogs. The types of potential impacts on California red-legged frogs described under alternative A could also occur under alternative E. However, the cessation of dairy ranching and conversion to beef cattle would change the intensity of livestock impacts on approximately 6,200 acres, of which approximately 2,900 acres are within designated critical habitat. Of the 136 known occurrences of California red-legged frog in the planning area, approximately 21% occur on lands subject to conversion from dairy to beef cattle under alternative E (NPS 2019h), but overall impacts from grazing would not

change. The elimination of manure spreading would have beneficial impacts on California red-legged frog by reducing potential pollutant-laden runoff in the Drakes Bay Drainages, Abbotts Lagoon watershed, Kehoe Drainage, and the Pacific Drainages. Furthermore, water quality in ponds and streams used by California red-legged frog could be improved via reduced soil erosion and sediment runoff from areas around milking and loafing barns and feeding areas. On existing beef ranches, impacts on California red-legged frog would be the same as those described for alternative B, with potential impacts reduced via a zoning framework, 1,200 acres of new resource protection areas, and added mitigation measures.

Other Reptiles and Amphibians. The types of impacts on reptiles and amphibians from ranching under alternative E would be the same as those described for alternative A, but the intensity would be reduced on approximately 6,200 acres where dairies would be converted to beef cattle, particularly in proximity to areas where dairy cattle are most concentrated. Also, as described above in the "Fish" section, the closure of dairies would potentially benefit reptiles and amphibians via improved water quality in wetlands and streams in the planning area. The impacts of cattle grazing described under alternative A would also occur under alternative E, but impacts would be reduced compared to existing conditions by implementing the zoning framework, resource protection areas, and mitigations measures as described under alternative B.

Invertebrates, Including Myrtle's Silverspot Butterfly (Federally Endangered) and California Freshwater Shrimp (Federally Endangered)

Myrtle's Silverspot Butterflies. The types of impacts to Myrtle's silverspot butterfly under alternative E would be the same as described under alternative A. While only 11, or approximately 3%, of known Myrtle's silverspot butterfly occurrences are on dairies, the closure of dairies and their conversion to beef cattle on approximately 6,200 acres could beneficially affect Myrtle's silverspot butterfly habitat by reducing localized impacts on 150-acres of heavy-use areas and continuing grazing that supports native forbs that serve as essential nectar sources to Myrtle's silverspot butterflies. For example, NPS (2001b) noted that the impacts of heavy dairy cattle grazing on the K Ranch immediately south of the Tule Elk Reserve may limit movement of Myrtle's silverspot butterflies to suitable habitat on other ranches to the south. On the other hand, high-impact areas could support non-native plants that also serve as nectar sources, such as bull thistle. Overall, cattle grazing would continue at a moderate intensity that meets RDM standards per Bartolome et al. (2015). This level of grazing would have mostly beneficial impacts because it would increase the density of nectar sources for the Myrtle's silverspot butterfly by reducing competition from the plants that are grazed by cattle.

California Freshwater Shrimp. The conversion of dairies to beef cattle ranches would not affect California freshwater shrimp because they do not occur in the affected watersheds. The indirect impacts of ranching on water quality in potential freshwater shrimp habitat in Lagunitas and Olema Creeks could still occur, as described under alternative A, but would be similar to alternative B with additional mitigation measures to reduce impacts.

Other Invertebrates. The elimination of concentrated grazing and associated nutrient inputs could lead to an increased abundance and richness of invertebrate groups on six dairies that would be converted to beef cattle ranches. Other impacts of continued ranching on invertebrates would be the same as those described for alternative B.

Cumulative Impacts

The impacts on wildlife from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute beneficial and adverse impacts, depending on the species. As described above, adverse impacts would occur from disturbance associated with ranching activities and altered habitat conditions, while beneficial impacts related to maintaining key habitats such as grasslands and stock ponds would continue. Establishment of the Resource Protection subzone as part of the zoning framework would also improve habitat values for many species, especially those that use riparian areas and coastal dunes. Alternative E would also eliminate impacts of forage production and manure spreading and reduce ground disturbance in high-intensity-use areas while maintaining grazing in

the planning area from the conversion of dairy ranching to beef ranching. When the incremental impacts of alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on wildlife would remain beneficial or adverse, depending on the species, as discussed above. The incremental impacts of alternative E would contribute a majority of the overall cumulative impacts. Overall, impacts on wildlife would be reduced compared to existing conditions from the implementation of a zoning framework and cessation of dairy operations.

Alternative F

Mammals

Alternative F would not affect any mammals listed under the ESA because these mammals are absent from the planning area.

Under alternative F, the elimination of livestock grazing would have meaningful ecological impacts because the primary disturbance regime to which mammals have adapted for more than 150 years would be removed. Without grazing, ecological succession would occur as grassland habitats transition into shrubland habitats in most areas, which would increase habitat for some wildlife but decrease it for those that live in grasslands. Vegetation that has been traditionally consumed by livestock would be left in place, providing increased ground cover and seeds for herbivorous small mammals and birds. However, increased thatch would restrict the movement of small mammals.

The cessation of ranching in the planning area would eliminate the potential disturbance of mammals from ranch management activities. Mammals that use forage production fields would no longer be subject to potential injury or mortality associated with harvest mowing on approximately 1,000 acres. Reduced grazing and the cessation of shrub management activities would increase habitat under alternative F for mammals that prefer shrublands. In addition, localized habitat changes associated with adaptive reuse of ranch complexes and buildings and different patterns of human activity could temporarily affect mammals. Affected species would be those that are generally tolerant of human activity, but impacts would be minimal because habitat around ranch complexes is predominantly low-quality and generally supports a lower abundance and diversity than the surrounding landscape. Visitor use on trails elsewhere in the planning area would still temporarily disturb some mammals and displace individuals from their territories, but potential impacts could increase from additional recreational uses in areas that have previously been used mainly for grazing or ranch activities. The impact of domestic cats, which can injure or kill small mammals in localized areas, would be eliminated under alternative F.

The elimination of livestock grazing under alternative F would provide small mammals with increased ground cover, allowing them to better avoid predation. Black-tailed jackrabbits, however, have been shown to avoid areas with dense vegetation because it limits their ability to see predators (Best 1996). Increased thatch could make some annual grasslands less hospitable to species such as deer mice and black-tailed jackrabbits, potentially affecting populations of mesocarnivores that prey on them like canids (i.e., foxes and coyotes), bobcats, and American badger. The increased abundance of elk under alternative F would provide prey for mountain lions, which could increase their range in the planning area as a result of the discontinuation of ranching. Lastly, the movement of Columbian black-tailed deer and other large-bodied wildlife across the landscape would improve as fences are removed, although the risk of injury or entanglement would persist until fences are completely removed.

Birds, Including Western Snowy Plover (Federally Threatened)

Western Snowy Plover. The potential for livestock to breach fences and trample western snowy plovers, nests and habitat would be eliminated. Western snowy plover would benefit from the termination of ranch activities that promote the unnatural abundance of common ravens, which are predators of snowy plover nests. However, as food resources on ranches are reduced, individual ravens seeking alternative food sources could depredate greater numbers of snowy plover nests because even small numbers of ravens can have substantial adverse impacts. Snowy plover nest protection measures would continue.

Other Birds. Alternative F could benefit some birds via increased availability of seed-producing plants that are able to reproduce without being grazed. The large number of birds that avoid grazed habitats, as described for alternative A, would benefit from the increased availability of suitable ungrazed habitat (Holmes et al. 1999). For example, northern harriers and white-tailed kites would likely increase in number. Moreover, many native birds would benefit from the removal of ranch activities that promote an unnatural abundance of corvids, European starlings, and brown-headed cowbirds that compete with, prey upon, and parasitize nests of native birds. On the other hand, habitat could be reduced for several birds that require low vegetation that results from grazing, including the special-status burrowing owl and grasshopper sparrow. Ferruginous hawks, peregrine falcon, merlin, and several other special-status raptors that forage in grasslands would experience a decrease in forage because livestock grazing would no longer promote the abundance and visibility of their small mammalian prey (Best 1996; Pandolfino et al. 2011; Bartolome et al. 2014). Lastly, localized habitat modification from adaptive reuse of ranch complexes and altered levels of human activity at ranch complexes could affect birds, but the affected avian species are generally tolerant of existing disturbances around ranch complexes.

Fish, Including Coho Salmon (Federally Endangered), Steelhead (Federally Threatened), and Chinook Salmon (Federally Threatened)

Salmon and Steelhead. The cessation of ranching under alternative F would have overall benefits on coho salmon, steelhead, and Chinook salmon, and their designated critical habitat compared to existing conditions. All potential direct and indirect impacts of livestock grazing and ranch practices on salmon- or steelhead-bearing streams would be eliminated. This would reduce erosion, increase water infiltration and soil water holding capacity, and increase groundwater replenishment, which could improve habitat quality for salmon and steelhead. Improved and increased streamside vegetation and reduced nutrient inputs (i.e., cattle manure) would also benefit these species. The elimination of adverse impacts from ranching could lead to improved spawning gravel from reduced eroded sediment, reduced water temperatures from increased shade from increased vegetation, and increased dissolved oxygen from reduced nutrient inputs. While elk would have more unrestricted access to streams and could increase grazing in areas currently fenced off from cattle, it is unlikely that elk grazing would increase in the foreseeable future to the degree that salmonids could be adversely affected.

Other Fish. Under alternative F, the removal of livestock grazing from the park would eliminate adverse impacts on riparian areas and wetlands described under alternative A, thereby enhancing fish habitat compared to existing conditions. The elimination of grazing would decrease erosion in the planning area and limit sediment input into streams, preventing any further degradation of spawning and rearing habitat for sensitive aquatic wildlife. Reaches of streams that are currently accessible to livestock would experience increased growth of riparian vegetation, which could reduce summer water temperatures and enhance aquatic habitat. These beneficial impacts would mostly occur in pastures where livestock currently have access to perennial streams as a result of the lack of exclusion fencing. The amount and rate of habitat improvement in riparian and wetland habitats would be increased and accelerated in comparison to the other alternatives.

Reptiles and Amphibians, Including California Red-legged Frog (Federally Threatened)

California Red-Legged Frogs. Under alternative F, impacts on this species would be beneficial from the elimination of livestock grazing and trampling of vegetation around approximately 90 stock ponds, wetlands, streams, and adjacent habitats. However, California red-legged frogs would experience adverse effects at approximately 120 breeding ponds from degraded habitat conditions from overly dense non-native annual grasses and emergent vegetation such as cattails (USFWS 2010b), which could limit the species' mobility, reduce the inundation period of ponds, and reduce turbidity and make frogs more susceptible to predators (Ford et al. 2013). There could also be beneficial impacts via improved water quality from a reduction of erosion and polluted runoff during storm events (e.g., coliform bacteria and suspended solids from cattle waste). There would be no disturbance to critical habitat because some stock ponds used for breeding would no longer be used by livestock.

Other Reptiles and Amphibians. Alternative F would affect reptiles and amphibians in much the same way as described for small mammals—increased vegetative cover could help animals avoid predators, but it would also create overly dense, unsuitable grassland habitat. Impacts would be greatest around stock ponds and other water surface waters that support amphibian breeding, where habitat suitability could be reduced at some locations for certain amphibians and reptiles but increased for others. Livestock grazing of wetlands would no longer potentially trample individuals or eggs or indirectly impact water quality of aquatic habitats.

Invertebrates, Including Myrtle's Silverspot Butterfly (Federally Endangered) and California Freshwater Shrimp (Federally Endangered)

Myrtle's Silverspot Butterflies. Although studies are limited about how grazing could affect the Myrtle's silverspot butterfly, alternative F could reduce the density of nectar plants (Adams 2004). Launer et al. (1992) suggested that the subspecies' persistence is dependent upon grazing and that livestock grazing is the most effective tool to manage grasslands in a way that provides nectar resources and maintains larval host plants for them. Although an increasing elk population and limited prescribed grazing would occur under alternative F, these types of grazing would not likely maintain nectar sources on grasslands as effectively as current levels of cattle grazing. Thus, the elimination of grazing would adversely affect the butterfly Myrtle's silverspot butterfly compared to existing conditions.

California Freshwater Shrimp. Alternative F would eliminate all potential direct and indirect impacts of ranching on California freshwater shrimp in the planning area compared to existing conditions. Beneficial impacts would result from improved stream habitat and water quality. These beneficial impacts are described above in the "Fish" section and the "Water Resources" section.

Other Invertebrates. While little research on invertebrates in California coastal grasslands is available (Holstein 2011), the cessation of grazing would likely cause some taxa to increase and others to decrease. Alternative F could increase the abundance of certain invertebrates, such as grasshoppers (Order: Orthoptera) from the elimination of grazing and increased herbaceous vegetation, and adversely affect pollinating insects, including sawflies, wasps, bees, and ants (Order: Hymenoptera) and butterflies (Order: Lepidoptera) from decreased native forb abundance (Holstein 2011). Overall, true bugs (Order: Hemiptera) and spiders could increase from the elimination of grazing (Debano 2005; Louis 2016). Aquatic invertebrates that are especially sensitive to water quality degradation and/or sedimentation would benefit from the elimination of ranching from reduced indirect impacts on water quality.

Cumulative Impacts

The impacts on wildlife from past, present, and reasonably foreseeable actions would be the same as described for alternative A. Alternative F would eliminate all impacts on wildlife related to dairy and beef ranching from the planning area, including disturbance, trampling, erosion and nutrient inputs. Ecological succession would occur as grassland habitats transition into shrubland habitats in most areas, which would increase habitat for some wildlife but decrease it for others. When the incremental impacts of alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact to wildlife would be beneficial or adverse, depending on the species, as discussed above. The incremental impacts of alternative F would contribute a majority of the overall cumulative impacts. Overall, impacts on wildlife would increase or decrease compared to existing conditions, depending on the species, due to changed habitat conditions.

TULE ELK

Methodology and Assumptions

Impacts of the alternatives on elk are based on their overall effect on elk population size and herd viability in the planning area compared to existing conditions. Because elk are not expected to exceed the park's carrying capacity in the near future, any actions that result in potential increases in elk population size would have beneficial impacts on elk. Conversely, any actions that would reduce the population of an

individual herd below the minimum threshold for a viable herd of 100 elk (CDFW 2017) would have adverse effects on elk over the long term.

Actions under the alternatives that would result in changes to the geographic extent (range) of elk in the planning area were also considered. Actions that would facilitate expansion of elk in the planning area would have beneficial impacts. It is assumed that actions that would limit geographic extent would not result in noticeable adverse impacts because sufficient habitat is available to avoid exceeding carrying capacity. Limitations on the range of elk herds could include use of exclusion fencing, management of herds within core areas, and restrictions on the establishment of new herds.

Other considerations for impacts of the alternatives on elk include actions that may create hazards for elk, such as fences, which can result in injury due to entanglement. These impacts may be short or long term, depending on the specific action to be implemented.

The area of analysis includes all lands in the planning area.

Alternative A

Under alternative A, impacts on elk from hazing efforts, Johne's disease monitoring, and annual monitoring would continue to include temporary disruption of grazing or other behaviors and increased energy demand on individual animals. While ongoing elk management practices under alternative A would limit the amount of time elk spend on active ranch lands and attempt to restrict the geographic extent of the free-ranging herds on ranch lands, it would not limit the size of the elk population, which would likely continue to expand based on current population trends. Without population control, the free-range elk population (Drakes Beach and Limantour herds) could grow to as many as 2,000 individuals over a 20-year period. As the population increases, the geographic extent of elk in the planning area would likely expand and be more difficult to control. If more elk favor ranch lands in the future, NPS would undertake increased efforts to haze elk from ranch lands. Given these possibilities, NPS would likely need to undertake a separate planning process in the future to determine appropriate management actions for free-ranging elk in Point Reyes. Management actions under alternative A would not threaten the future existence or viability of a free-ranging elk herd in Point Reyes.

Habitat enhancements would continue to directly benefit elk over the long term by providing water sources and improved forage habitat. Continued efforts to control invasive species under alternative A would also maintain suitable forage habitat for elk.

Competition with grazing livestock would not limit elk population size or affect the overall health of the herds. Maintenance of existing ranch fences would help limit the risk of injuries to elk from entanglement; however, installing additional elk crossings at appropriate locations would minimize the intensity of this impact. Visitor use on ranch lands would continue to result in occasional disturbances to elk in the planning area, especially in the western portion of the planning area where they are most easily seen along Sir Francis Drake Boulevard and Drakes Beach Road near D ranch.

Overall, continuation of elk management actions under alternative A would not result in adverse impacts at the herd or population level.

Cumulative Impacts

Past, present, and reasonably foreseeable actions that have affected or would affect elk in the planning area include invasive species management. Management of invasive species has and would continue to have beneficial impacts by maintaining grassland habitat that is suitable for elk foraging. Alternative A would continue to contribute beneficial impacts from habitat modifications and adverse impacts from fencing and hazing. When the incremental impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on elk would remain beneficial, with the incremental impacts of alternative A contributing a majority of the overall cumulative impacts. Overall, impacts on elk would remain consistent with existing conditions.

Alternative B

Continued ranching activities under alternative B would not result in a measurable change from existing conditions for elk. Because grazing resources are not currently a limiting factor for elk, additional competition with other grazing livestock as a result of diversification activities would not affect elk health or population size.

Adaptive reuse of complexes and buildings could potentially increase visitor use or NPS activities in areas where structures are currently vacant, including at D Ranch, where structures are adjacent to areas regularly used by the Drakes Beach herd. To ensure that any potential disturbances to elk as a result of adaptive reuse of complexes and buildings would avoid or minimize disturbance to elk, NPS would seek a compatible adaptive use for structures adjacent to core areas. Therefore, adaptive reuse of complexes and buildings under alternative B is not expected to result in meaningful adverse impacts on elk.

Drakes Beach Herd. Management actions under alternative B would limit the population of the Drakes Beach herd to 120 individuals through lethal removal. Approximately 10 to 15 adult elk are expected to be lethally removed annually, resulting in an approximately 8% to 12% annual population reduction in the planning area, based on the current population size of the herd. Removals would target suspected diseased animals, older reproductive females, and prime bulls and would result in direct, adverse impacts on individual elk in the Drakes Beach herd that are lethally removed. However, population management would strive to maintain the natural sex ratio and ensure a stable and viable Drakes Beach herd. Removal of the individual elk would result in temporary disturbances to remaining members of the herd from noise and presence of humans. With a population threshold of 120 individuals, actions taken under alternative B would not jeopardize the viability of the Drakes Beach herd (CDFW 2017).

Under alternative B, the geographic extent of the Drakes Beach herd would continue to be limited because NPS would actively manage the herd to remain in its existing core use area and off ranch lands, using hazing techniques, although male elk would be allowed to wander. Male elk that stray from core use areas would be monitored closely, and actions may be taken to mitigate for impacts on ranching operations. Population reduction efforts may target male elk outside the core use area if new conflicts with ranching operations arise. Impacts on elk from hazing and management of the geographic extent would be the same as those described for alternative A.

Limantour Herd. Management of the Limantour herd would be minimal and would focus on limiting the geographic extent of the herd to reduce their presence on leased ranch lands in Point Reyes, which would not result in a change from existing conditions. Individual elk would be allowed to wander in Point Reyes with few geographic restrictions, but they would be monitored closely and managed in consideration of ranch operations. Hazing and 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, resulting in impacts like those described above for the Drakes Beach herd. Management actions under alternative B would not threaten the future existence or viability of the Limantour herd.

Other Impacts and Considerations. Impacts from hazing, disease testing, control of invasive species, habitat enhancement, and fence repair, as described for alternative A, would be the same under alternative B. Wildlife-friendly fencing would be required under alternative B, and more lowered elk crossings could be installed in the areas frequented by the Drakes Beach and Limantour herds, which could reduce the risk of injury to elk compared to existing conditions.

Hazing techniques would continue to be used to prevent the establishment of new herds. Lethal action could be used as a method of last resort, resulting in long-term, adverse impacts on individual elk but would not adversely affect the viability of the existing herd.

Public Use and Enjoyment

Expanded opportunities for hiking, biking, and equestrian access in the planning area would not result in noticeable adverse impacts on elk because these activities would not limit elk movement or create

entanglement hazards. Potential impacts on elk associated with expanded visitor use include occasional, sporadic displacement and/or disruption of grazing or other behaviors. However, elk in the planning area are accustomed to some level of human activity, including noise and the presence of vehicles. Therefore, any impacts on elk as a result of expanded visitor use would not affect elk population or herd viability. Additionally, NPS would avoid constructing any trails or access projects in locations that would have high potential for disturbance of elk.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would continue to contribute beneficial impacts from habitat modifications and adverse impacts from fencing and hazing. Alternative B would also have adverse impacts on individual elk from the lethal removal of approximately 10 to 15 elk annually but would maintain a viable population. When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on viable populations of free-range elk would remain beneficial, with the incremental impacts of alternative B contributing a majority of the overall cumulative impacts.

Alternative C

Under alternative C, impacts on elk in the Limantour herd would be the same as those described for alternative B.

Under alternative C, NPS would lethally remove the Drakes Beach herd, totaling approximately 124 individual elk. Lethally removing the Drakes Beach herd would result in an approximately 40% reduction of free-range elk in the planning area and a 2% reduction in the estimated California state-wide elk population (CDFW 2017) compared to existing conditions and would eliminate one of two free-range tule elk herds in the national park system. Impacts on the Drakes Beach herd would be significant because it would no longer exist. Overall viability of the tule elk population in Point Reyes or in California would not be affected; however, removal of a native species for ranching considerations would be unprecedented in the national park system and would be inconsistent with CDFW management of elk on ranchlands outside the park.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative C would contribute beneficial impacts from habitat modifications and adverse impacts from fencing and hazing of the Limantour herd. Alternative C would also contribute important adverse impacts from the removal of the Drakes Beach herd. When the incremental impacts of alternative C are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on elk would be adverse compared to existing conditions, primarily due to the removal of the Drakes Beach herd. The incremental impacts of alternative C would contribute a majority of the overall cumulative impacts.

Alternative D

Under alternative D, impacts on elk from visitor use and enjoyment, habitat enhancement, control of invasive species, fence repair, and the management of both elk herds would be the same as those described for alternative B. Like alternative B, NPS would continue to use hazing to prevent new herds from establishing in areas under lease/permit, which would have temporary, adverse impacts on individual elk from disruption of grazing or other behaviors and increased energy demand on individual animals. If, as a last resort, lethal action were used, it would result in long-term, adverse impacts on individual elk, but it would not adversely affect the viability of the Drakes Beach or Limantour herds.

Lands permitted for ranching under alternative D would be reduced by approximately 7,500 acres in the planning area compared to existing conditions. These lands would include portions of D Ranch (pastures

B and C), which are frequently grazed by elk in the Drakes Beach herd. Existing fencing would be removed in these areas, which would reduce the risk of entanglement by elk. If new herds form on the 7,500 acres where ranching was discontinued, they would be allowed to continue, potentially expanding the geographic extent of elk in the planning area and benefitting the overall elk population by providing additional grazing opportunities. NPS would use the forage model and other considerations to determine future management of new herds.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative D would contribute beneficial impacts from habitat modifications and adverse impacts from fencing and hazing. Under alternative D, ending ranching on 7,500 acres would result in removal of existing fencing and additional grazing opportunities for elk on that land, which would provide a beneficial impact compared to existing conditions. When the incremental impacts of alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on elk would be beneficial compared to existing conditions. The incremental impacts of alternative D would contribute a majority of the overall cumulative impacts.

Alternative E

Under alternative E, impacts on elk from visitor use and enjoyment, habitat enhancement, control of invasive species, and fence repair would be the same as those described under alternative B.

NPS would take no action (e.g., lethal removal) to limit the population growth of the Drakes Beach and Limantour herds, and management of the geographic extent of elk would occur only if needed to support other resource protection and park goals, including the goal of not allowing elk to establish outside Point Reyes, resulting in long-term, beneficial impacts on elk compared to existing conditions.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute beneficial impacts from habitat modifications and improved pasture conditions from conversion of dairy ranching to beef ranching as well as a reduction in hazing, resulting in a beneficial impact compared to existing conditions. Adverse impacts would result from fencing. When the impacts of alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on elk would be beneficial compared to existing conditions. The incremental impacts of alternative E would contribute a majority of the overall cumulative impacts.

Alternative F

Under alternative F, both the population and geographic extent of elk would increase in Point Reyes. Ranching activities would not disturb elk because ranching would be discontinued. Similar to alternative E, NPS would take no action to limit the population growth of free-range elk in the Drakes Beach and Limantour herds, and management of the geographic extent of elk would occur only if needed to support other resource protection and park goals, including not allowing elk to establish outside Point Reyes. Based on modeling efforts, without population management, the free-range elk population could grow to 2,000 individuals in 20 years. In addition to the expanded populations of the Drakes Beach and Limantour herds, the fence at Tomales Point would be removed, resulting in three free-range elk herds and further increasing the overall free-range population in Point Reyes. All existing ranch fencing would be removed after ranching is phased out, resulting in long-term, beneficial impacts on elk compared to existing conditions. NPS would identify priority areas for vegetation management using prescribed grazing as necessary, but these efforts would be unlikely to meaningfully affect elk grazing activities because of the limited size of the operations. Under alternative F, impacts on elk from visitor disturbance would be similar to those described for alternative B. Although visitor use patterns may change, overall visitation is not anticipated to increase compared to existing conditions. While the use of developed complexes may

change from ranching to visitor uses, disturbance in these areas would continue, resulting in impacts similar to those described under alternative B.

Impacts from the control of invasive species and monitoring as described for alternative A, would continue under alternative F.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative F would contribute beneficial impacts to elk in the planning area from the cessation of ranching, which would eliminate impacts related to hazing and fencing. There would be limited NPS management of the free-range elk population in Point Reyes, and the herd from Tomales Point would be allowed to range into the planning area. When the impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on elk would be beneficial compared to existing conditions. The incremental impacts of alternative F would contribute a majority of the overall cumulative impacts.

VISITOR USE, EXPERIENCE, AND ACCESS

Methodology and Assumptions

Impacts on visitor use, experience, and access are analyzed by examining expected changes in visitor experience related to wildlife viewing opportunities; changes in visitor experience related to ranching operations, specifically viewing and educational opportunities and ranching diversification; changes in visitor use, experience, and access related to improvements to trails, signage, and wayside exhibits; and changes in visitor experience resulting from the enhancement of interpretation at historic districts. Visitor use data, comments from the public, and personal observations of visitation patterns by park staff were used to estimate the effects of the alternative actions on visitor use, experience, and access.

Visitor experience could be altered because of changes to ranching operations in the planning area, including ranch closures (both positive and negative effects, depending on the type of visitor values), continued ranching, increased wildlife/bird/tule elk viewing opportunities related to the removal of ranch fencing and increased visitor access on ranchlands, and adaptive reuse of a limited number of ranch-related structures that could be used for classroom educational opportunities, tours, and overnight stays.

Visitor experience and access could change by expanding trail systems and connections; expanding multiuse (e.g., hiking and biking on the same trail) trails on existing administrative roads; promoting increased access to ranch lands; and improving signage, wayside exhibits, and roadside pullouts.

The area of analysis for visitor use, experience, and access is the planning area.

Alternative A

Public Use and Enjoyment

Under alternative A, park visitors would continue to have many diverse opportunities, ranging from passive recreation such as bird watching and wildlife viewing to more active pursuits such as hiking. Annual visitation is not expected to change compared to existing conditions; approximately 2 to 2.5 million visitors are expected to continue to visit the park each year.

Ranch Management

Park visitors would continue to have access to the ranchlands; however, access for visitors could continue to be unclear in certain areas because of fencing and ranch infrastructure. Under alternative A, visitors would continue to experience and have opportunities to understand the role of coastal prairie ranching in California and the historic ranching landscape. Visitor opportunities related to experiencing natural sights and sounds would continue to be affected by the machinery, structures, odors, and noise associated with

operating ranches. For these visitors, ranching operations in the planning area would result in continued direct, adverse impacts on their use and experience.

Elk Management

Continued management of elk would not affect visitor experience because elk viewing opportunities of the Drakes Beach and Limantour herds would continue unchanged. Management activities such as hazing practices are not expected to disrupt visitor use, experience, and access, nor would they disrupt visitors' ability to view elk.

Cumulative Impacts

Past, present, and reasonably foreseeable actions that have affected or would continue to affect visitor use, experience, and/or access in the planning area include coastal dune restoration, the Lagunitas Creek Salmonid Habitat Restoration Project activities, the fire management program, cultural resource restoration projects, road improvement projects, PG&E fire prevention projects, corvid management, and invasive plant management activities. All of these projects and management actions have beneficial impacts on visitor use and experience because they restore habitat to support thriving populations of wildlife, reduce potential adverse impacts from unplanned wildfires, restore cultural resources, and improve roads and parking areas in the park. Although some of these actions may temporarily restrict visitor access in certain areas while restoration and other management actions are being completed, overall impacts on visitor experience from these cumulative projects would be long term and beneficial.

Alternative A would contribute noticeable impacts, either adverse or beneficial, depending on the opportunities that visitors are seeking in the planning area. When the impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on visitor use and experience would remain the same as existing conditions.

Alternative B

Public Use and Enjoyment

Under alternative B, actions to enhance public use and enjoyment would be implemented. However, annual visitation is not expected to change, and approximately 2 to 2.5 million visitors are expected to continue to visit the park each year. The implementation of strategies that provide more information for visitors to be able to accurately wayfind and select experiences throughout the park would be beneficial to the visitor experience compared to existing conditions by enhancing opportunity selection and ability to achieve desired outcomes for a park visit. While visitors are currently allowed on ranchlands, without clear signage, many visitors do not use these areas. Improved wayfinding and trail connections, as detailed below, as well as gates or fence step overs, would help facilitate enhanced and compatible visitor use in the planning area.

Implementing strategies and projects to expand the range of visitor opportunities in the planning area would provide additional opportunities for day use and overnight accommodations as well as enhanced interpretation and would contribute to the diversification of visitor use opportunities that would benefit the visitor experience. Currently there are no overnight accommodations in the planning area. With the potential incorporation of overnight camping or farm stays, overnight visits to the park would offer a new visitor experience under alternative B. New visitor experiences could also be provided through the adaptive reuse of vacant structures, including new concessions, educational complexes, or potential boat-in opportunities. Providing a wider range of recreational opportunities in the planning area would benefit public use and enjoyment compared to existing conditions.

Implementing a broader range of strategies that address visitor access to and in the planning area would generally have an overall beneficial impact on the visitor experience by managing for a high-quality visitor experience. In support of this strategy, NPS would develop additional hiking, biking, and equestrian access, focusing on the use of existing roads to facilitate connections across the planning area.

Combined with improved signage and wayfinding, the expanded trail network would allow visitors to experience a larger portion of the planning area. These trails could also provide connectivity to regional trails, allowing visitors to incorporate the park into a more extensive cycling network. Partnering with the county to improve multiuse roads to provide enhanced safety for bicycles would improve visitor circulation and safety and provide an additional modality for visitors seeking access to key areas of the park, in which would have beneficial impacts on public use and enjoyment.

Adopting a comprehensive management framework for visitor capacity would help ensure the park's ability to achieve desired conditions for the visitor experience as opposed to responding to individual issues on a case-by-case basis.

Ranch Management

Impacts on visitor experience from continued ranching operations would generally be the same as those described for alternative A. Alternative B would also authorize diversification activities such as ranch tours that would result in additional beneficial impacts by creating new opportunities for visitors to observe and learn about ranch operations. Diversification activities under alternative B that add new types of livestock, row crops, and associated fencing or other infrastructure would result in additional adverse impacts for visitor opportunities related to natural sights and sounds.

Elk Management

Under alternative B, visitors would continue to have opportunities to view the Drakes Beach and Limantour herds in their existing core areas, and management actions would be taken to keep the population at approximately 120 individuals. This herd size, which is similar to existing conditions, would continue to be highly visible and accessible to visitors, especially along Drakes Beach Road. Adverse impacts on visitor use, experience, and access would be limited because only a small number of animals would be removed annually (approximately 10 to 15 elk) during low visitor use times. Localized areas may be temporarily closed to visitors during the removal of elk, although this activity is not expected to last more than a couple of hours and would not occur during times of high visitor use. These closures could occur several times a year, as needed. Over time, the experience of visitors who oppose elk control would be indirectly adversely affected because the Drakes Beach herd would not be allowed to expand as under alternative A.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would contribute noticeable beneficial impacts by providing a wider range of recreational and educational opportunities in the planning area. Adverse impacts on visitor use and experience could occur as a result of temporary closures during elk management activities. When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on visitor use and experience would be beneficial, with the incremental impacts of alternative B contributing a majority of the impacts. Overall, visitor use and experience would improve compared to existing conditions.

Alternative C

Impacts related to public use and enjoyment and ranch management under alternative C would be the same as those described under alternative B.

Elk Management

Under alternative C, the opportunity for visitors to view the Drakes Beach elk herd would be eliminated, which would result in a highly noticeable, long-term, adverse impact on visitor use and experience because this herd is the most visible elk herd in the planning area. However, other areas would still be available to view elk, including the free-range herd at Limantour, so the opportunity to view free-range elk in Point Reyes would not be completely eliminated for visitors. The planning area could be closed to

visitor use during the removal of the Drakes Beach herd, resulting in temporary, localized, adverse impacts on visitor experience, use, and access because this management action would occur over a four to six-month period.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative C would contribute noticeable beneficial impacts by providing a wider range of recreational and educational opportunities in the planning area. The loss of the opportunity to view the Drakes Beach herd would have a noticeable adverse impact on visitor use and experience. When the impacts from alternative C are combined with the impacts of past, present, and reasonably foreseeable actions, the overall cumulative impact on visitor use and experience would remain beneficial, with the incremental impacts of alternative C contributing a majority of impacts. Overall, visitor use and experience would improve compared to existing conditions.

Alternative D

Actions to enhance public use and enjoyment under alternative D would be the same as those described under alternative B, resulting in an expanded range of visitor opportunities in the planning area compared to existing conditions.

Ranch Management

Visitor opportunities related to experiencing natural sights and sounds would continue to be affected by machinery, structures, odors and noise associated with operating ranches, although they would be slightly reduced compared to existing conditions from the removal of grazing operations on 7,500 acres.

Elk Management

Impacts related to the management of the Drakes Beach herd would be the same as those described for alternative B. Under alternative D, elk viewing opportunities may be expanded if new herds become established on the 7,500 acres of land removed from ranching, resulting in beneficial impacts on visitor experience. The distribution of elk in the planning area would remain generally consistent with existing conditions, and the Drakes Beach herd would continue to be highly visible and accessible to visitors.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative D would contribute noticeable beneficial impacts by providing a wider range of recreational and educational opportunities in the planning area. The reduced scale of ranching would improve visitor opportunities related to experiencing natural sights and sounds. Slightly adverse impacts on visitor use and experience would occur from actions to limit the Drakes Beach herd, including temporary closures. When the impacts from alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on visitor use and experience would be beneficial, with the incremental impacts of alternative D contributing most impacts. Overall, visitor use and experience would improve compared to existing conditions.

Alternative E

Actions to enhance public use and enjoyment under alternative E would be the same as those described under alternative B, resulting in an expanded range of visitor opportunities in the planning area compared to existing conditions.

Ranch Management

Under alternative E, NPS would continue to issue lease/permits for ranching in the planning area, which would have the same impact on visitor use and experience as described under alternative B. While dairy ranching would be discontinued, beef ranching could expand compared to existing conditions. Visitors

would no longer be able to observe and experience dairy ranching operations in the planning area, but the conversion to beef ranching would likely reduce the noise and odors associated with concentrated dairy operations and benefit visitor opportunities related to experiencing natural sights and sounds in the planning area.

Elk Management

Under alternative E, NPS would not manage the elk population or its geographic extent. The elk population in the park would continue to increase, likely providing expanded opportunities for viewing elk, which would benefit visitor experience.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative E would contribute noticeable beneficial impacts, particularly from the potential additional opportunities to view elk and reduction in noise and odor impacts associated with dairy operations. When the impacts from alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on visitor use and experience would remain beneficial, with the incremental impacts of alternative E contributing a majority of impacts. Overall, visitor use and experience would improve compared to existing conditions.

Alternative F

Public Use and Enjoyment

Actions to enhance public use and enjoyment under alternative F would be the same as those described for alternative B. Under alternative F, a comprehensive visitor use plan would also be prepared to provide site-specific guidance for visitor use in the 27,800-acre planning area after ranching operations cease. Without active ranching, NPS generally anticipates additional public recreational and visitor opportunities across the landscape, including adaptive reuse of ranch complexes; however, overall visitation is not expected to change from existing conditions. NPS anticipates many of the ranches and their associated facilities would be offered for public not-for-profit education, research, outdoor experiential activities, and other public recreational and visitor opportunities–all of which would expand visitor opportunities in the park. Under alternative F, NPS would also consider expanding trail linkages that connect new visitor opportunities located in former ranch complexes. The exact locations of additional linkages would depend on the future uses of the ranch complexes. NPS would interpret the history of ranching in the park using a range of techniques, potentially including exhibits in historic structures. Alternative F would involve the most extensive adaptive reuse of ranchlands and ranch complexes/structures, resulting in long-term, beneficial impacts compared to existing conditions.

Ranch Management

Under alternative F, all ranching would cease over a five-year period, and after the life estates eventually expire, no commercial agricultural activities would be permitted. Visitors would no longer be able to experience working ranches in the planning area. Some historic buildings, structures, and landscapes could be preserved based on their relative historical significance, offering interpretive opportunities related to ranching history. Removing operating ranches would eliminate a unique experience that the park currently provides. However, impacts to visitor opportunities related to experiencing natural sights and sounds in the planning area would be beneficial because the impacts of cattle and ranch operations on natural resources (e.g., vegetation, wildlife, water resources and air) would cease as the park is restored to a more natural environment. Structures and complexes that are not demolished could be renovated for adaptive reuse, including additional overnight stay locations, non-profit partnerships, and day use facilities, potentially providing expanded visitor opportunities in the planning area beyond those discussed under alternative B. Developing additional trails and pedestrian crossings on former ranchlands, connecting trails, providing additional waysides and signage along trails, improving and developing additional parking lots, enhancing interpretation and education, developing additional day use and

overnight accommodations, and developing a visitor shuttle system would have long-term, beneficial impacts on visitor use, experience, and access in the planning area compared to existing conditions.

Elk Management

Under alternative F, NPS would take no action to limit the population growth or geographic extent of free-range elk in Point Reyes. NPS management of the elk would occur only to support other resource protection needs and goals. The potential expansion of the elk population in Point Reyes would result in long-term, beneficial impacts on visitor use and experience for visitors who enjoy observing elk in their natural and historical habitat. The Drakes Beach and Limantour herd populations would increase, providing additional opportunities and new locations for visitors to view elk. In addition to the Drakes Beach and Limantour herds, the Tomales Point elk fence would be removed, and all elk would be free ranging throughout the park. The Tomales Point herd would likely expand into the planning area, which would benefit visitor experience by increasing viewing opportunities.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. The incremental impacts of alternative F would have noticeable beneficial impacts on visitors by expanding the location and type of visitor experiences available in the planning area. Noticeable adverse impacts on visitor use and experience would occur from the elimination of the opportunity to experience working ranches in the planning area. When the impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on visitor use and experience would be beneficial for visitor opportunities to experience natural sights and sound and adverse for visitor opportunities to experience historical ranching compared to existing conditions, with alternative F contributing most of the impacts.

CULTURAL LANDSCAPES, HISTORIC DISTRICTS, AND HISTORIC STRUCTURES

Methodology and Assumptions

Each of the proposed alternatives would have similar impacts on cultural resources in the planning area, including changing the use of some structures; adding new structures; and possibly demolishing structures that have deteriorated if underutilized or maintained. Under an alternative where no ranching or a reduction in ranching would occur, impacts would include changes to the traditional historic use of a ranch complex, impacts on the historic districts as a whole, and changes to the cultural landscape.

The current Condition Assessment provides a baseline condition for all structures in the Olema Valley Dairy Ranches and Point Reyes Peninsula Dairy Ranching Historic Districts. The condition of each structure was used to determine the prioritization of rehabilitation and maintenance activities throughout the park. Under alternative F, the Condition Assessment was used to determine how to prioritize which ranches would be adaptively reused. Under all remaining alternatives, the Condition Assessment was used to determine which ranches and individual buildings would be suitable for continued ranching and/or reuse for livestock diversification and which buildings/ranches would be mothballed or demolished.

Short-term impacts on historic resources in the four historic districts (and one landmark) were analyzed by calculating the number of contributing resources lost through direct actions such as demolition, mothballing, or adaptive reuse (in the case of buildings and structures) and lack of grazing/maintenance for contributing sites such as pastures. The status of resources that would be affected to the extent that they no longer contribute to the district would change to non-contributing. The loss of pastures and other sites was quantified by calculating the net acreage removed and its percentage of the total contributing acreage. The number of contributing properties remaining in a district was compared to the original number to determine the overall impact on the district. In addition, the location of the non-contributing resources was mapped to determine whether the impact would be widespread or localized. Long-term impacts from continued vacancy and lack of maintenance were analyzed in the same way.

Under alternative A, management of cultural resources would follow the 1980 GMP, NPS *Management Policies 2006*, and the *Cultural Resource Management Guideline*. The General Management Plan specifies preservation or adaptive reuse for most buildings in the Olema Valley Dairy Ranches and Point Reyes Peninsula Dairy Ranching Historic Districts. The main management objectives of the plan with regard to cultural resources at Point Reyes are:

- to identify, protect, and preserve the significant historic and cultural resources of Point Reyes
- to monitor and support productive land uses and activities that are consistent with historical patterns

Section 106 of the NHPA, as amended (16 U.S.C. 470 et seq.) and its implementing regulations under 36 CFR 800 require all federal agencies to consider the effects of federal actions on cultural properties eligible for or listed in the National Register. Any impact on contributing structures, buildings, objects, or sites in the Olema Valley Dairy Ranches Historic District or Point Reyes Peninsula Dairy Ranching Historic District would be subject to section 106 review. Any adverse effects on historic resources would be avoided, minimized, or mitigated.

Analysis of cultural resources impacts considers mitigation measures that would be implemented to minimize adverse impacts. The area of analysis includes the cultural resources within the boundaries of the planning area.

Alternative A

Ranch management under alternative A, including the ongoing use of historic structures by active ranch operations, would continue to result in adverse and beneficial impacts on cultural landscapes and historic districts. Occupation and use of ranch structures would benefit these buildings because issues that arise are more quickly identified in occupied buildings than vacant ones; however, deferred maintenance by ranchers would result in adverse impacts on historic buildings through continued deterioration. Over time, the backlog of deferred maintenance would continue to increase, resulting in long-term, adverse impacts on historic structures from deterioration of the historic fabric. Continued cattle grazing would also maintain the existing conditions and characteristics of the grazing lands, which are contributing elements to the cultural landscapes. Overall, the Point Reyes Peninsula Dairy Ranching Historic District and Olema Valley Dairy Ranches Historic District cultural landscapes would continue in fair condition but with a trend toward poor condition because of deferred maintenance. Continued visitor use of ranchlands and elk management would not affect cultural landscapes and historic districts.

Cumulative Impacts

Past and present actions that have affected cultural resources in the park include cultural resource restoration projects that have occurred in both historic districts over the past five years. These activities have improved the condition and integrity of the individual historic resources in the districts and the districts as a whole. The benefits associated with completed maintenance projects will continue into the future, but new efforts are limited by the availability of funds, NPS staffing capacity, and the maintenance needs of other historic properties in the park.

Overall, these actions have and would continue to result in beneficial cumulative impacts. Alternative A would continue to contribute both adverse and beneficial impacts to cultural resources, depending on the level of funding available for deferred maintenance. When the incremental impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative impact on cultural resources would be adverse compared to existing conditions because the maintenance backlog would eventually outweigh the limited restoration projects taking place. Alternative A would contribute most of the impacts.

Alternative B

Under alternative B, existing ranching and dairy operations would continue in the planning area. Currently occupied buildings would remain occupied and grazed lands in the historic districts and cultural landscapes would be maintained. NPS would revise and clarify building maintenance requirements to better maintain the character-defining features and the long-term integrity of the historic districts.

NPS would clarify the cyclic maintenance tasks that are the responsibility of each rancher. Specific maintenance expectations for historic buildings on each ranch would be included in the ROAs and updated annually. Appendix F provides a list of preservation and maintenance guidelines for ranch buildings under lease/permit. NPS would also explore the possibility of establishing a maintenance account for each ranch that would be funded through a portion of the rental payment. The fund would provide a reserve to draw on to support maintenance projects over the life of the lease. All maintenance and repair work would be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and the *Standards and Guidelines for Rehabilitation.* These mechanisms would help ensure ranchers are meeting cyclic maintenance requirements and would have long-term, beneficial impacts by reducing deferred maintenance over time. Like alternative A, continued cattle grazing of pastures would maintain the existing conditions of grazing lands and preserve the significant characteristics of the cultural landscapes. Development of new visitor use opportunities, including trails and trail-based recreation, would not affect grazing lands because most development would use existing roads or would not noticeably alter the cultural landscape.

The increased opportunities for diversification in the Ranch Core subzone allowed as part of this alternative may result in modifications to historic buildings or the construction of new buildings. These improvements would be reviewed on a case-by-case basis and would be required to meet the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. The adaptive reuse of existing buildings would result in a long-term, beneficial impact as potentially vacant or underused buildings are accommodated to the new uses. Buildings adapted to new uses would receive higher priority rankings for maintenance funding than vacant properties. Diversification of operations could also result in increased investments by ranchers and would have a long-term, beneficial impact because the Secretary's standards would be followed.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable projects would be the same as those described for alternative A. The incremental impacts of alternative B would contribute most of the impacts and would be noticeably beneficial as a result of a reduction in deferred maintenance, development of a formal process for addressing vacant structures, and continued occupation of active ranches and the pastoral landscape. Alternative B could contribute adverse impacts on cultural resources if resources are demolished. When the impacts from alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on cultural resources would be beneficial compared to existing conditions.

Alternative C

Alternative C would have the same type and intensity of beneficial and adverse impacts on cultural resources as alternative B. Elimination of the elk herd would not affect the cultural landscapes, historic districts, or historic structures, although elimination of the Drakes Beach herd would allow for a wider variety of potential adaptive reuse opportunities at D Ranch.

Cumulative Impacts

The cumulative impacts of alternative C would be the same as those described for alternative B.

Alternative D

Under alternative D, reduced ranching activities would focus on parcels where no residential use of historic complexes occurs, thereby minimizing adverse impacts on historic complexes in the district. Reduced ranching could have an adverse impact on the historic districts if grasslands reverted to shrubs/forest, changing the setting and feeling of the districts. If the 7,500 acres removed from grazing convert to shrubs or forest, the integrity of setting, feeling, and design of the historic districts would be adversely affected. Impacts on historic structures within the ranches, including adaptive reuse of vacant properties and deferred maintenance would be the same as those described for alternative B. Lands that remain in grazing would preserve the integrity of the cultural landscape. Despite these adverse impacts, both historic districts would remain eligible for listing in the National Register.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable projects would be the same as those described for alternative A. The incremental impacts of alternative D would contribute most of the impacts on cultural resources. Beneficial impacts would occur from a reduction in deferred maintenance, development of a formal process for addressing vacant structures, and continued occupation of active ranches and maintenance of the pastoral landscape. However, alternative D would contribute adverse impacts by removing 7,500 acres from grazing. When the impacts from alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on cultural resources would be adverse compared to existing conditions.

Alternative E

Phasing out dairy operations and allowing the elk population to increase would have adverse and beneficial effects on cultural resources. Impacts on current beef cattle ranches would be the same as those described for alternative B. For the six dairy operations that are phased out, long-term, adverse impacts are anticipated because of the number of ranch buildings and possibly entire ranches that would become vacant. Because the L Ranch, B Ranch, and I Ranch Dairy complexes have a greater level of integrity, preservation and adaptive reuse of these complexes would be prioritized over A Ranch, C Ranch, and J Ranch that have a lower level of integrity. Grazing would not be noticeably altered, which would preserve the pastoral setting and directly benefit the districts.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable projects would be the same as those described for alternative A. The incremental impacts of alternative E would contribute most of the impacts on cultural resources. While alternative E would maintain the pastoral landscape across all 24 ranches, it is anticipated that dairy infrastructure would become vacant on 6 dairies, resulting in adverse impacts on historic structures. When the impacts from alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on cultural resources would be adverse compared to existing conditions.

Alternative F

Under alternative F, no commercial agricultural activities would be permitted in the planning area, and ranch structures may become unoccupied for a period of time. Alternative F proposes adaptive reuse for as many historic structures as feasible, prioritizing ranches that contain the characteristic buildings and structures typical of the historic ranches. High priority properties contain most, if not all, the requisite historic milking and dairy production structures; residential/domestic structures; ranch support structures such as barns, sheds, and garages; and historic landscape features such as pastures and windbreaks. Ranches with fewer examples of these characteristic structures would have lower preservation priority.

In the Olema Valley Dairy Ranches Historic District, the Giacomini and Zanardi Ranches would be high priorities for preservation and potential adaptive reuse. These ranches have a notable number of the

characteristic buildings typical of ranches in the district. The McIsaac and Stewart Ranches would be medium priority for preservation. The remaining ranches in this district in the planning area would be medium to low priorities and would not be preserved unless specific funding or adaptive reuse opportunities became available. In the Point Reyes Peninsula Dairy Ranching Historic District, 6 ranches would be high or high/medium priorities for preservation and potential adaptive reuse: B, C, D, Home, I, and L Ranches. The remaining 10 ranches in this district would be medium to low priorities.

Adaptively reusing ranch complexes that are high or high/medium priority would have a long-term, beneficial impact on those ranch buildings that are maintained and rehabilitated for new uses, especially those that currently have deferred maintenance. Medium-priority ranches would receive less maintenance and would potentially be mothballed if in fair condition or demolished if in poor condition. Building demolition or potential deterioration over time would result in long-term, adverse impacts on medium- and low-priority properties and the National Register districts to which they contribute. Mothballing of properties would have a short-term, adverse impact because the setting of the district would be altered with boarded up buildings and potentially a long-term, adverse impact if a use could not be found and maintenance continues to be deferred. Changing the traditional historic use of ranch complexes would be a long-term, adverse impact on the historic districts as a whole. Cultural landscape features such as fences, boundaries, and circulation features would be removed, resulting in a long-term, adverse impact by changing the setting and feeling of the landscape. The pastoral appearance of the ranching districts would not be maintained, which would alter the historic district's setting and feeling. Loss of pastures that are contributing sites in the ranching districts would also cause a long-term, adverse impact on the historic districts and over a long period could cause the districts to lose sufficient integrity so as to no longer be eligible for listing in the National Register, which would likely result in significant, adverse impacts on the Point Reyes Peninsula Dairy Ranching and Olema Valley Dairy Ranches. The pastoral appearance of the antenna fields in the Marconi/RCA Bolinas Transmitting Station Historic District and RCA Point Reyes Receiving Station Historic District would also not be maintained, causing long-term, adverse impacts on both historic districts' setting and feeling; however, both districts would remain eligible for listing in the National Register.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable projects would be the same as those described for alternative A. The incremental impacts of alternative F would contribute most of the adverse impacts because structures in moderate or poor condition may be mothballed or demolished, the pastoral appearance would not be maintained, and the historic districts may lose their eligibility for the National Register as a result of an overall loss of integrity. When the impacts from alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on historic resources would be adverse compared to existing conditions.

SOCIOECONOMICS

Methodology and Assumptions

The study area for socioeconomic impacts includes Marin County, California because this county would encompass the area within which the primary impacts from the alternatives could be felt. Western Marin County, where the park is located, is primarily rural, with scattered, small, unincorporated towns that serve tourism, agriculture, and residents. Ranches in the park also purchase goods and services from businesses in Sonoma County, and some workers at the ranches reside in Sonoma County. The study area comprises both Marin and Sonoma Counties in California. Additional information about San Francisco is also included in this assessment because of its proximity to the study area and the economic relationship that the ranches in the study area may have with this county. While these counties contain several larger cities, including San Rafael, San Francisco, Santa Rosa, Petaluma, and their surrounding areas, the park is located in a predominantly rural area away from the large urban areas.

The analysis of socioeconomic impacts considers potential effects on employment, population, and revenue from park visitation and ranching activities that may result from changes in the leasing arrangements of ranching activities at the park. Beef cattle and dairy operations support the income and employment of farmers, ranchers, and operations staff. These operations also support income, sales, and employment at the businesses where they purchase goods and services. Additionally, visitation to the park supports gateway communities, hotels, tour operators, and visitor outfitters, such as kayak rental companies. Visitors support local communities and businesses through their spending, which supports jobs, income, sales, and fiscal revenues primarily in Marin County and beyond Marin County where the flow of goods and services from these businesses support additional employment and income.

Economic Impact Assessment of Changes in Sales at Ranches on Point Reyes (Backward-Linked Impacts). An Input-Output (I/O) analysis measures the interdependence among industries in the regional economy to provide an estimate of multiplier effects. This kind of analysis describes the demand and supply of products and services among industries, households, and governments to create a detailed mathematical description of an economy in a specified area. This approach is based on the notion that there is a fundamental relationship between the volume of output of an industry and the volume of the various inputs used to produce that output. Industries are often grouped into production, distribution, transportation, and consumption categories. The IMpact analysis for PLANing (IMPLAN®) is an industry-standard I/O model used to estimate economic impacts.

IMPLAN software and data are sophisticated economic tools that apply I/O analysis to estimate the impacts of changes in regional economies. IMPLAN customizes regional I/O models to provide estimates of output (sales), employment, income, and gross regional product effects in a specified location. Changes in the purchases of goods and services for final consumption (final demand change) are the driving forces in I/O models. Each industry that produces goods and services generates demands for other goods and services. For example, when construction firms pay their workers and purchase supplies or services, economic activity is generated in the local or regional economy through salaries, business, and household spending. Multipliers are used to describe this additional economic activity. As of December 2014, IMPLAN has the capability to analyze 536 industry sectors, providing a detailed examination of the economic effects on specific industries.

Initial expenditure or revenue can have both a direct effect on the local economy (local labor) as well as effects that are considered leakages (e.g., imports, commuters). Some portion of the direct effect is likely captured locally, usually a portion of the direct jobs and income. Goods and services needed to produce the directly affected service or product include purchases from local (within the study area) and non-local (e.g., imports) businesses. Purchases made locally for services, products, and labor generate additional economic activity in the study area. Subsequent rounds of spending do not generate the same level of economic activity due to the import of goods, services, and labor and to account for transactions that do not stimulate further spending in the economy of an IMPLAN model (i.e., within the study area). It is often assumed that profits, savings, and taxes generate no further economic activity for the region because profits and savings represent monies set aside for later use, and collected taxes can leave the region before being spent.[11] The final result of all the purchase rounds generated in the study area by the initial expenditure is the total impact. Table 12 presents the types of impacts that can be estimated using the IMPLAN model.

[11] Taxes can be an important source of funding for local government entities. For instance, some taxes, such as property taxes and sales taxes remain within the local area and are used to fund government projects and services. Other taxes, such as severance taxes on mineral and energy extraction may be collected by a state agency that redistributes the revenues throughout the state. Thus, the local study area may only realize a portion of the tax revenues generated in the region.

TABLE 12. ECONOMIC IMPACT DEFINITIONS

Impact Term	Definition
Direct impact	The direct effects are the initial expenditures (or production revenues) made by the industry experiencing the economic change.
Indirect impact	The indirect effects include the backward-linked industry suppliers for any goods and services used by the directly affected industries.
Induced impact	The results of local spending of employees' wages and salaries for both employees of the directly affected industry and the employees of the indirectly affected industries.

Source: Day n.d.

The IMPLAN model is started by creating an "event" that becomes the input into the model. This event is then "run" in the model to produce outputs from the model in the form of direct, indirect, and induced impacts to the study area in the form of changes to sales, employment, income, and gross regional product (referred to as "total output" in IMPLAN) that would occur as a result of the "event." In this analysis "events" represent changes in sales of beef and cattle dairy operations. These "events" are changed depending on the alternative to represent the likely change in sales at each ranch operation. The model outputs direct, indirect, and induced impacts to employment, sales, income, and output in the study area. Sales values have been adjusted for the following IMPLAN industries to measure these impacts:

- Sector 11 Cattle ranching and farming
- Sector 12 Dairy cattle and milk production
- Sector 13 Poultry and egg production

The IMPLAN study area for this model includes Marin and Sonoma Counties because goods and services provided to ranch operations at Point Reyes are assumed to come from both counties. Because the park is in Marin County, most impacts are assumed to occur there. However, agricultural suppliers and farm hands that provide goods and services to ranches in the planning area reside in Sonoma County. Therefore, a multi-regional input output analysis was completed to assess the separate impacts that would occur to Sonoma County as a result of this project. By performing multi-regional I/O modeling, these two counties are linked together to determine how dollars spent on purchases in one county, such as Marin, move to Sonoma County. This also allows the tracking of additional indirect and induced jobs supported by indirectly affected businesses in Sonoma County because these businesses in turn purchases additional goods and services in both Marin and Sonoma Counties (Day n.d.). It should be noted that IMPLAN estimates that impacts would occur in another county as a result of spending in an industry in the directly affected county based on the average purchasing methods of businesses in the directly affected industries. Real impacts would likely be different as individual businesses make decisions outside their industry averages that could lead to greater or fewer impacts in neighboring counties. The results of the IMPLAN model, especially impacts identified in neighboring counties, should therefore be viewed cautiously as an estimate of how an industry in general in Sonoma County may be affected by the modeled changes.

Assumptions for IMPLAN modeling:

- IMPLAN default values for the percentage of local goods that each ranch operation procures to produce its products were used as inputs into beef and dairy cattle operations. All initially direct impacts to sales at ranch operations were set at 100% for Marin County because all affected sales in the two directly affected industries occur in Marin County.
- All milk produced at the ranches is organic milk and is sold to third parties to be sold again directly to consumers or through intermediaries that turn the initial milk product into a higher value good such as yogurt or cheese.

- The total amount of milk produced per day per cow at each dairy ranch in the planning area is 71 pounds. This value was applied to all milking cows at Point Reyes based on the number of reported cows at each ranch (Black 2019).
- A dollar value of $30.02 per hundred pounds was used to calculate the sales value of the milk produced at dairy ranches on Point Reyes (Marin County Department of Agriculture, Weights and Measures 2017). This value was adjusted from 2017 to 2018 dollars using the US Consumer Price Index (US BLS 2018).
- All beef operations are non-organic except for one small operation, at G Ranch, where organic beef operations take place.
- The number of permitted animals, provided by Point Reyes, was used to calculate the production of beef at the park.
- Because the total number of permitted animals at each beef cattle operation are not ready for harvest at one time, only a portion of the herd was assumed to be available for harvest each year. Therefore, the number of permitted animals was multiplied by 86% to determine the actual number of animals sold each year relative to the number of permitted animals at each ranch. This value was determined by reviewing the "COW-CALF/GRASS-FED Beef Operation" Report published by the University of California Cooperative Extension in 2004 (UCCE 2004). This report states that a 200 cow-calf breeding cycle operation includes 375 animals in total each year. Of these, 200 are breeding cows, 142 are culled animals (20 culled cows, 1 culled bull, and 121 sale calves), and 30 are second year grass-fed heifers. That means there are 172 animals sold each year from an average cattle farm from a total of 200 permitted animals that reside on that farm during the year. Dividing 172 by 200 equals 0.86 or 86%.
- A dollar value of $749 per head of cattle was used to calculate the value of an animal produced for beef sales (Marin County Department of Agriculture, Weights and Measures 2017). This value was adjusted from 2017 to 2018 dollars using the US Consumer Price Index (US BLS 2018).
- Only one ranch runs a poultry operation in the planning area. It was assumed that this operation uses Rhode Island Red chickens that can produce up to 300 eggs per year and that the operation has 2,000 laying hens. It was also assumed that one dozen eggs sell for $0.87 (2017$) (USDA-NASS 2018a). Based on these statistics, this operation can raise $43,300 per year from egg production. Additionally, it was assumed that this operation sells 900 broiler hens per year based on park permit data and that these broilers are sold for $3.39 (2017$) per head (USDA-NASS 2018b). Based on total sales of poultry in Marin County in 2017 of $17.816 million (2017$), it was determined that poultry sales at the park made up 0.26% of all sales in the county (Marin County Department of Agriculture, Weights and Measures 2017).

Discrepancy between IMPLAN Output (Sales) and County Reported Sales for Dairy Production. Marin County's 2017 Livestock and Crop Report states total milk production, also understood as "at the farm gate" sales, was $34,153,000 in 2017 (Marin County Department of Agriculture, Weights and Measures 2017). IMPLAN stated the same sector's output, interpreted as "at the farm gate" sales in this analysis, at $54,645,000 in 2017 dollars ($53,544,678 in 2016 dollars), after adjusting for inflation. IMPLAN obtained this value by using two inputs: (1) state-level output estimates for the farm sectors from the USDA, National Agricultural Statistics Service's Value of Production (NASS) and ERS cash receipts data series, and (2) by using the ratio of county physical production to state physical production in an industry from the latest Census of Agriculture (IMPLAN 2019). In this case, IMPLAN used 2016 ERS cash receipts totaling $6,065,550,000 for the "Dairy products, Milk" commodity (USDA-NASS 2019). IMPLAN multiplied this product by the ratio of Marin County sales to the state of California sales of "Milk from cows" in the 2012 US Agricultural Census. Marin County's sales were $61,264,000 (2012$) and California's sales were $6,945,102,000 (2012$) in the 2012 US Agricultural Census (USDA-NASS 2012), for a ratio of 0.0088211. The resulting product of this ratio and ERS' cash receipts for

"Dairy products, Milk" commodity in 2016 is $53,505,312, which is statistically close to 53,544,678 (note: there is a small discrepancy due to rounding in the calculations). The value of $53,505,312 adjusted for inflation results in a value of $54,645,164, which is 60% greater than the county's valuation of $34,153,000 in "at the farm gate" sales of dairy milk in the same year. Therefore, IMPLAN may be overestimating the impact that sales in this industry have in the local economy in its baseline data. However, because IMPLAN derives its industry sales multipliers from RIMS II, among other sources, there is no reason to believe that an incorrect assessment of baseline sales in an industry would have further impact in the model. Therefore, this should not affect results from the changes in sales that are run through the model for the various alternatives. However, because IMPLAN applies the latest employment statistics in an industry to an industry's output to measure changes in employment, income, and household spending associated with changes to an industry's output, the number of employees supported per dollar of output may be underestimated. NPS studied employment in this industry, and it is apparent that IMPLAN is undercounting the number of employees supported by this industry. To adjust employment impacts for this potential discrepancy, the results from a survey of employment at ranches in the planning area were incorporated into the inputs of the IMPLAN analysis. This allows for a more accurate representation of impacts on employment. However, the model may still underestimate impacts on local output and gross regional product.

Forward-Linked Impacts from Changes in Operations

The IMPLAN model is not designed to calculate impacts to forward-linked industries that purchase outputs, such as beef and dairy products, from ranch operations at Point Reyes because goods sold by the ranches are commodities that would be replaced in the supply chain of forward-linked industries. Possible forward-linked impacts on businesses that purchase outputs from ranches at Point Reyes are discussed below in qualitative terms of the possible disruption of their supply chain from locally constrained inputs, such as milk, to increased transportation costs.

Data Sources

Data sources used in this analysis included IMPLAN for its trade flow models, the US Census Bureau for population and demographic information, the US Bureau of Labor Statistics for information on employment and unemployment in the study area, the US Bureau of Economic Analysis for information on employment by industry, David Lewis with the University of California Cooperative Extension in Marin County, Point Reyes, for information on ranch operations, and the 2012 and 2017 US Census of Agriculture for county and state level agriculture information.

Alternative A

Population, Employment, Income, and Sales

Ranching, as authorized under existing lease/permits, would not change. New lease/permits would be renewed every 5 to 10 years, subject to NPS discretion and based on updated FMV appraisal determinations. The current population residing on ranches in the planning area and total employment associated with the ranches would remain the same. Ranchers would continue to purchase and sell goods and services in the local economy at existing levels.

As described in the "Visitor Use, Experience and Access" section, visitation and tourism in the planning area would not change under alternative A. Therefore, visitor spending, $108.5 million in 2017, in the planning area and in gateway communities would not change. Park visitation would continue to contribute economic benefits to Marin and Sonoma Counties.

Ranching and Agricultural Activities

Beef and dairy ranching operations and one commercial chicken operation would continue. Ranching operations would directly support 63 local jobs, $5.7 million in income, $16 million in agricultural product sales, and population in the study area while also indirectly supporting additional employment,

income, and sales through purchases of inputs into their operations from local suppliers as described in chapter 3. Mowing and forage production would continue to occur at existing rates, which reduces the need for ranchers to purchase supplemental feed for their livestock. Beef ranching under alternative A would continue to account for 15% of total cattle ranching, by sales, in Marin County, while dairy production in the planning area would account for 41% of dairy production, by sales, in the county. Poultry farming in the planning area would continue to account for approximately 0.3%, by sales, of poultry production in the study area. Overall, ranching in the planning area would continue to contribute less than 0.1% of both total regional employment and gross regional product.

Cumulative Impacts

Invasive plant management projects have the potential to contribute long-term support for employment, income, and sales in the study area as a result of goods or services that are purchased in the study area for development of these projects. PG&E fire management projects have the potential to seasonally support local employment, income, and sales through purchases of goods and services over the long term as fire management projects are undertaken. The primary economic benefits to the study area would accrue through contracts to mechanically cull trees and brush over time. Cultural restoration projects and roadway improvements would beneficially affect the study area as a result of spending on local labor and supplies for roadway projects. This spending would directly and indirectly support local employment, income, and sales in the study area. The primary economic benefits of these projects would accrue to local laborers hired to work on these projects. These laborers would induce additional rounds of economic benefits in the study area as a result of their household spending on goods and services.

Overall, these past, present, and reasonably foreseeable future actions have and would continue to result in beneficial impacts on employment, income, and sales in the study area. Alternative A would continue to contribute to regional employment and gross regional product from continued support of employment, incomes, sales, and taxes by ranchers, park spending and projects, and visitation to the park. When the incremental impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative socioeconomic impacts would remain beneficial. The incremental impacts of ranching under alternative A would contribute 0.03% of total regional employment and 0.01% gross regional product in the study area.

Alternative B

Population, Employment, Income, and Sales

Under alternative B, projects to enhance public use and enjoyment may be implemented, and the construction of these projects may result in the temporary support of jobs, sales, and income for construction companies hired to implement them. Construction workers for these projects are expected to come from the study area; therefore, the local population would not increase in the short or long term. This alternative would further provide indirect support for local jobs and income as construction companies and their laborers purchase additional goods and services in the local economy. These impacts would occur only during the period of construction and would cease once construction is completed.

While alternative B could create new recreational opportunities over the long term, the overall visitation to the park is expected to remain similar to the last decade. The local population and employment would not be directly affected in the long term because the creation of new jobs or need for permanent living areas would not occur as a result of these opportunities. Ranching operations would continue as under alternative A. Continued ranching would not cause an increase in the local residential population. As described in the “Visitor Use, Experience, and Access” section, there would be no change in visitation under this alternative compared to existing conditions, and as such, there would be no change to jobs, income, sales, and taxes in the study area in the short or long term.

Grazing, Ranching, and Agricultural Activities

Under alternative B, all ranches would be offered lease/permits with 20-year terms allowing both beef and dairy ranches to continue operating generally at current levels. Consistent with existing conditions, ranching operations would continue to directly support 63 local jobs, $5.7 million in income, $16 million in agricultural product sales, and population in the study area. These operations would also indirectly support additional employment, income, and sales through purchases of inputs into their operations from local suppliers. These levels of revenues are expected to change based on Consumer Price Index and other long-term indices. Longer lease terms would allow ranchers to more easily obtain loans for property upgrades and provide for their businesses' financial security compared to existing conditions. Any restoration of vacant buildings or ranching improvements would directly support study area employment, income, and sales for any goods and services procured in the study area.

Expanded ranch diversification activities, including pigs, chickens, sheep, goats, and horse boarding, could provide a possible economic buffer for ranchers during poor forage production years, reductions in the price of products, or increases in the price of inputs. If ranchers undertake diversification activities, additional economic benefits in the study area could accrue. This diversification option could also result in additional spending in the study area for feed, equipment, and other supplies to support diversification activities. However, impacts would likely be minimal. For example, if all 18 ranches that are eligible to raise chickens elected to raise the maximum 500 chickens allowed under diversification activities, this activity would only account for 0.8% of all chicken revenue in the study area. Any economic benefits created by the sale of products from these activities and from purchases made by ranchers to develop these activities in the planning area would support local jobs, income, sales, and taxes in the study area.

Economic benefits from continued beef and cattle ranching would be similar to those described for alternative A, accounting for 15% of total cattle ranching, by sales, in Marin County. Dairy production in the planning area would account for 41% of dairy production, by sales, in the county. Overall, ranching in the planning area, including additional beneficial impacts from diversification activities, would continue to contribute less than 0.1% of both total regional employment and gross regional product.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would continue to contribute to regional employment and gross regional product from ongoing support of employment, incomes, sales, and taxes by ranchers, park spending and projects, and visitation to the park. The socioeconomic impacts of alternative B would be beneficial compared to existing conditions from the potential for additional diversification activities and longer lease terms that would allow ranchers to invest more heavily in their operations.

When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative socioeconomic impacts would remain beneficial. The incremental impacts of ranching under alternative B would contribute 0.03% of total regional employment and 0.01% gross regional product in the study area.

Alternative C

Under alternative C, impacts would be the same as those described for alternative B.

Alternative D

Population, Employment, Income, and Sales

Alternative D would be similar to alternative B, except under this alternative, approximately 7,500 acres of ranching would be removed from the planning area and non-cattle livestock in the Pasture subzone would not be authorized. Because the ranches identified for conversion have no residential complexes, the population in the planning area would not be affected. As described for alternative B, construction of projects to support visitor use may result in additional local jobs, income, sales, and taxes in the study

area. These impacts would occur only during the period of construction and would cease once construction is completed. As described in the "Visitor Use, Experience, and Access" section, no change in visitation would occur under this alternative compared to existing conditions; therefore, there would be no change to jobs, income, sales, and taxes in the study area in the long term.

Grazing, Ranching, and Agricultural Activities

Under alternative D, ending grazing on 7,500 acres of the planning area would reduce the authorized beef cattle AUs in the planning area by approximately 700. There would continue to be 3,130 dairy cattle in the planning area. This decrease would result in an approximate $500,000 reduction in annual beef sales in the study area, or about 5% of beef sales in Marin County. These sales directly support 17 full-time jobs, indirectly support another 1.5 full-time jobs in Marin County, and 1 additional job in Sonoma County. As a result of the closure of these ranches, household spending by former ranch employees and by employees from businesses where ranches purchase goods and services would be reduced. This would result in the loss of support for 1 additional induced job in Marin County. In total, the jobs that would no longer be supported account for $560,000 in labor income, or less than 0.01% of labor income, in the study area. Gross regional product would be reduced by $630,000 in the study area under this alternative, less than 0.01% of the total gross regional product.

If ranchers were to undertake diversification activities, additional economic benefits in the study area could accrue compared to existing conditions, although benefits may be slightly less than those experienced under alternative B because diversification would be limited to the Ranch Core subzone. This diversification option could also result in additional spending in the study area for feed, equipment, and other supplies to support diversification activities. Although likely minimal, economic benefits in support of local jobs, income, sales, and taxes in the study area would occur from the sale of products from these activities and from purchases made by ranchers to develop these activities in the planning area.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative D would contribute to regional employment and gross regional product, from ongoing support of employment, incomes, sales, and taxes by ranchers, park spending and projects, and visitation to the park. Alternative D would also contribute beneficial impacts compared to existing conditions from additional diversification opportunities. However, ending ranching on 7,500 acres would result in adverse impacts compared to existing conditions from the loss of $500,000 in beef cattle sales and the corresponding elimination of 19 jobs at ranches in the study area. When the incremental impacts of alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative socioeconomic impacts would remain beneficial. The incremental impacts of ranching under alternative D would contribute 0.005% of total regional employment and 0.01% of gross regional product in the study area.

Alternative E

Population, Employment, Income, and Sales

Under alternative E, all dairy ranches would be phased out during a five-year period and would convert to beef ranches. This alternative would continue to authorize residential use on ranches, even if they are no longer operating dairy ranches, so no change in population in the study area is anticipated. However, alternative E would result in adverse impacts on local jobs, income, sales, and taxes in the study area because dairies would close, and jobs would be reduced as the operations converted to beef ranching, which, based on IMPLAN outputs and an interview with UC Cooperative Extension Sonoma County (Black, pers. comm. 2019), require fewer full-time equivalent workers. Like alternative B, actions to enhance public use and enjoyment would be implemented and would temporarily support construction worker jobs and income. As described in the "Visitor Use, Experience, and Access" section, no change in

visitation is expected under this alternative compared to existing conditions. No changes to jobs, income, sales, and taxes in the study area would occur in the short or long term as a result of changes in visitation.

Grazing, Ranching, and Agricultural Activities

The cessation of dairy operations and the one commercial chicken operation in the planning area would result in the loss of $14.4 million in dairy, egg, and meat poultry sales annually compared to existing conditions; however, the conversion of dairy ranches to beef operations would offset approximately $580,000 of these sales losses. Total dairy sale losses would represent 41% of total dairy sales in Marin County, while the conversion of operations to beef cattle and subsequent sale of beef products would result in a 5% increase in county beef sales. The closure of the commercial chicken operation would reduce annual poultry sales in Marin County by approximately 0.3%. In total, changes in dairy, cattle, and poultry product sales under this alternative would reduce support for 27 direct jobs at the ranches in the study area and another 21 indirect jobs for other businesses in Marin County as a result of the purchase of goods and services by ranchers. The conversion of dairy ranches to beef ranches would also reduce household spending by former ranch employees and by employees from businesses where ranches purchase goods and services. This would result in a reduction in support for 11 induced jobs in Marin County. In total, the loss of these 58 jobs would represent 0.03% of all jobs in the county and support $5.3 million in labor income. An additional 3 indirect jobs and 1 induced job, accounting for $210,000 in labor income, would no longer be supported by goods and services purchased by the dairy ranchers in Sonoma County. This alternative would reduce the gross regional product in the study area by $9.1 million (0.01% of the gross regional product). It is anticipated that the study area would experience an overall loss of jobs, income, sales, and tax revenues because dairy operations support more employment and sales than beef cattle operations.

Additionally, forage production or row crops would not be authorized under this alternative. Ranchers would need to procure additional feed for their livestock from suppliers outside the planning area, which would increase operating costs. However, forage production is typically linked to dairies, so the conversion of dairy operations to beef should minimize the need to bring in feed from outside the planning area. The economic impacts of this action would be mixed and would primarily result in the increased transfer of dollars to a forage provider in the study area and reduced spending on goods, service, and labor in support of growing forage on the ranches, resulting in a minimal economic impact in the study area.

There would also be “forward-linked” impacts on industries that purchase products produced by ranches in the planning area under this alternative. For example, creameries and dairy processors in Marin and Sonoma Counties, such as Clover Sonoma, Straus Creamery, and Sierra Organics, would no longer be able to purchase dairy products from ranchers in the planning area. They may choose to curtail their own production or purchase dairy products from other businesses. This choice would have an adverse impact on their business operations because they have presumably already optimized where they purchase their inputs, choosing planning area dairies for their price, quality, or another desirable trait. A reduction in the quality of the dairy product that these processors procure may affect demand for their own products or require further costly refinement of their product. Procurement of dairy products from a new dairy may also be more expensive than purchasing dairy products from ranches in the planning area either as a result of the additional distance that the dairy product would need to be shipped or because of a more limited market supply of dairy products in the region, and the subsequent increase in price received for these products. For example, one creamer works with nine dairy farms and operates off a quota-based system where dairy farms must meet a certain quota within 2% of a certain amount of milk annually (Black, pers. comm. 2018). However, given the historical decline in milk prices (Marin County Department of Agriculture, Weights and Measure 2017) and the current excess supply of organic milk available in the market (Black, pers. comm. 2018), it is possible that any remaining dairy farms that a creamery works with may be able to make up for the loss of one or more dairy farms in the planning area. In the short term, creameries may have to cut production while adapting to the conversion of ranches in the planning

area. However, depending on market conditions and availability of milk at the time of cessation of dairy ranching in the planning area, this impact is likely to be limited and short term in scale. Therefore, in the short term, forward-linked impacts are likely to be minimal but adverse in this industry as the result of converting ranching operations and closing one commercial chicken operation in the planning area.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would contribute to regional employment and gross regional product from continued support of employment, incomes, sales, and taxes by ranchers, park spending and projects, and visitation to the park. However, conversion of dairy ranching to beef ranching would result in adverse impacts compared to existing conditions from the loss of $14.4 million in annual revenue and 27 jobs at ranches in the planning area. When the incremental impacts of alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative socioeconomic impacts would remain beneficial. The incremental impacts of ranching under alternative E would contribute 0.01% of gross regional product and employment in the study area.

Alternative F

Population, Employment, Income, and Sales

Under alternative F, phasing out all beef and dairy operations would result in the eventual conversion of all ranch residences and ranch employment in the planning area. Alternative F would result in a reduced population in the planning area. It is not known whether families or employees residing in the planning area would relocate elsewhere in the study area. As shown in chapter 3, sales from ranching operations in the planning area currently support 63 full-time jobs. According to an analysis by park staff, 188 residents live on ranches in the planning area (NPS, Voeller, pers comm 2019d). These individuals represent 0.07% of the population of Marin County. Additionally, because these ranches represent 18 of the 100 beef cattle operations and 6 of the 48 dairy operations in Marin County, it is possible that workers could relocate to another ranch in the county (US Census of Agriculture 2012c). If all these individuals and families relocate outside the study area, the population in the study area would experience a small, direct, long-term reduction of 0.07%.

Demand for supporting goods and services associated with ranch operations in gateway communities, such as food and supplies, would decrease, reducing support for local sales, jobs, and income in these communities. Additionally, any ranch employees who reside in gateway communities would lose their jobs. It is possible that some of these individuals would relocate from gateway communities to find work elsewhere. Impacts from these relocations would vary depending on the proportion of the population that leaves any specific gateway community. For example, a reduction in population of 188 persons represents 33% of the population of Point Reyes Station and would be equivalent to over half the reduction in population that has occurred in this town over the past 15 years. This level of population reduction would result in a noticeable reduction in household spending and subsequent support for local jobs, income, and sales in this community. However, because most of the ranch workers and operators live on ranches in the planning area, their household spending is spread among a number of gateway communities in the area, diluting the impacts any one specific gateway community would feel from a reduction in the local population. Overall, the reduction in ranch spending in local communities and the reduction in household spending by ranch workers would result in adverse impacts on local employment, income, and sales.

As described in the “Visitor Use, Experience, and Access” section, visitation levels under this alternative are not expected to change compared to existing conditions. Therefore, no change to jobs, income, sales, and taxes in the study area are anticipated in the short or long term due to changes in visitation levels.

Grazing, Ranching, and Agricultural Activities

All ranching operations at Point Reyes would cease under this alternative, resulting in the removal of $1.6 million in sales of beef products, $14.4 million in sales of dairy products, and approximately

$50,000 in egg and meat poultry sales in Marin County. These losses would represent 15% of total beef sales, 41% of total dairy sales, and approximately 0.3% in egg and poultry sales in the county annually. As described in chapter 3, these sales directly support 63 full-time jobs at ranches in the planning area and indirectly support another 27 jobs in Marin County from the purchase of goods and services by ranchers in the planning area. These jobs would no longer be supported by purchases from park ranches. As a result of the conversion of these ranches, household spending by former ranch employees and by employees of businesses where ranches purchase goods and services would be reduced. This would result in the loss of support for an additional 16 induced jobs in Marin County. These jobs would represent 0.06% of all jobs in the county and support $6.6 million in labor income.

Additionally, seven indirect jobs—primarily in the beef cattle ranching and other animal food manufacturing industries in Sonoma County—would no longer be supported as a result of reduced purchases from ranching operations in the planning area. These jobs support one additional induced job through household spending. In total, $350,000 in labor income in Sonoma County would be lost by eliminating ranching in the planning area, less than 0.01% of labor income in Sonoma County. In total, $10.7 million in gross regional product would be lost in the study area by removing sales of beef and dairy products from ranching operations in the planning area (0.01% of study area gross regional product).

Marin County has no fixed slaughterhouses; Sonoma County has one. Because this is the only slaughterhouse in the San Francisco Bay Area, it would experience forward-linked impacts (Press Democrat 2014). Impacts on this operation would likely be comparable to those for the entire two-county study area, with up to 3% of all beef cattle sales in the region coming from the planning area. Therefore, this slaughterhouse may see around a 3% decrease in sales, depending on how much local beef cattle is processed at this plant.

Forward-linked impacts from eliminating beef cattle operations, dairy ranching, and the chicken operation would be the same as those described for alternative E. Ultimately, it is likely that businesses that process beef, dairy, and poultry products from the planning area would see an increase in the cost of their operational inputs and a decrease in the amount they are able to process, or both, as a result of the elimination of ranching. This would result in long-term, adverse economic impacts on the study area because income and sales could be reduced at processing facilities, which could further reduce employment at these facilities.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Ending ranching under alternative F would contribute meaningful adverse impacts compared to existing conditions from the loss of approximately $16 million in annual revenue area, which constitutes 0.01% of the study area's gross regional product. In addition, 63 direct jobs at ranches in the planning area would be lost, as would additional jobs and revenue described above. These jobs would represent less than 0.03% of regional employment. When the incremental impacts of alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the overall cumulative socioeconomic impacts would remain beneficial. Ranching in the planning area would no longer contribute to the total regional employment and gross regional product in the study area.

AIR QUALITY

Methodology and Assumptions

The project is located in Marin County, California, which is a nonattainment area for the 8-hour ozone standard (marginal) and $PM_{2.5}$ (moderate) (USEPA 2019). Therefore, the relevant pollutants and thresholds for the general conformity applicability analysis are as follows:

- VOC: 100 tons/year

- NO_x: 100 tons/year
- $PM_{2.5}$ direct: 100 tons/year
- SO_2: 100 tons/year
- NH_3: 100 tons/year

VOC and NO_x are ozone precursors and VOC, NO_x, SO_2, and ammonia are $PM_{2.5}$ precursors.

Ammonia is considered a significant contributor to $PM_{2.5}$ formation in the Bay Area, as evidenced by the inclusion of ammonia in the California Air Resources Board $PM_{2.5}$ State Implementation Plan submissions to the USEPA (the primary source of NH_3 emissions is the agricultural sector) (CARB 2011).

Mobile Source Emissions

For contextual purposes, existing mobile source emissions in the park were quantified. Detailed information (vehicle classification, age, speed, road grade) is not readily available, and the effort to obtain this information would exceed the scope of the concern. Nevertheless, an order-of-magnitude estimate of mobile source emissions was developed based on 2018 traffic count data on the park roadways and USEPA's MOVES model emission factors.

Table 13 summarizes the estimate of vehicle miles travelled necessary to quantify mobile source emissions. NPS collects traffic counts on the major park roadways. Vehicles entering one of the listed areas were assumed to have driven the full length of the roadway (e.g., a vehicle counted on Sir Frances Drake Boulevard was assumed to have traveled to the lighthouse and back). Roadway lengths were estimated in Google Earth. For 2018, Vehicle Miles Travelled = 2018 entering vehicles × one-way roadway length × 2.

TABLE 13: 2018 VEHICLE MILES TRAVELED ESTIMATE

Count Location	Total Vehicles Entering in 2018	Roadway Represented	One-Way Length (miles)	2018 Vehicle Miles Travelled
Bear Valley Visitor Center	164,547	Bear Valley Road	2.27	747,043
Palomarin	70,872	Mesa Road	3.75	531,540
Limantour	101,638	Limantour Road	7.4	1,504,242
Pierce Point	132,760	Pierce Point Road	8.95	2,376,404
Sir Frances Drake	200,622	Sir Frances Drake Boulevard (from Pierce Point Road to Lighthouse)	13.3	5,336,545
			Total	**10,495,775**

MOVES emission rates were developed with the following assumptions:

- National scale (the MOVES national scale mode uses USEPA default data, which is not suitable for regulatory purposes, but appropriate given that the objective of this analysis is to provide a general order-of-magnitude emission)
- 2018 analysis year, January, 8:00 am–9:00 am hour

- Marin County, California, geographic bound
- Gasoline passenger car vehicle type (no other vehicle/fuel types)
- Rural unrestricted access roadway type (accounts for stop-and-go traffic pattern as opposed to freeway-type driving)
- Running exhaust and crankcase running exhaust for NH_3, VOCs, and CO_2e (and all required prerequisites) and tire and brake wear for $PM_{2.5}$
- Speed of 25 miles per hour (per Superintendent's Compendium, majority of park roadways have posted speed limit of 35 miles per hour or less)

Table 14 summarizes the generalized MOVES passenger auto emission rates.

TABLE 14. GASOLINE PASSENGER AUTO GENERALIZED EMISSION FACTORS (GRAMS/VEHICLE-MILE)

NH_3	VOC	$PM_{2.5}$	CO_2e
0.0233	0.0486	0.0139	355.7810

Note: $PM_{2.5}$ includes exhaust + tire wear + break wear

Existing condition $PM_{2.5}$ emissions from dust generated by vehicle travel on paved roads was estimated based on the following methods:

- Equation and inputs from CARB's Miscellaneous Process Methodology 7.9 Entrained road dust, paved road dust (updated November 2016)
- Silt loading factor of 0.32 grams/m^2 (statewide default for local roads used by CARB)
- Average vehicle weight of 2.4 tons (statewide average)
- Number of wet days with greater than 0.01 inch of precipitation of 66 (CARB calculation)
- $PM_{2.5}$ fraction of PM_{10} = 15%

Under all action alternatives, vehicle use is anticipated to either remain at current levels or decrease relative to existing conditions and the no action alternative. For this reason, alternative-specific mobile source emission estimates were not prepared. Mobile source emissions would continue similar to existing conditions under alternatives A, B, and C. Under alternatives D, E, and F, mobile source emissions are expected to decrease relative to existing conditions. The reduced mobile source emissions may include general ranch equipment/operations (e.g., tractors, deliveries, employees), as well as trips specific to certain types of ranching (such as dairy trucks).

Livestock Quantities by Alternative

Table 15 summarizes the number of dairy and beef cattle assumed for each alternative for purposes of estimating cattle-related emissions. No action and existing conditions cattle numbers are assumed to be equivalent. An existing commercial chicken operation (2,000 laying hens and 900 broilers) would be authorized to continue operating under alternatives A, B, C, and D. The chicken operation would not be allowed to continue under alternatives E and F.

Small amounts of other non-cattle livestock are present on the ranches, but because of the low numbers of horses, goats, pigs, and other livestock, the emissions from these animals would be inconsequential relative to the primary emission source (cattle) and therefore were not quantified. Diversification under alternatives B, C, and D could encourage some reduction in cattle and increase in non-cattle livestock. However, it is not known the extent to which ranch operators would use the option of diversification or what types of animals they would select. For purposes of this analysis, 9,000 total chickens were assumed. The increase in non-cattle emissions from diversification would be at least partially offset by the reduction in cattle emissions and would likely remain small relative to the overall livestock-related

emissions occurring in the park. Therefore, emissions related to potential increased diversification were not quantified.

TABLE 15. NUMBER OF LIVESTOCK BY ALTERNATIVE FOR EMISSION ESTIMATES

Alternative	Beef Cows	Dairy Cows	Dairy Heifers	Total Cattle	Chickens
Alternative A	2,441	2,098	1,024	5,563	2,900
Alternatives B and C	2,441	2,098	1,024	5,563	9,000
Alternative D	1,689	2,098	1,024	4,811	9,000
Alternative E	3,196	0	0	3,196	0
Alternative F	0	0	0	0	0

Livestock Waste Emissions

CARB sponsored a study that developed California-specific cattle NH_3 emission factors (CARB 2008). Table 16 summarizes the NH_3 waste emission factors from this study for ranged beef cows, dairy cows, and dairy manure spreading. For NH_3 emissions from dairies, the emission factors shown were applied to milking cows. For heifers, substantially lower NH_3 emissions are expected, and a 50% reduction in the emission factor for heifers is supported by the Agrammon N-flux model (see supplemental data tables included in Kupper, Bonjour, and Menzi 2015).

For VOC emissions from dairy cattle, an emission factor was obtained from a 2012 study conducted by the San Joaquin Valley Air Pollution Control District (SJVAPCD 2012). The VOC emission rates includes enteric emissions from cows, milking parlors, freestalls/barns, corrals/pens, liquid manure handling/land application, separated solids piles, and solid manure storage. For beef cattle, a Reactive Organic Gasses emission factor was obtained from a 2004 CARB methodology document (CARB 2004). For purposes of this relative comparison of alternatives, VOC emissions were assumed to be equal to Reactive Organic Gas emissions.

Poultry manure emission factors for NH_3 and VOCs were obtained from a South Coast Air Quality Management District guidance document (SCAQMD 2016). For poultry manure, an uncontrolled PM emission factor of 0.0616 pounds/head/year was also obtained from the South Coast Air Quality Management District.

TABLE 16. LIVESTOCK WASTE NH_3 AND VOC ANNUAL EMISSION FACTORS

	NH_3 (lbs/head/year)	VOC (lbs/head/year)
Beef Cattle (Range Cows)	1.54	12.8
Dairy Cattle	74.0	20.0
Dairy Operations–Manure Spreading	5.6	NA
Poultry	0.096	0.02565

Fugitive Dust Emissions

Dust emissions from beef cattle ranching were estimated using a particulate matter of 10 micrometers or less (PM_{10}) emission factor of 24 pounds PM_{10} per thousand head per day (Penfold et al. n.d.). This emission factor was developed specifically for beef cattle feedlots; however, no alternative emission factor more representative of cattle ranching practices in the study area was identified in a literature review. An emission factor of 4.4 pounds PM_{10} per thousand head per day was selected for use in estimating emissions for dairies (Goodrich et al. 2002). Converting these daily emission rates to units of pounds/head/year results in emission factors of 8.76 and 1.61 for beef and dairy cattle, respectively. A particulate size fraction of 0.15 is used to estimate $PM_{2.5}$ from PM_{10} based on AP-42 Chapter 13, Miscellaneous Sources, Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors.

Methods and Assumptions for Greenhouse Gas Emissions

A GHG emissions analysis was prepared for purposes of NEPA. As explained below, mobile source emissions were not analyzed, but cattle-related emissions from enteric fermentation and manure management were estimated based on the projected head of cattle under each alternative. The final emissions are presented in terms of metric tons of CO_2e per year.

Nonpoint Source Emissions

Enteric fermentation is fermentation that takes place in the digestive systems of animals and results in CH_4 being exhaled or belched by ruminants (USEPA 1995). USEPA has developed the following California-specific enteric fermentation emission rates as part of its 2019 Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2017 (Table A-176):

- Mature dairy cows—146 kg/head/year
- Mature beef cows—100 kg/head/year

The USEPA greenhouse gas inventory emission factors include different rates for different cattle ages, but detailed information on cattle age distribution is not readily available. Assuming all cattle are mature is a conservative approach that likely overestimates emissions.

Manure management activities during ranching emit the greenhouse gases nitrous oxide (N_2O) and CH_4. USEPA's Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2016 provides a detailed manure management emissions quantification methodology that accounts for beef versus dairy cattle and various types of manure management (USEPA 2018b). The primary form of manure management at the ranches in the planning area is storage of liquid slurry in ponds. The manure is spread on fields and rangeland during the dry season. However, given the purpose of the GHG quantification for this EIS is to provide an order-of-magnitude and relativistic comparison of the alternatives, a simplified approach based on implied emission factors is used. The USEPA inventory provides the total dairy cattle and beef cattle population for the United States, as well as the total CH_4 and N_2O associated with these populations. Approximate emission factors were estimated based on this information as summarized in table 17.

The emission factors do not consider the details of ranching operations in the study area but provide a reasonable approximation to compare alternatives. The additional time and cost of analyzing the emissions using methods that are more detailed would not be informative to decision making.

Poultry waste-related emissions were quantified based on CARB's statewide emission inventory factor of 20 grams CH_4 per head per year for pasture-raised broilers (CARB 2015). An N_2O emission rate specific to pasture-raised poultry was not available; therefore, an emission rate of 1.78 grams of N_2O per head per year for "poultry with bedding" was used (CARB 2015).

TABLE 17: CH_4 AND N_2O EMISSION FACTORS FOR MANURE MANAGEMENT

	Total US Population (2015)[a]	Total US CH_4 (metric tons) (2015)[b]	US Ave. CH_4 Emission Factor (kg /head/year)	Total US N_2O (metric tons (2015)	US Ave. N_2O Emission Factor (kg /head/year)
Dairy Cattle	18,798,000	1,391,000	74.00	20,000	1.06
Beef Cattle	76,225,000	126,000	1.65	26,000	0.34

Source: USEPA 2018b

[a] https://www.epa.gov/sites/production/files/2018-01/documents/2018_all_annexes.pdf

[b] https://www.epa.gov/sites/production/files/2018-01/documents/2018_chapter_5_agriculture.pdf

Greenhouse Gas Reduction Opportunities

While not required as part of any of the alternatives, this section provides information on optional approaches that could serve to reduce GHG emissions associated with ranching in the planning area.

Alternative Manure Management. California funds non-digester emission reduction strategies for manure emissions reduction through the alternative manure management program (CARB 2018). Because CH_4 is formed when manure is stored under anaerobic conditions, alternative manure management strategies focus on creating aerobic conditions or decreasing manure storage under anaerobic conditions. Examples of alternative manure management approaches include mechanical solids-liquid separation with drying, conversion of flush systems to scrape with dry manure storage or composting, and conversion to pasture-based management and compost pack barns (CDFA 2018). Reductions at specific ranches would depend on the strategies selected for implementation compared to the baseline strategies on each ranch.

Carbon Farming. Carbon farming refers to practices that increase CO_2 removal from the atmosphere and convert it into plant material and soil organic matter (Marin Carbon Project 2018). Marin County's Carbon Project includes assistance to ranches to encourage carbon farming by sponsoring the completion of carbon farming plans. Examples of carbon farming practices may include compost application, riparian restoration, silvopasture (combination of trees and pasture), and critical area planting, among others (Niebrugge and Creque n.d.). As an example of the potential long-term CO_2 reduction achievable with these methods, application of compost to 4,300 acres of grazed grassland on Cachuma Ranch was estimated to sequester 162,619 metric tons of CO_2e over a 30-year analysis period (Niebrugge, Schembre, and Creque n.d.). The carbon farming planning process involves inventory of the natural resources and soil conditions and use of various online emissions reduction calculator tools, such as NRCS's COMET (USDA-NRCS n.d.). Like other GHG-reduction strategies, the actual reduction achieved would depend on the extent to which the carbon farming plan is implemented and the baseline emissions of a particular ranch. Not all carbon farming practices may be appropriate for implementation in the park, but to the extent that compatible practices are implemented voluntarily by ranches and with NPS approval, carbon farming could reduce GHG emissions from ranching activities.

Alternative A

Ranch Management

Under alternative A, existing beef and dairy cattle ranching operations would continue to emit criteria pollutants and GHG emissions, as described in chapter 3. No changes in the number of cattle would occur under alternative A relative to existing conditions. Ranching-related emissions include emissions from the cattle directly, manure management on dairies, and fugitive dust. Mobile source emissions related to visitor use, park operations, and ranching would also continue to emit criteria pollutants and GHG emissions similar to the levels shown in table 8. Emissions from mobile sources are not expected to

change. These emissions would continue to contribute to ambient concentrations of criteria pollutants and impacts on AQRVs (such as nitrogen deposition and visibility) in combination with other emission sources and transport of emissions from outside the planning area. Ambient concentrations of O_3 and $PM_{2.5}$ are expected to continue to be below the NAAQS thresholds. Visibility improvement trends noted in chapter 3 are also expected to continue (likely driven by changes in emissions outside the planning area). Nitrogen wet deposition impacts on ecosystems exceed NPS's critical load levels under existing conditions, and alternative A would not alter these levels or change these impacts. As shown in table 9, NH_3 (the pollutant most strongly associated with agriculture) emissions in the park represent approximately 11% of county-level total NH_3 emissions; for other pollutants, the relative contribution of sources in the park would be substantially less. Overall, the changes under alternative A would be minimal because emissions from livestock and mobile sources would be similar to existing conditions, and regional emissions sources would continue to be the driver of air quality in the planning area.

Cumulative Impacts

Coastal dune restoration projects and cultural resource restoration projects would continue to generate criteria pollutant emissions and GHG emissions from the engines of off-road construction equipment and truck trips. Fugitive dust would also be generated during construction activities. Similarly, heavy off-road equipment and haul trucks used for repairing 22 miles of roads and parking lots in the park would release temporary and localized emissions of air pollutants. These impacts would be localized and temporary in any particular location and would not exceed air quality standards. The Lagunitas Creek habitat enhancement projects would involve using heavy equipment (such as excavators, dozers and dump trucks) to adjust the floodplain to support the creek's salmonid population. This construction equipment would generate criteria pollutants and GHG emissions on a temporary and localized basis (approximately 1.2 tons reactive organic gases, 11.9 tons NO_x, and 0.6-ton exhaust $PM_{2.5}$ [MMWD 2017b]). Implementation of the *Fire Management Plan* would result in emissions—PM_{10}, $PM_{2.5}$, VOC, CO, and NO_x—from prescribed fires and mechanical treatments (e.g., chainsaws). Emissions modeling for the Fire Management Plan EIS demonstrated that the overall effect of the *Fire Management Plan* on air quality would be beneficial because although prescribed fires would have localized impacts, the potential for large-scale catastrophic fires would be reduced. Prescribed burns would be conducted in accordance with the Bay Area Air Quality Management District Smoke Management Program, which includes consideration of the appropriateness of meteorological conditions before approval for a burn program.

These impacts would be limited in geographic extent depending on the specific action. The magnitude of impacts from larger actions (such as prescribed fires) would be mitigated through existing regulatory processes (such as approval for prescribed fires being controlled by meteorological conditions to avoid fires when conditions could create adverse impacts on ground level ambient air quality from smoke).

Regional sources of emissions from outside park boundaries would continue to be the largest contributor to air pollution effects in the park, and nitrogen deposition would continue to be a resource concern for park resource management in the future.

Overall, cumulative actions would continue to have adverse impacts on air quality in the park, and park ecosystems would continue to be at increased risk for harmful effects from nitrogen deposition. Alternative A would continue to have impacts that would be adverse from cattle, manure management on dairies, fugitive dust, and mobile source emissions. Given the current cumulative nitrogen deposition concerns, emissions from ranching and dairy operations are the most substantial source of in-park emissions that contribute, together with sources outside park boundaries, to cumulative air quality impacts. When the incremental impacts of alternative A are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on air quality would be adverse; however, visibility trends are expected to continue improving compared to existing conditions. Overall, the primary driver of air quality in the planning area would continue to be regional sources.

Alternative B

Under alternative B, emissions from ranching would be generally the same type and intensity as described under the existing conditions (table 8). The number of cattle in the planning area is assumed to remain the same as existing conditions. Implementation of management activity standards and mitigation measures would likely result in a reduction in emissions compared to existing conditions; however, emissions related to diversification activities, like additional chickens, could increase slightly (table 18). Mobile source emissions would continue to be like existing conditions because no change in visitor use levels is anticipated. Overall air quality conditions and trends in the park would remain like existing conditions.

TABLE 18: ANNUAL LIVESTOCK-RELATED EMISSIONS FROM RANCHING UNDER ALTERNATIVE B (TONS/YEAR)

	NH_3	VOC	$PM_{2.5}$	CO_2-Equivalent (metric tons/year)
Existing Conditions	105.9	46.9	1.99	24,611
Alternative B	106.2	47.0	2.02	24,617
Net Change	0.3	0.1	0.02	6
% Change	0.28%	0.17%	-1.41%	0.03%

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative B would have impacts that would be adverse from cattle, manure management on dairies, fugitive dust, and mobile source emissions. When the incremental impacts of alternative B are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on air quality would be adverse; however, visibility trends are expected to continue improving compared to existing conditions. Overall, the primary driver of air quality in the planning area would continue to be regional sources (see table 9).

Alternative C

Direct, indirect, and cumulative impacts would be the same as those described for alternative B.

Alternative D

As shown below in table 19, the reduction of 700 authorized beef cattle AUs under alternative D would reduce livestock-related NH_3, VOC, and $PM_{2.5}$ emissions by 0.6%, 10%, and 24%, respectively, relative to existing conditions. Particulate matter emission rates associated with beef ranching are higher than dairy and dominate the overall particulate matter emission total; therefore, the reduction in beef cattle would have a larger impact on $PM_{2.5}$ emissions. Other pollutants such as NH_3 have much higher emission factors for dairy cattle and would experience less of an impact from the reduction in beef cattle. Livestock-related GHG emissions would also be reduced by 8.05%. Mobile source emissions would continue, similar to existing conditions (no change in visitor use levels is anticipated). The reduction in emissions under alternative D would have a beneficial effect on criteria pollutant concentrations and AQRVs (including visibility, and nitrogen deposition) compared to existing conditions. The beneficial impacts relative to existing conditions may be most noticeable for particulate matter and visibility; however, it should be noted there is uncertainty associated with the particulate matter emission factor for cattle and therefore a large beneficial impact may not be realized, as noted in the methodology and assumptions.

TABLE 19: ANNUAL LIVESTOCK-RELATED EMISSIONS FROM RANCHING UNDER ALTERNATIVE D (TONS/YEAR)

	NH_3	VOC	$PM_{2.5}$	CO_2-Equivalent (metric tons/year)
Existing Conditions	105.9	46.9	1.99	24,611
Alternative D	105.6	42.1	1.50	22,630
Net Change	-0.3	-4.8	-0.5	-1,981
% Change	-0.28%	-10.3%	-24.8%	-8.05%

Cumulative Impacts

Impacts on air quality from past, present, and reasonably foreseeable projects would be the same as those described for alternative A. The incremental impacts of alternative D would be beneficial from the reduction in the number of authorized beef cattle AUs. When the impacts from alternative D are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on air quality would be adverse or beneficial depending on the air quality indicator. Existing trends would likely continue. While alternative D would slightly reduce NH_3 emissions leading to nitrogen deposition, the magnitude of the reduction would not reverse the overall cumulative adverse impact for nitrogen deposition given the minimal reduction and that nitrogen deposition is primarily affected by regional pollutant transport from outside the park (see table 9).

Alternative E

Under alternative E, dairy cattle, which generate more emissions of NH_3, VOC, and CO_2 per head than beef cattle, would be eliminated, but the number of authorized AUs of beef cattle would increase as dairy ranchers convert to beef ranching. Overall, the total cattle population would be reduced compared to existing conditions, leading to a measurable reduction in ranching-related emissions of NH_3 (98%), VOC (56%), and CO_2e (66%). Effects on air quality would primarily be beneficial, compared to existing conditions, for criteria pollutants and GHG emissions as shown in table 20. However, $PM_{2.5}$ emissions are estimated to slightly increase (5.4%) from the increase in beef cattle ranching and associated dust. Mobile source emissions would continue to be similar to existing conditions (no change in visitor use levels is anticipated). Ranching/livestock emissions would remain the main source of NH_3 and VOC emissions in the planning area (mobile source emissions of these pollutants are on the order of 1% of the ranching emissions). The reduction in emissions under alternative E would have a beneficial impact on criteria pollutant concentrations and AQRVs (including visibility, and nitrogen deposition). Regional transport from sources outside the park would continue to affect the planning area (see table 9 for county-level emissions information).

TABLE 20: ANNUAL LIVESTOCK-RELATED EMISSIONS FROM RANCHING UNDER ALTERNATIVE E (TONS/YEAR)

	NH_3	VOC	$PM_{2.5}$	CO_2-Equivalent (metric tons/year)
Existing Conditions	105.9	46.9	1.99	24,611
Alternative E	2.5	20.5	2.1	8,446
Net Change	-103.4	-26.4	+0.1	-16,165
% Change	-97.7%	-56.4%	+5.4%	-65.7%

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative E would have impacts that would be adverse from beef cattle, fugitive dust, and mobile source emissions. The elimination of dairy cattle would result in beneficial impacts compared to existing conditions; however, alternative E would also add a small amount of $PM_{2.5}$ from an increase in beef cattle AUs. When the incremental impacts of alternative E are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact on air quality would be adverse; however, visibility trends are expected to continue improving compared to existing conditions. Overall, the primary driver of air quality in the planning area would continue to be regional sources (table 9).

Alternative F

Alternative F would phase out ranching in the park over a period of five years, except for the two life estates which would continue until their reserved rights expire. As a result, virtually all ranching-related emissions of criteria pollutants and GHG emissions would end within five years, and the remaining emissions would eventually also cease. Vehicle trips associated with the ranches would be eliminated, further reducing overall emissions.

In the long term, public use of former ranch lands, including new visitor opportunities on former ranch complexes, could result in additional vehicle travel and emissions, but such emissions would be minimal in the context of overall visitor use. Overall impacts on air quality under alternative F would be beneficial compared to existing conditions because emission sources from ranching operations would be eliminated.

Cumulative Impacts

The impacts from past, present, and reasonably foreseeable actions would be the same as those described for alternative A. Alternative F would contribute meaningful beneficial impacts compared to existing conditions because all emissions related to ranching operations in the planning area would cease. When the incremental impacts of alternative F are combined with the impacts from past, present, and reasonably foreseeable actions, the total cumulative impact would be adverse. Overall, the primary driver of air quality in the planning area would continue to be regional sources (see table 9).

CHAPTER 5: CONSULTATION AND COORDINATION

PUBLIC PARTICIPATION AND SCOPING

The Scoping Process

Scoping in an essential component of the NEPA planning process. The formal scoping process for this draft EIS consisted of public scoping and consultation with federal and state agencies and tribal governments. The formal NEPA process and 30-day public scoping period was initiated on October 31, 2018, with the publication of a Notice of Intent in the *Federal Register* (83 FR 54775). In addition to the Notice of Intent, preliminary information regarding the EIS was provided to the public and other interested parties through a press release and a public scoping newsletter. During the public scoping period, NPS hosted two open house meetings and received more than 1,350 pieces of correspondence. A public comment summary report is available on the park website at www.nps.gov/pore.

AGENCY CONSULTATION

Agency consultation is the early involvement of federal and state agencies and tribal governments that may be affected by the federal action. Similar to the public scoping process, this allows affected agencies or tribal governments to comment and contribute early in the decision-making process and helps NPS to identify key issues or requirements to be considered in the NEPA process. During development of the draft EIS, NPS had discussions with the regulatory and consulting agencies listed below regarding their recommendations for streamlining regulatory requirements related to the actions being considered in this EIS. The following permits/consultations must be completed prior to implementation of the selected action:

- Clean Water Act Section 404 permit—US Army Corps of Engineers
- Clean Water Act Section 401 permit—San Francisco RWQCB
- Endangered Species Act Section 7, Biological Opinion—USFWS
- Endangered Species Act Section 7, Biological Opinion—NMFS
- Coastal Zone Management Act Federal Consistency Review—California Coastal Commission
- National Historic Preservation Act Section 106 Consultation—California SHPO
- National Historic Preservation Act Section 106 Consultation—Tribal Heritage Preservation Officer, Federated Indians of Graton Rancheria

RECIPIENTS OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Upon publication of the notice of availability of the draft EIS in the Federal Register, electronic notification will be provided to the media, federal departments/agencies, state and county governments, elected officials, tribal governments, organizations, businesses, and interested individuals via the NPS mailing list. Hard copies of the draft EIS will be distributed to USEPA Region 9 and the California State Clearinghouse.

LIST OF PREPARERS

Name	Title	Qualifications
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