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
FINAL ENVIRONMENTAL IMPACT STATEMENT
Appendices

SEPTEMBER 2020

APPENDIX A—MAPS

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Point Reyes National Seashore
General Management Plan Amendment
Environmental Impact Statement

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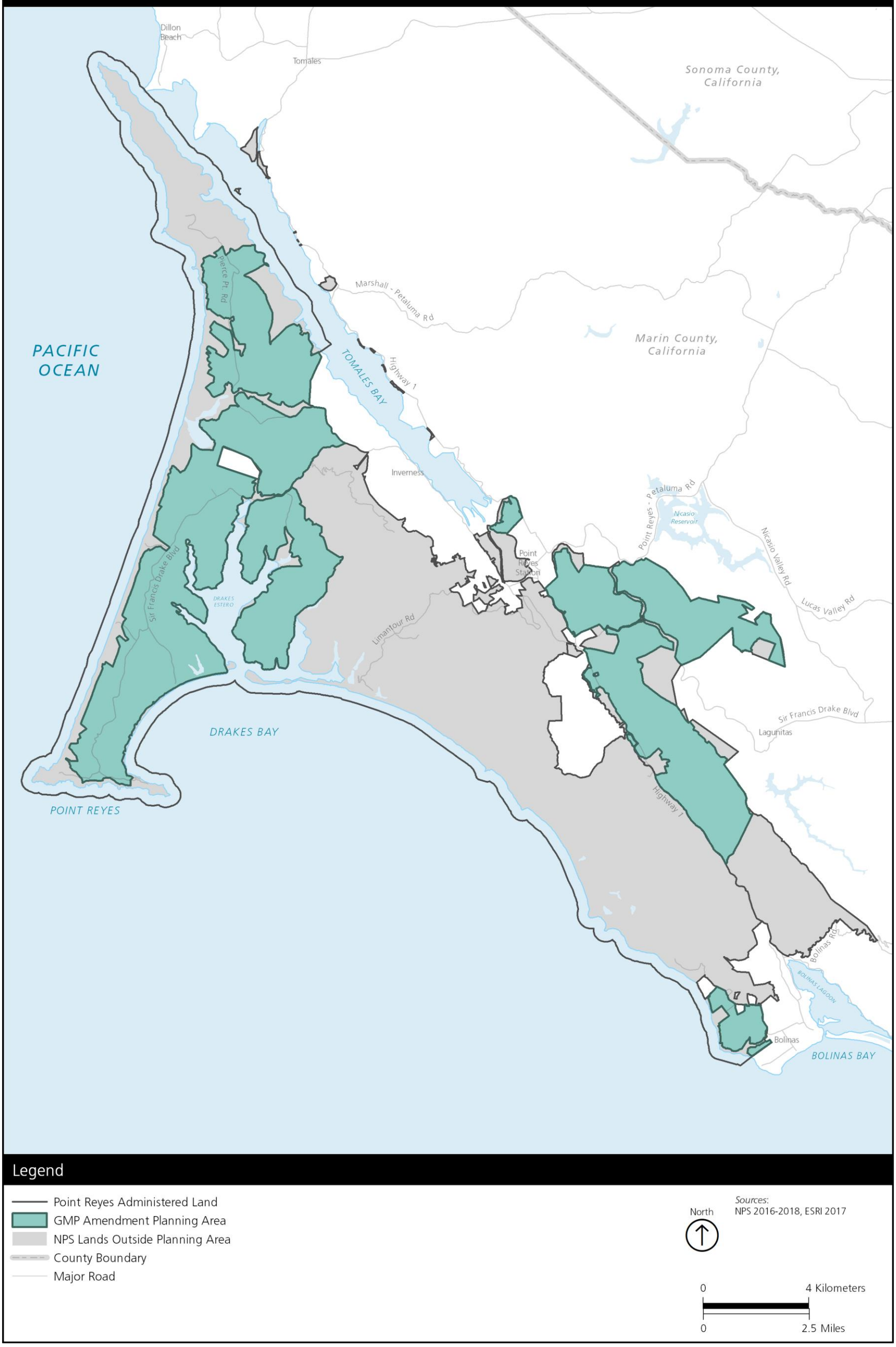

FIGURE 1: PLANNING AREA

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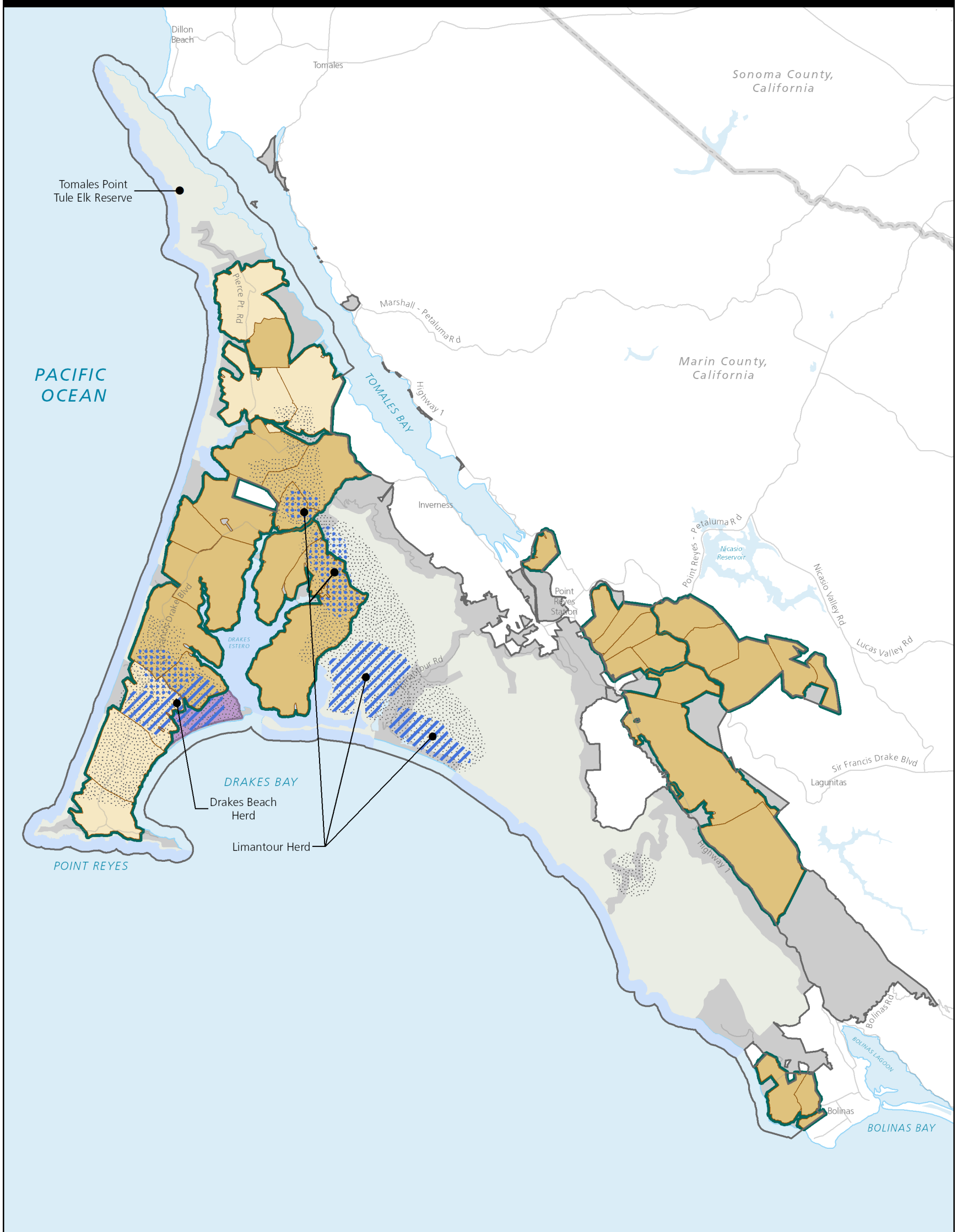

FIGURE 2: TULE ELK RANGE IN POINT REYES

Point Reyes National Seashore

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

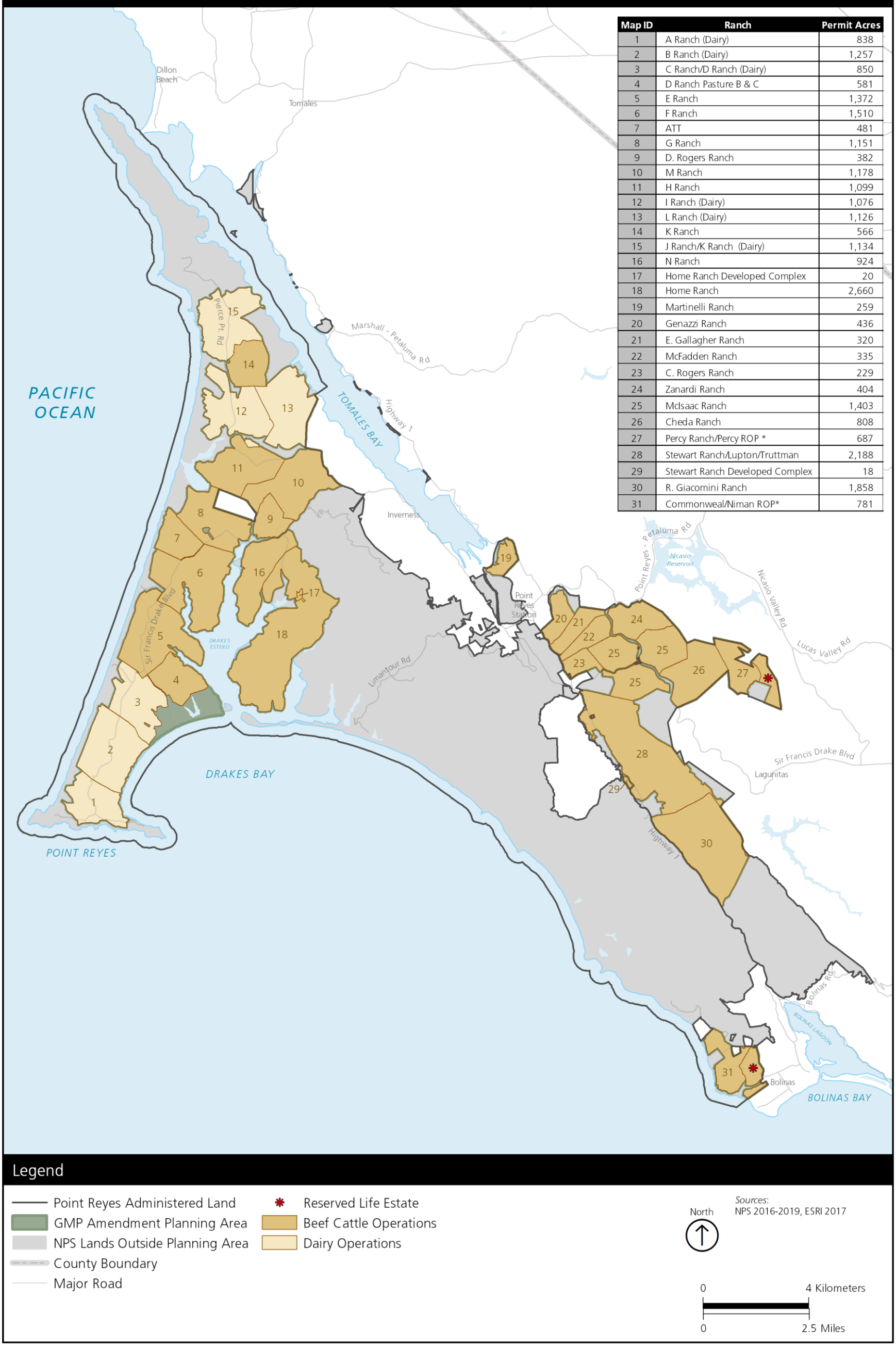

FIGURE 3: RANCH KEY MAP

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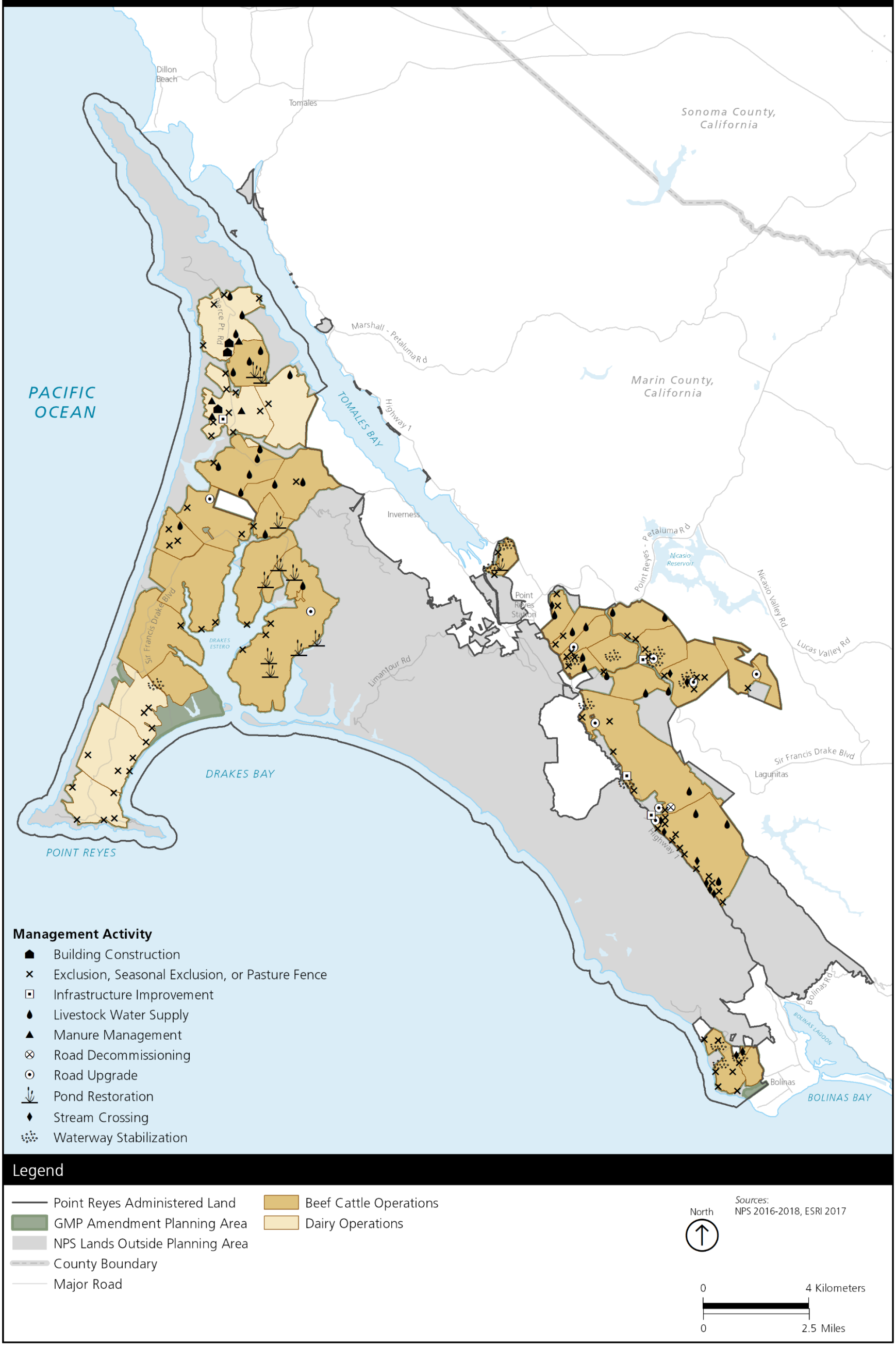

FIGURE 4: ACTIVITIES TO IMPROVE RESOURCE CONDITIONS IN THE PLANNING AREA

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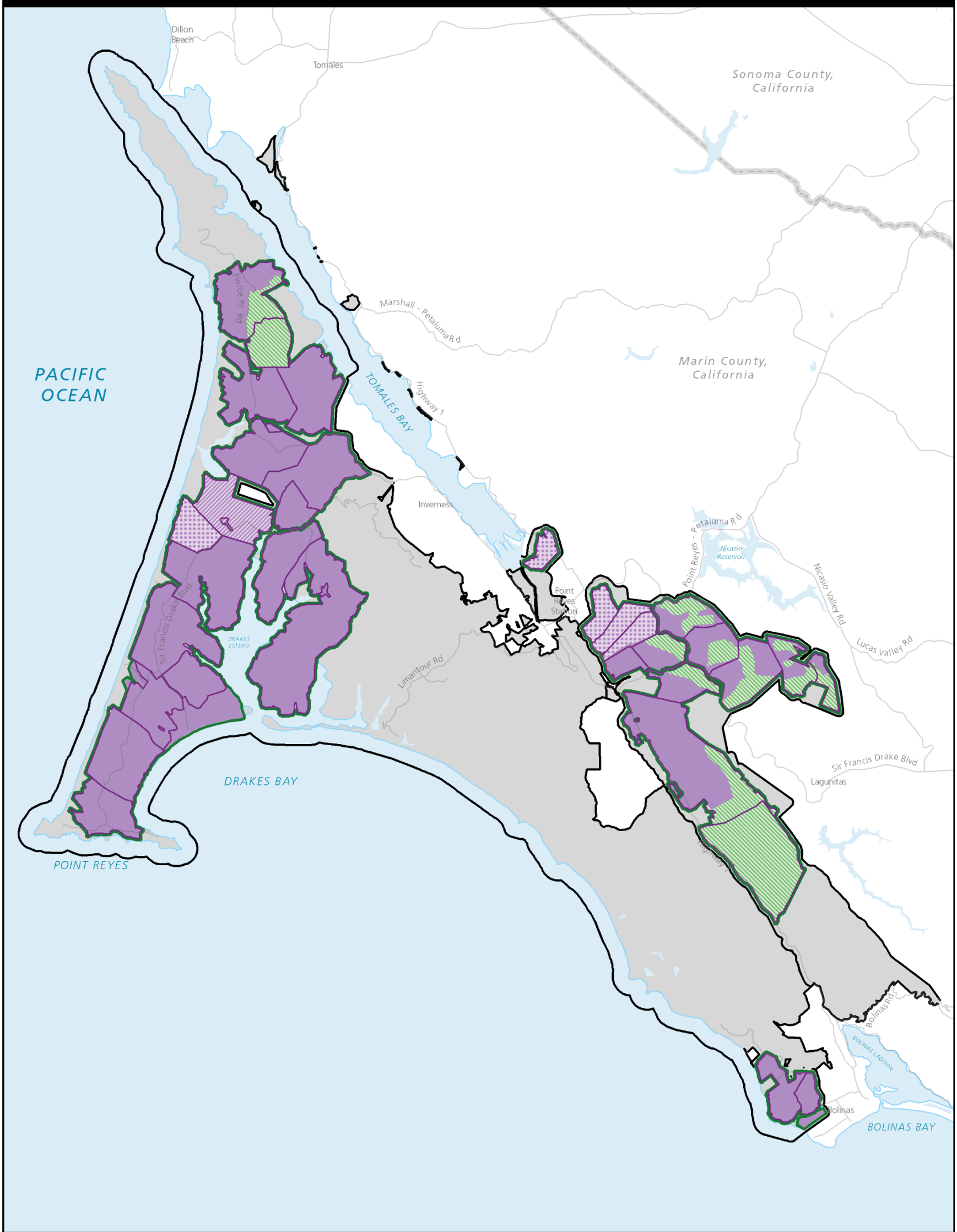

FIGURE 5: ALTERNATIVE A ZONING MAP—1980 PASTORAL ZONE DESIGNATION

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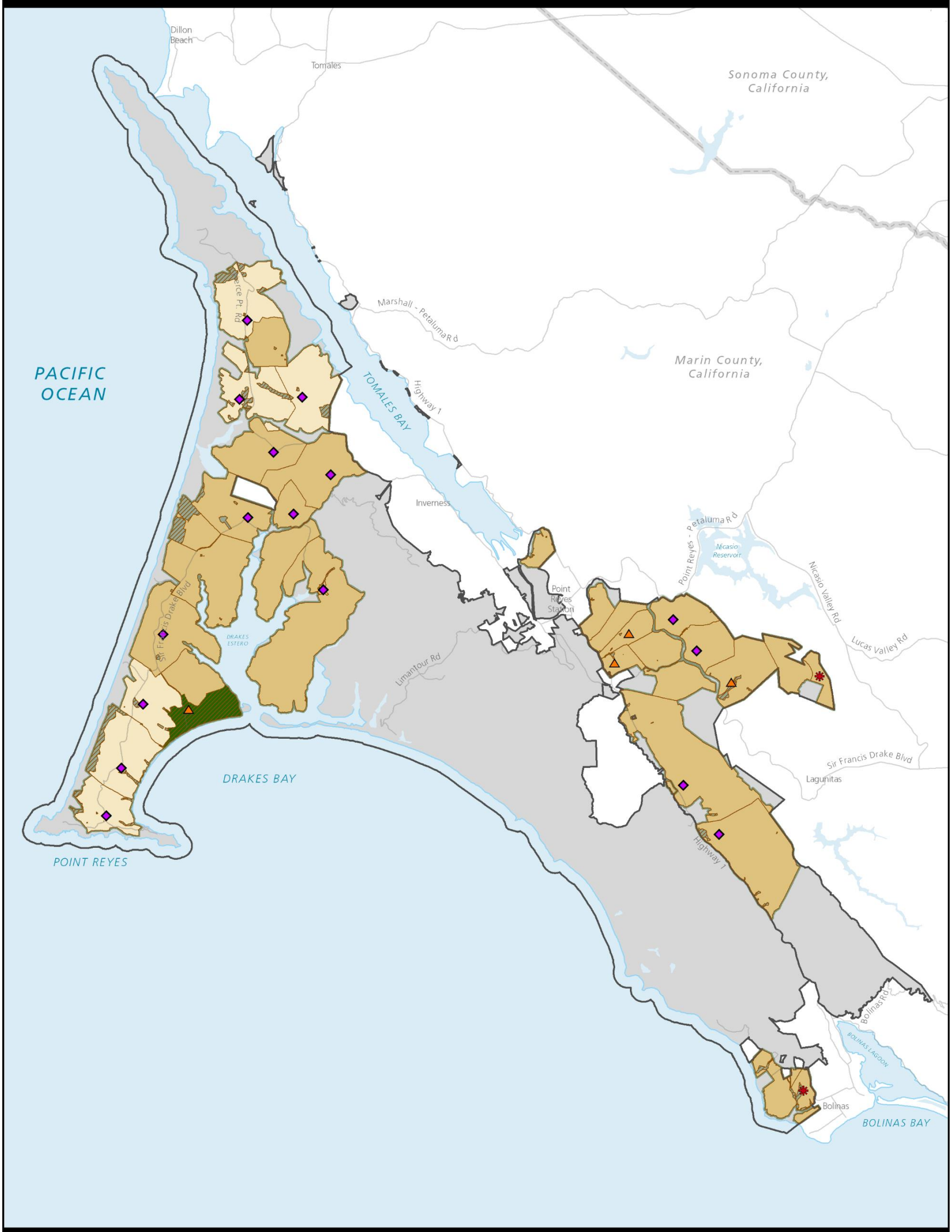

FIGURE 6: ALTERNATIVE A

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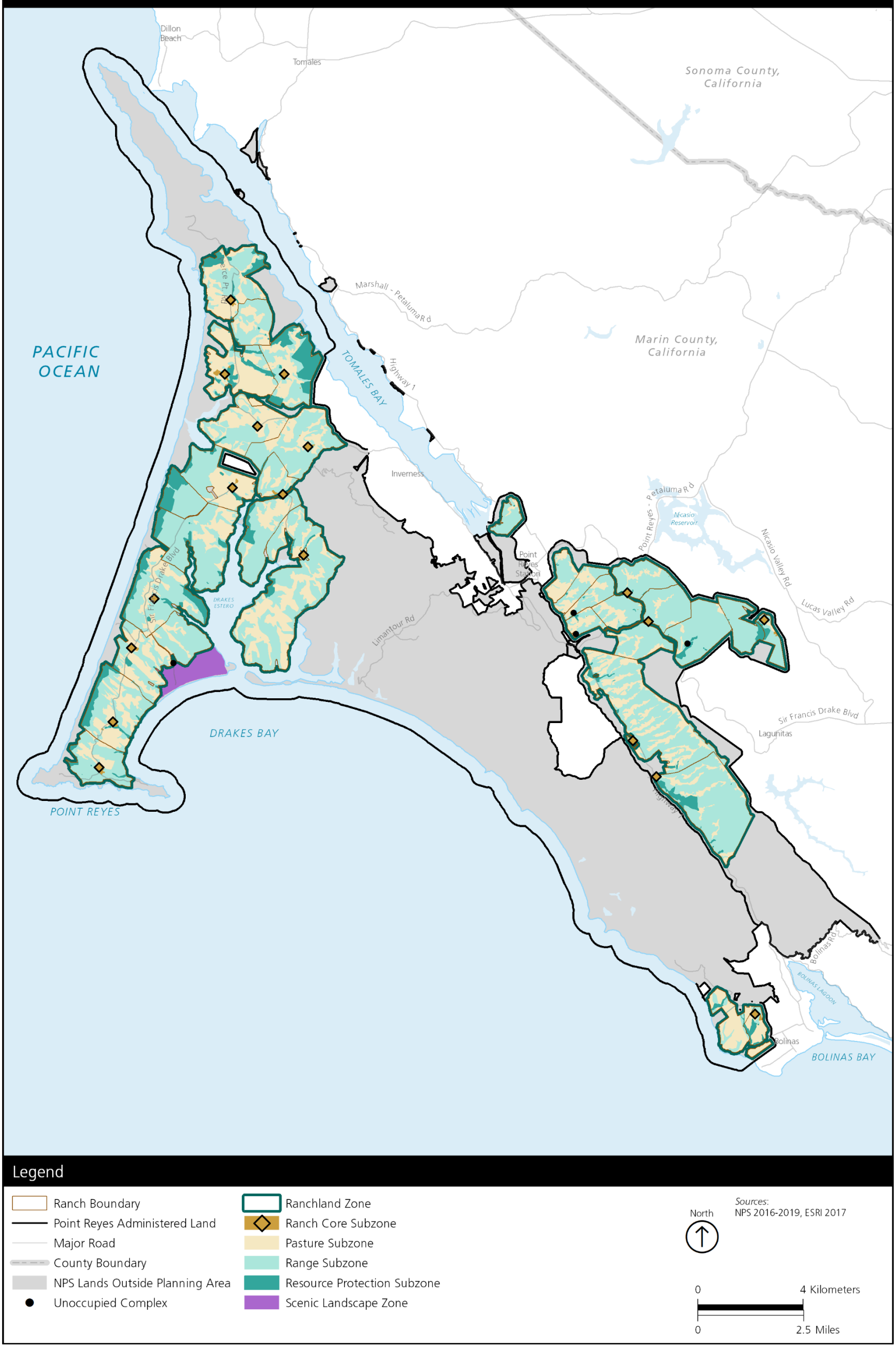

FIGURE 7: ALTERNATIVE B ZONING MAP

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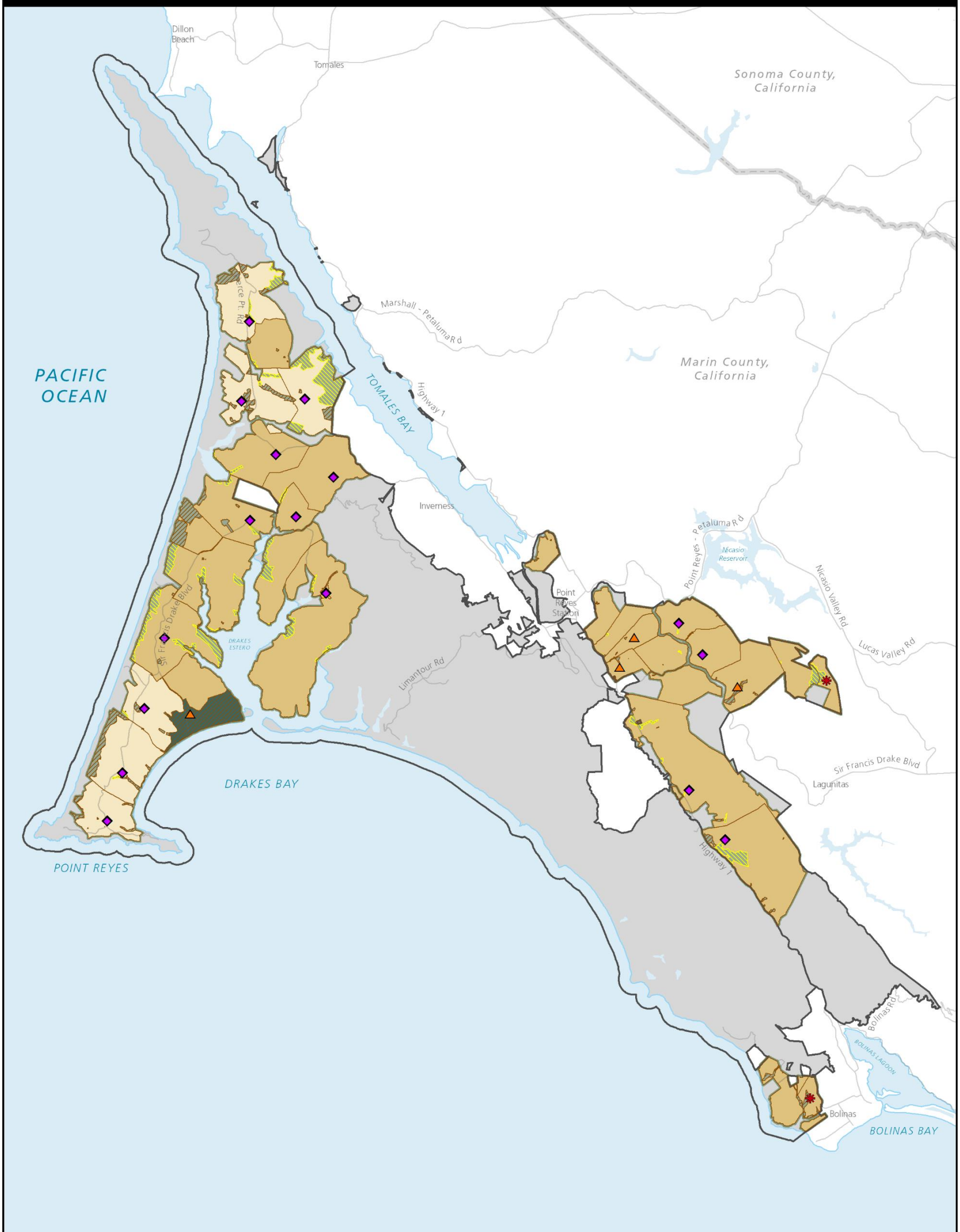

FIGURE 8: ALTERNATIVE B

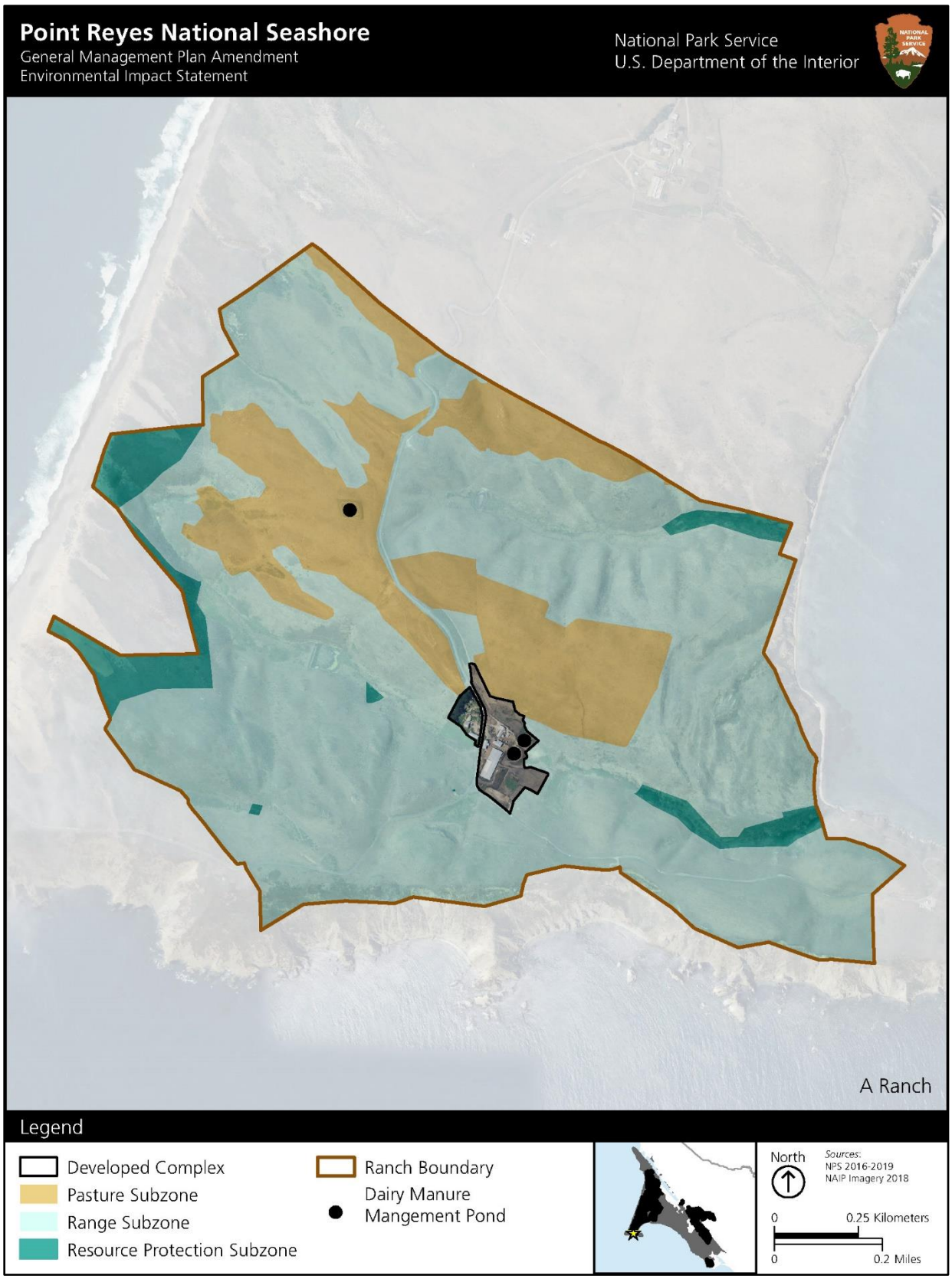

FIGURE 9: A RANCH ZONING MAP

FIGURE 10: B RANCH ZONING MAP

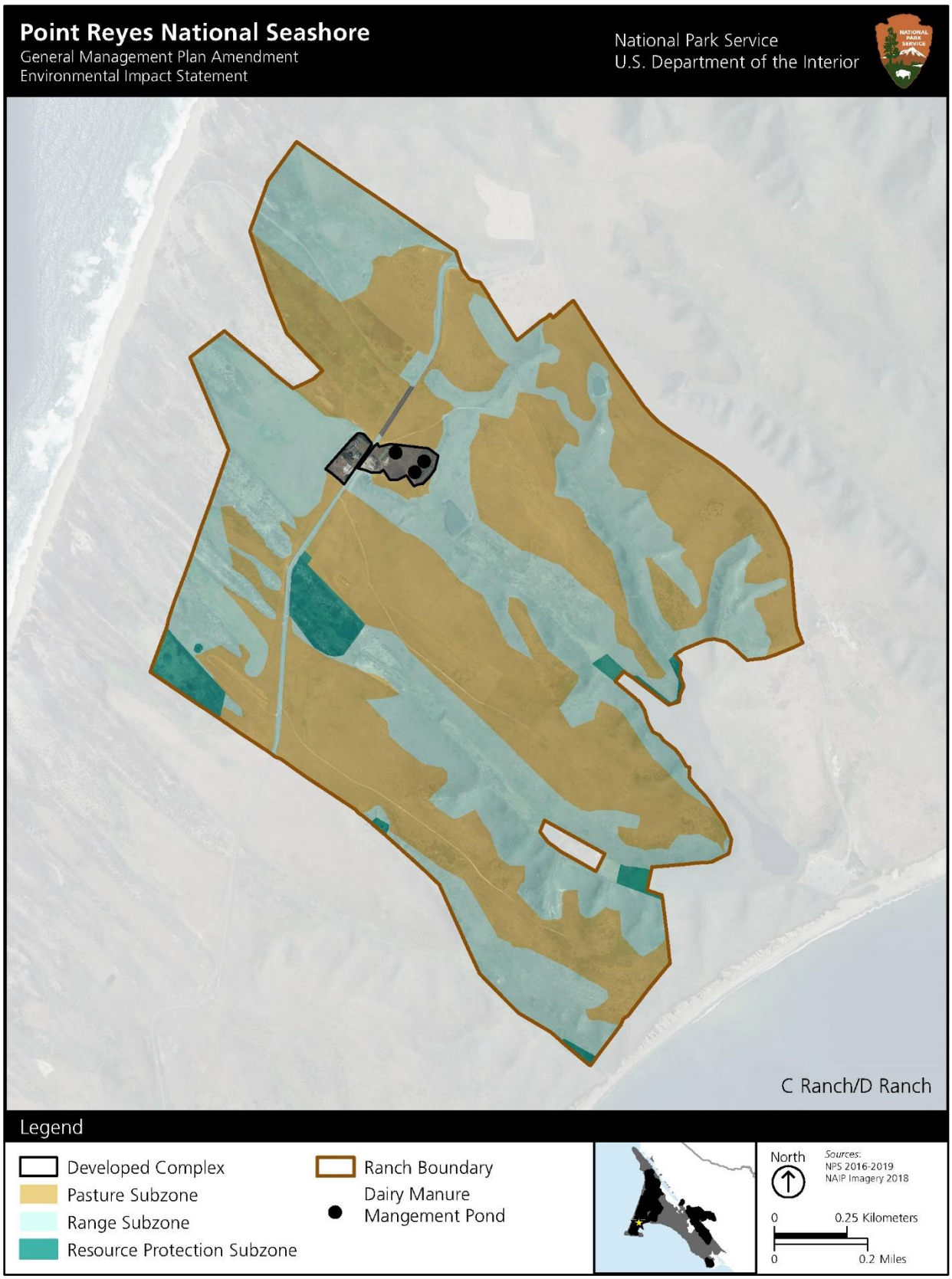

FIGURE 11: C RANCH/D RANCH ZONING MAP

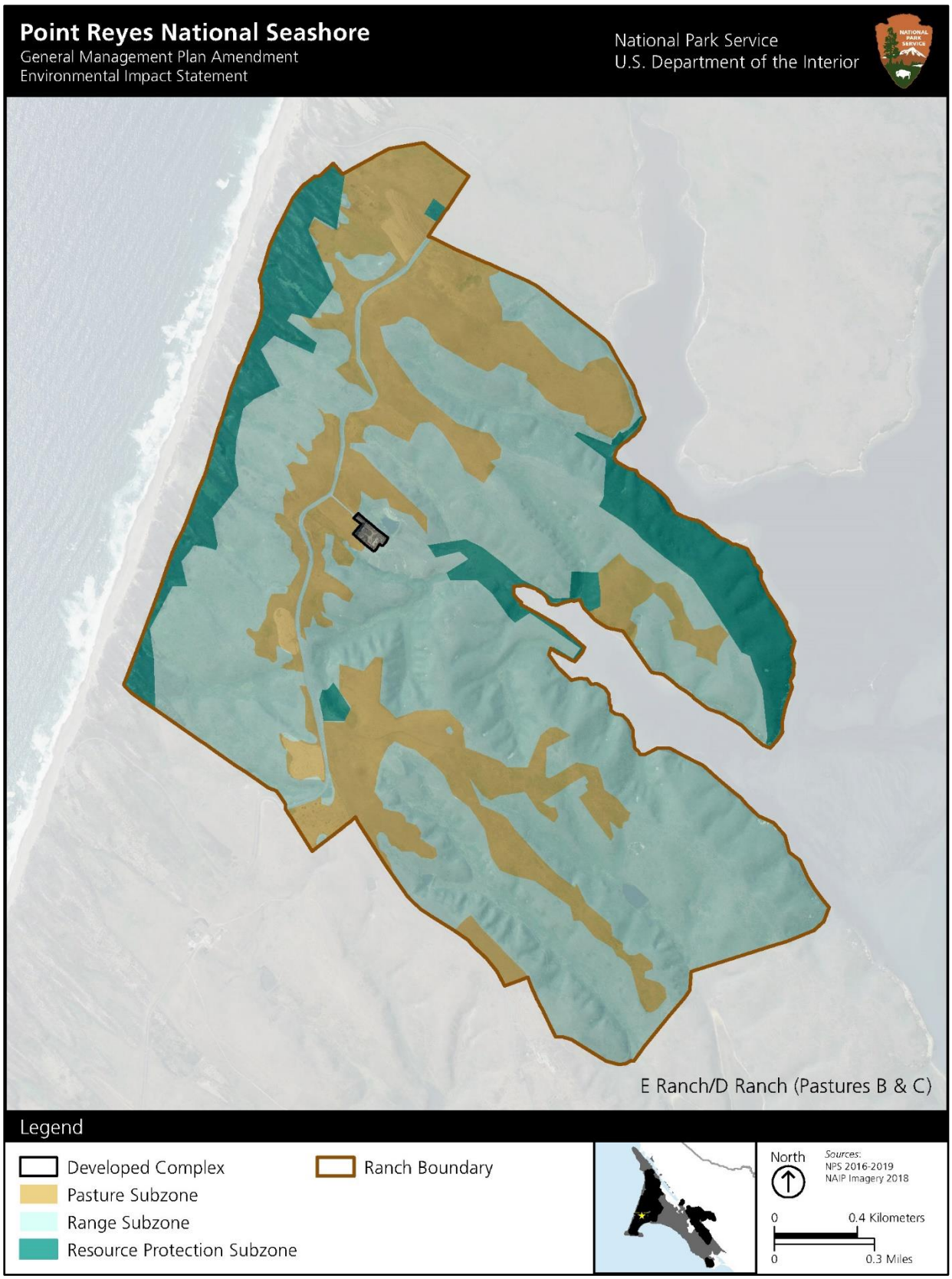

FIGURE 12: E RANCH AND PASTURE B & C OF D RANCH ZONING MAP

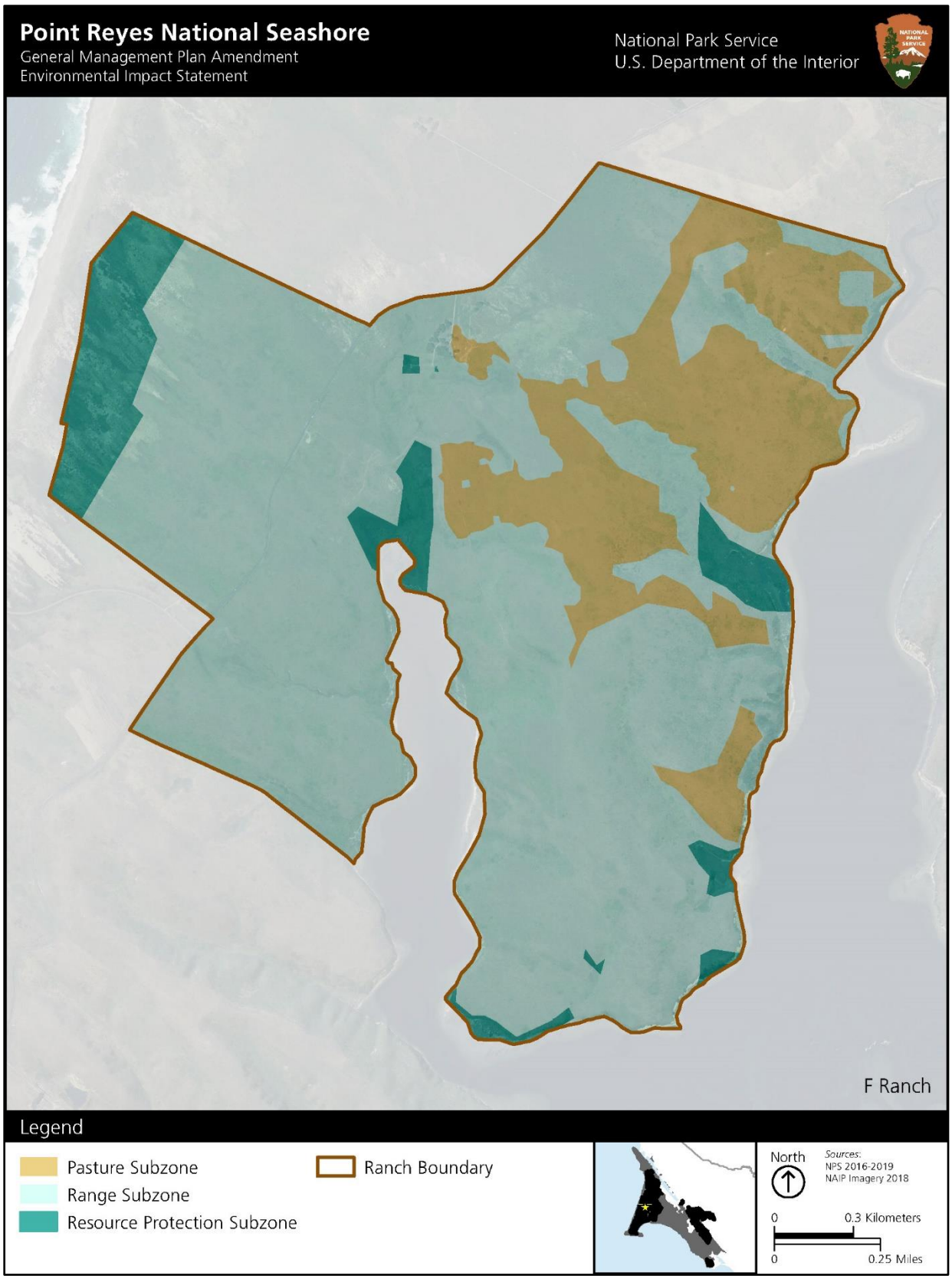

FIGURE 13: F RANCH ZONING MAP

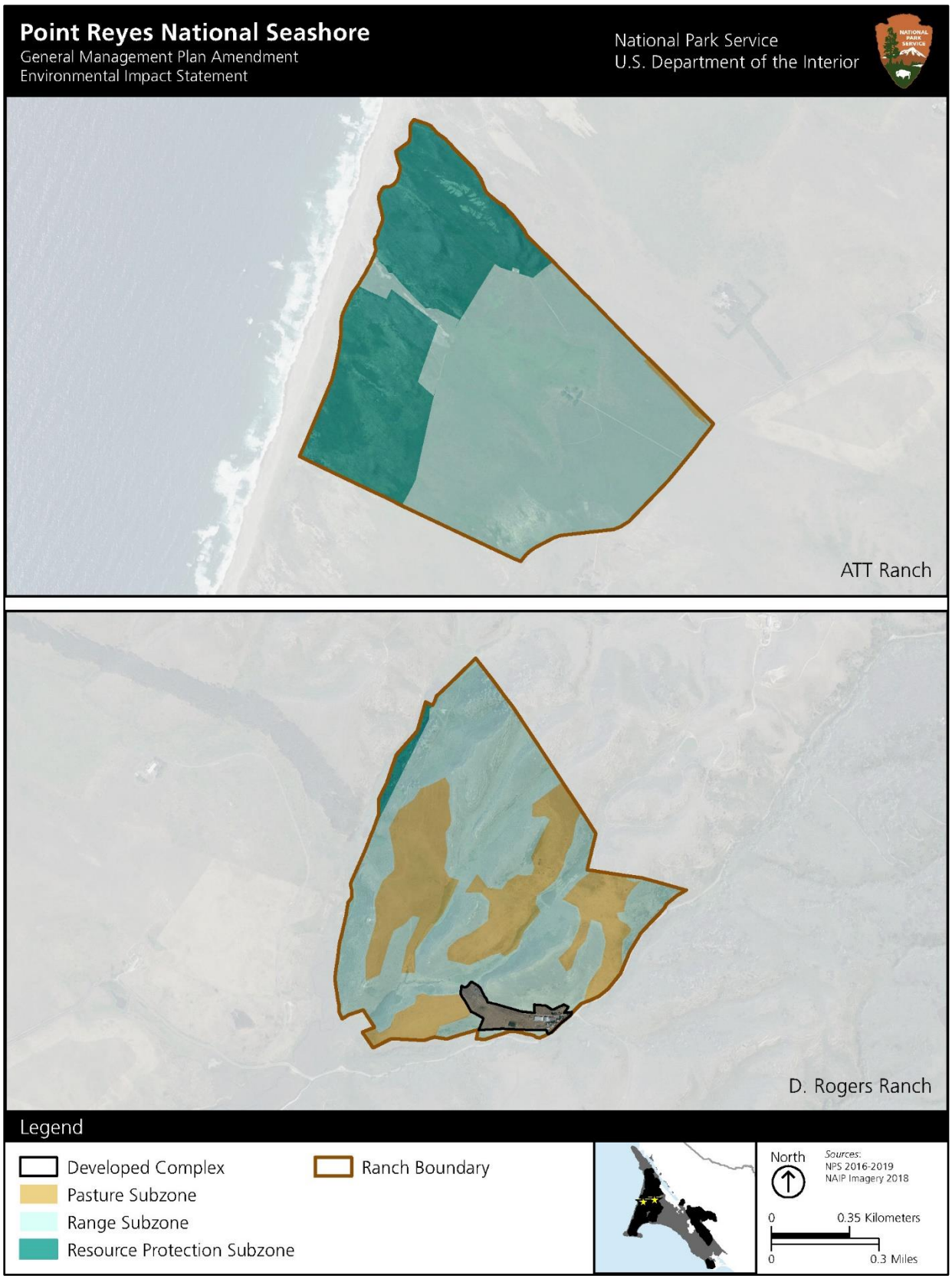

FIGURE 14: ATT RANCH/D. ROGERS RANCH ZONING MAP

FIGURE 15: G RANCH ZONING MAP

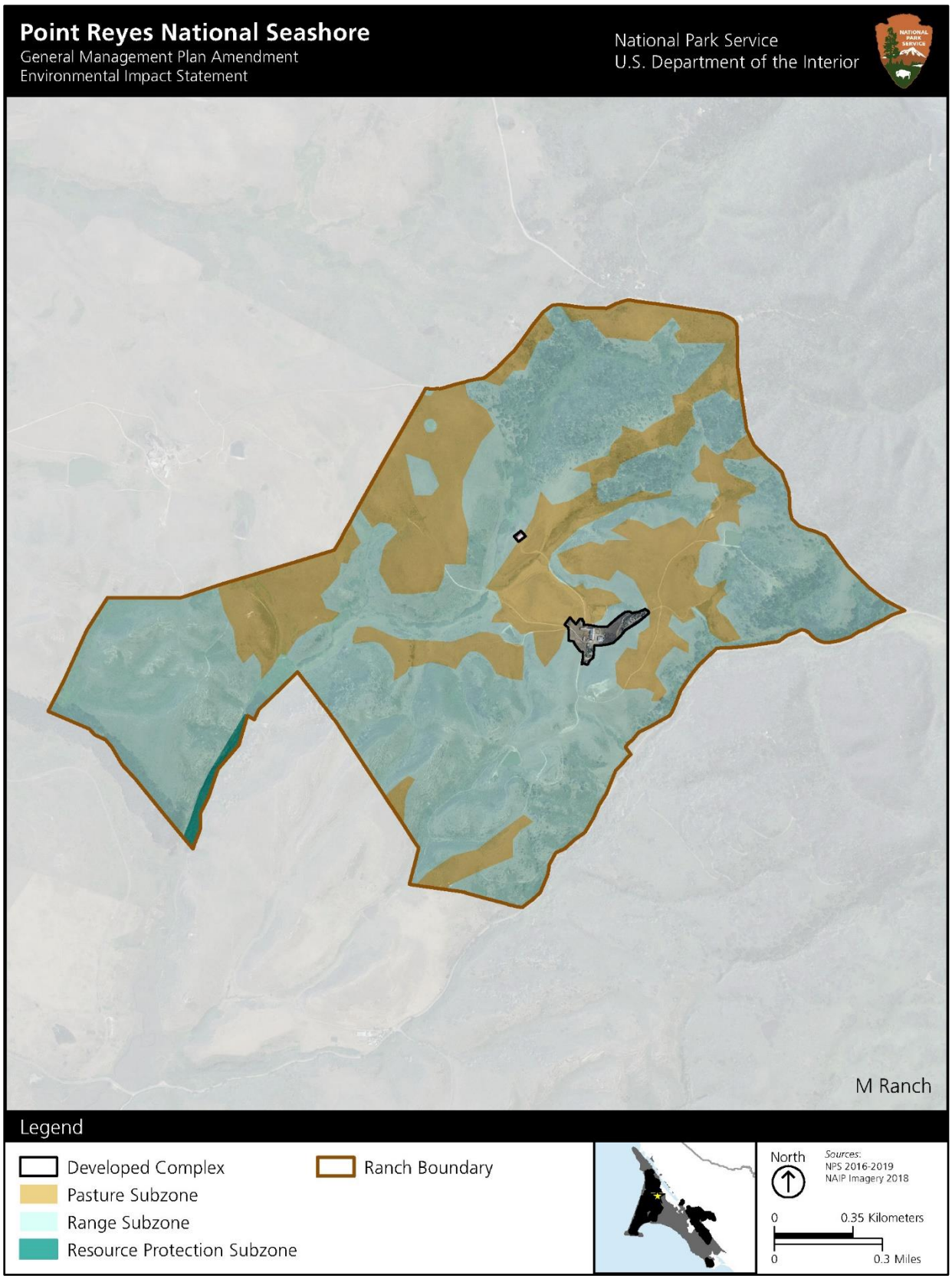

FIGURE 16: M RANCH ZONING MAP

FIGURE 17: I RANCH ZONING MAP

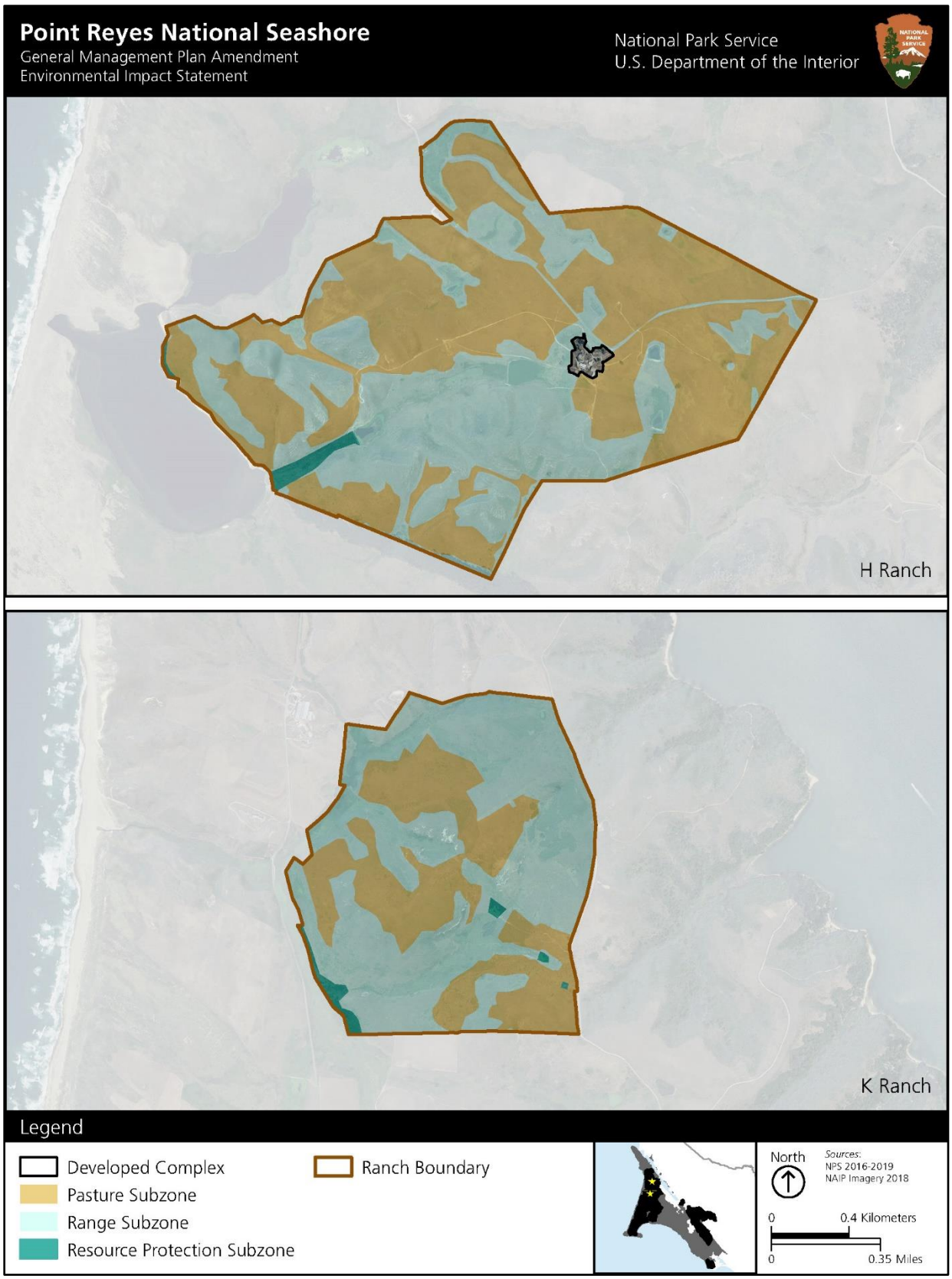

FIGURE 18: H RANCH/K RANCH ZONING MAP

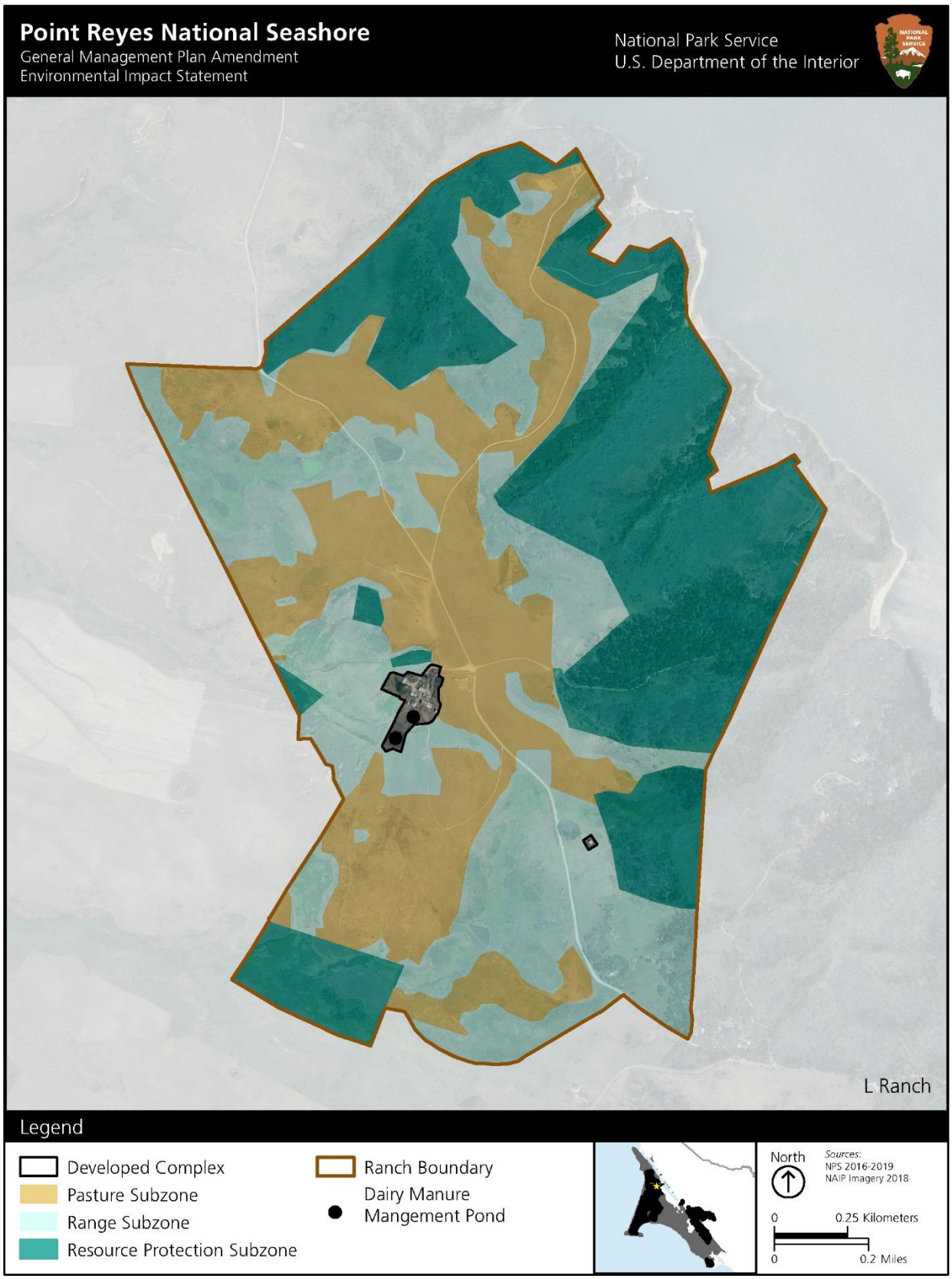

FIGURE 19: L RANCH ZONING MAP

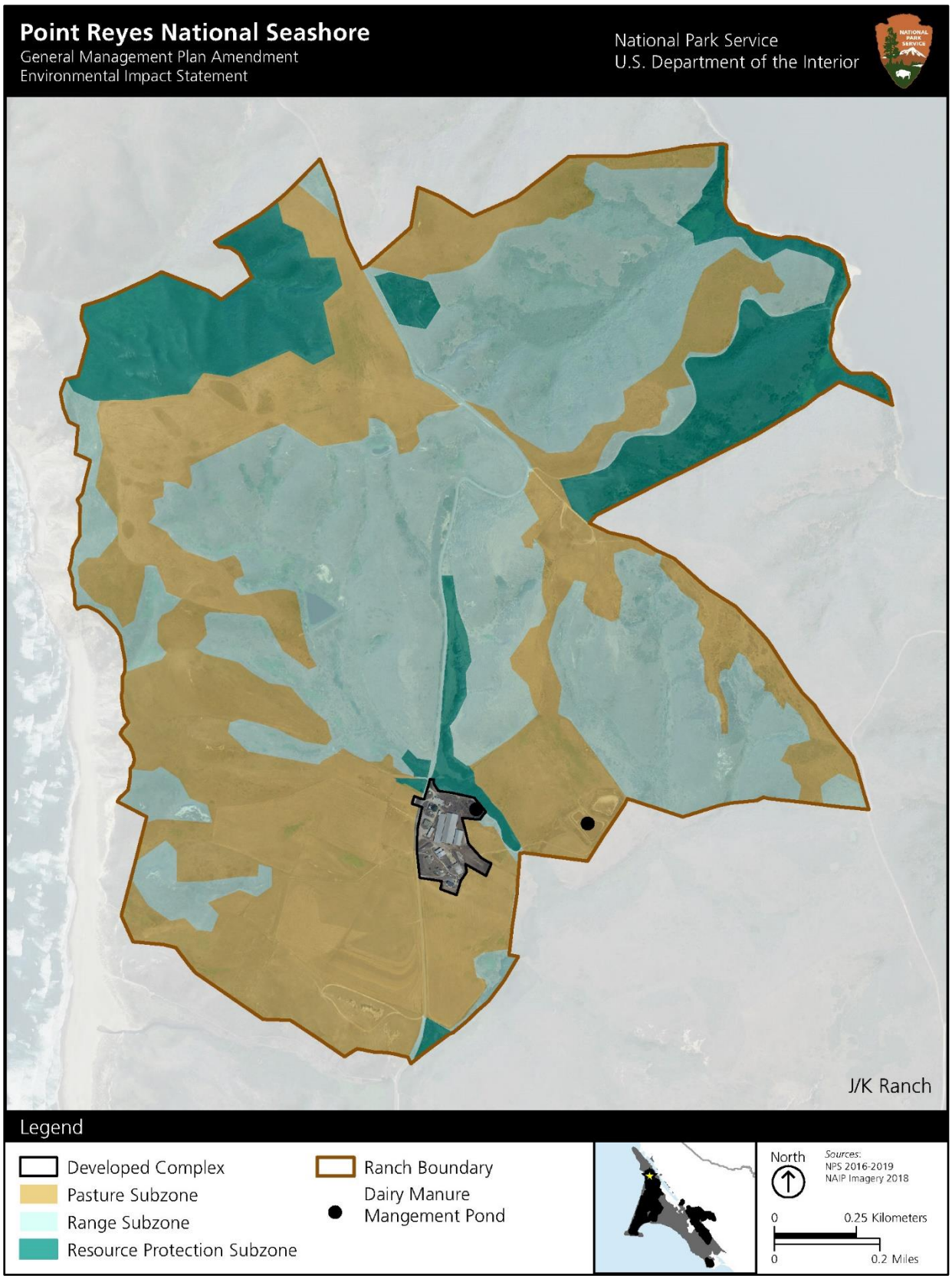

FIGURE 20: J/K RANCH ZONING MAP

FIGURE 21: N RANCH/HOME RANCH ZONING MAP

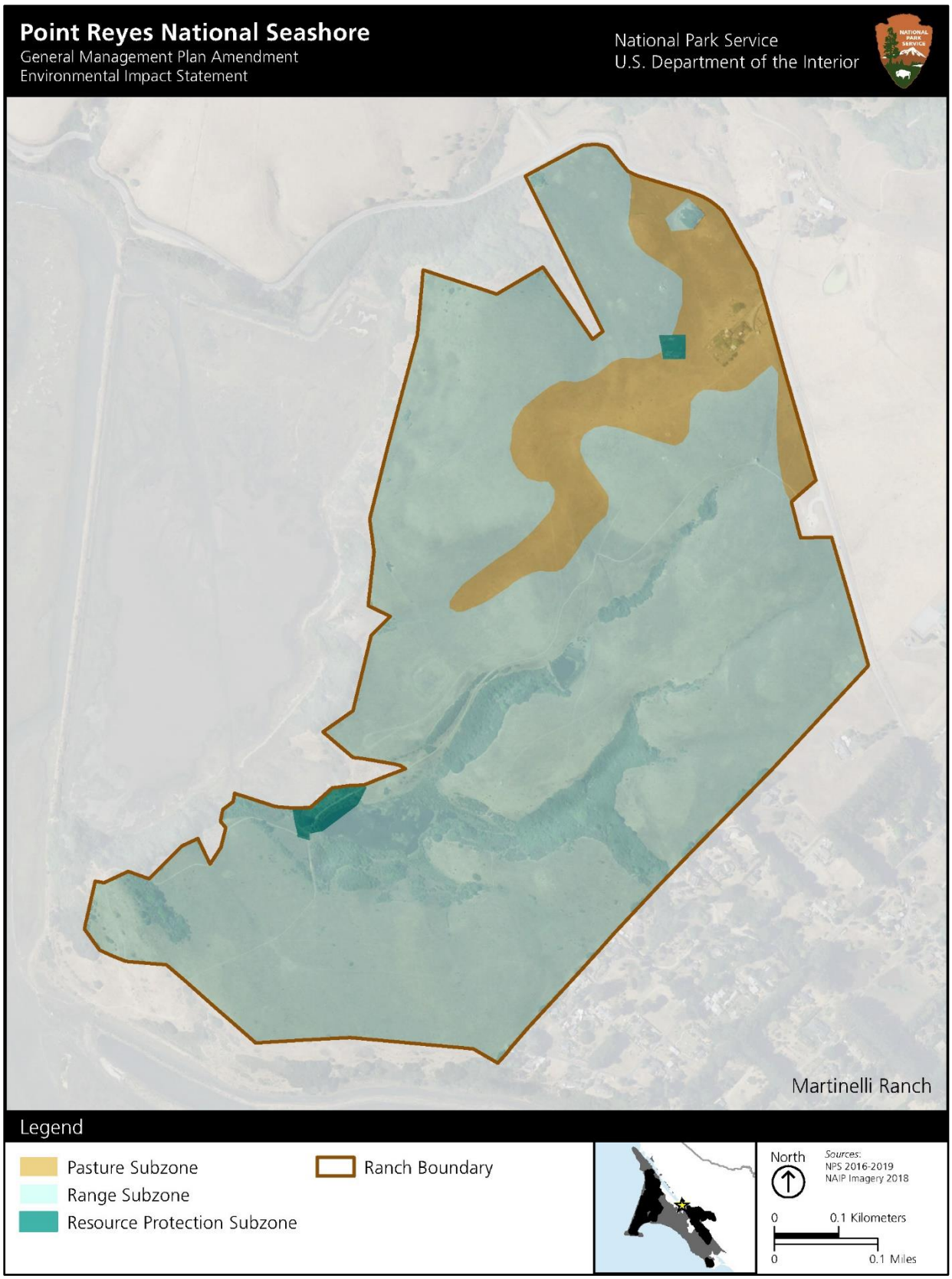

FIGURE 22: MARTINELLI RANCH ZONING MAP

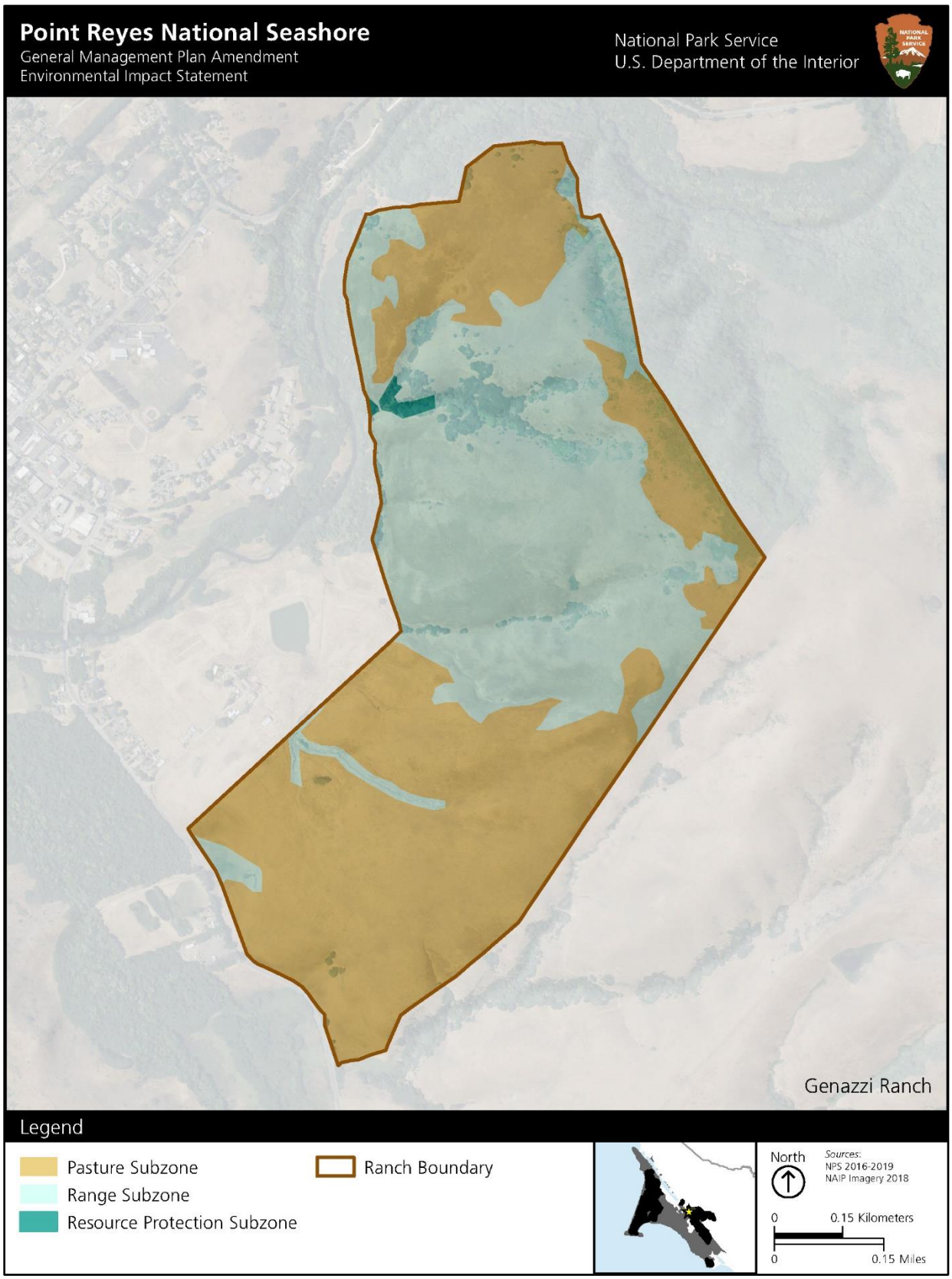

FIGURE 23: GENAZZI RANCH ZONING MAP

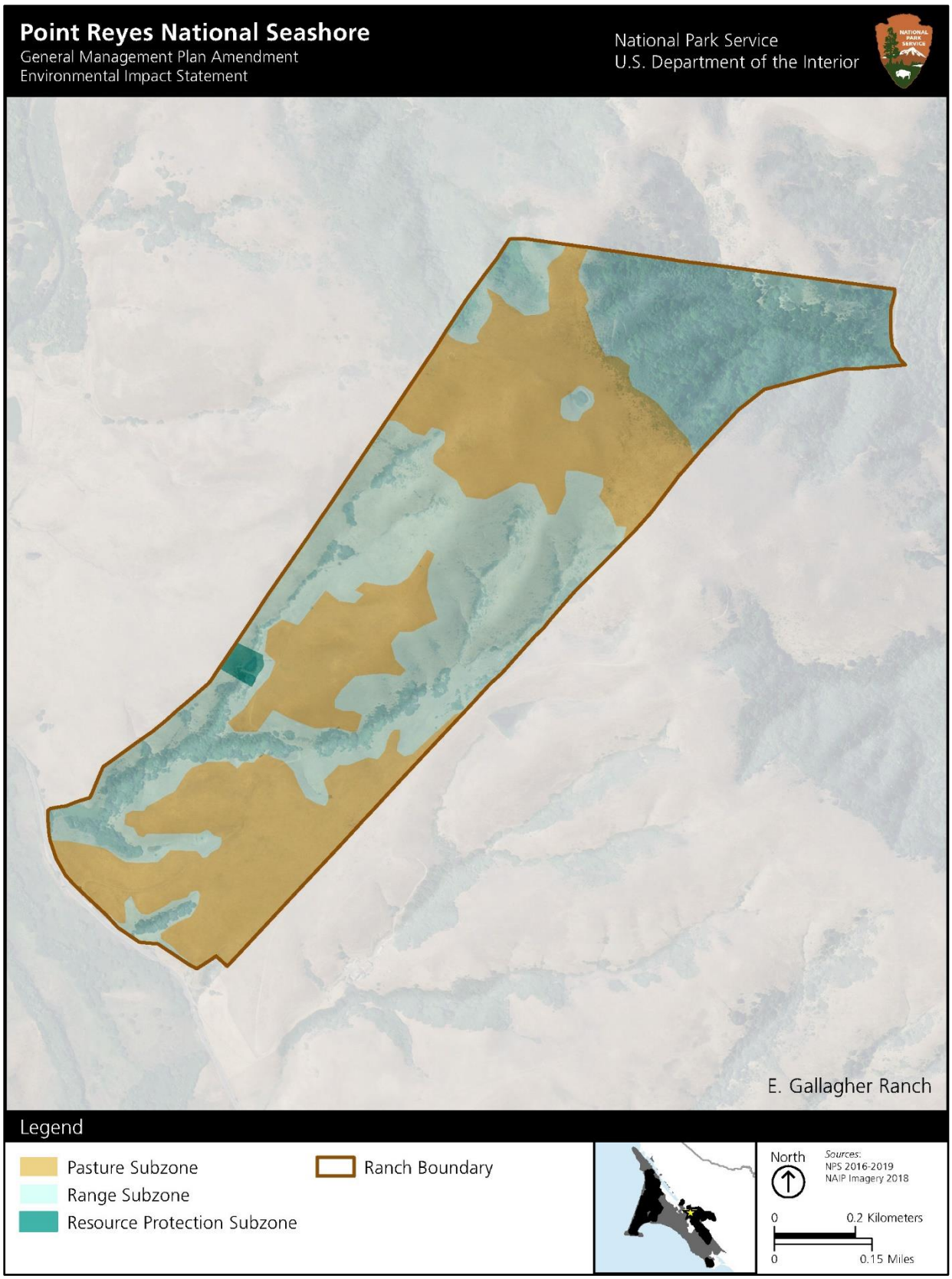

FIGURE 24: E. GALLAGHER RANCH ZONING MAP

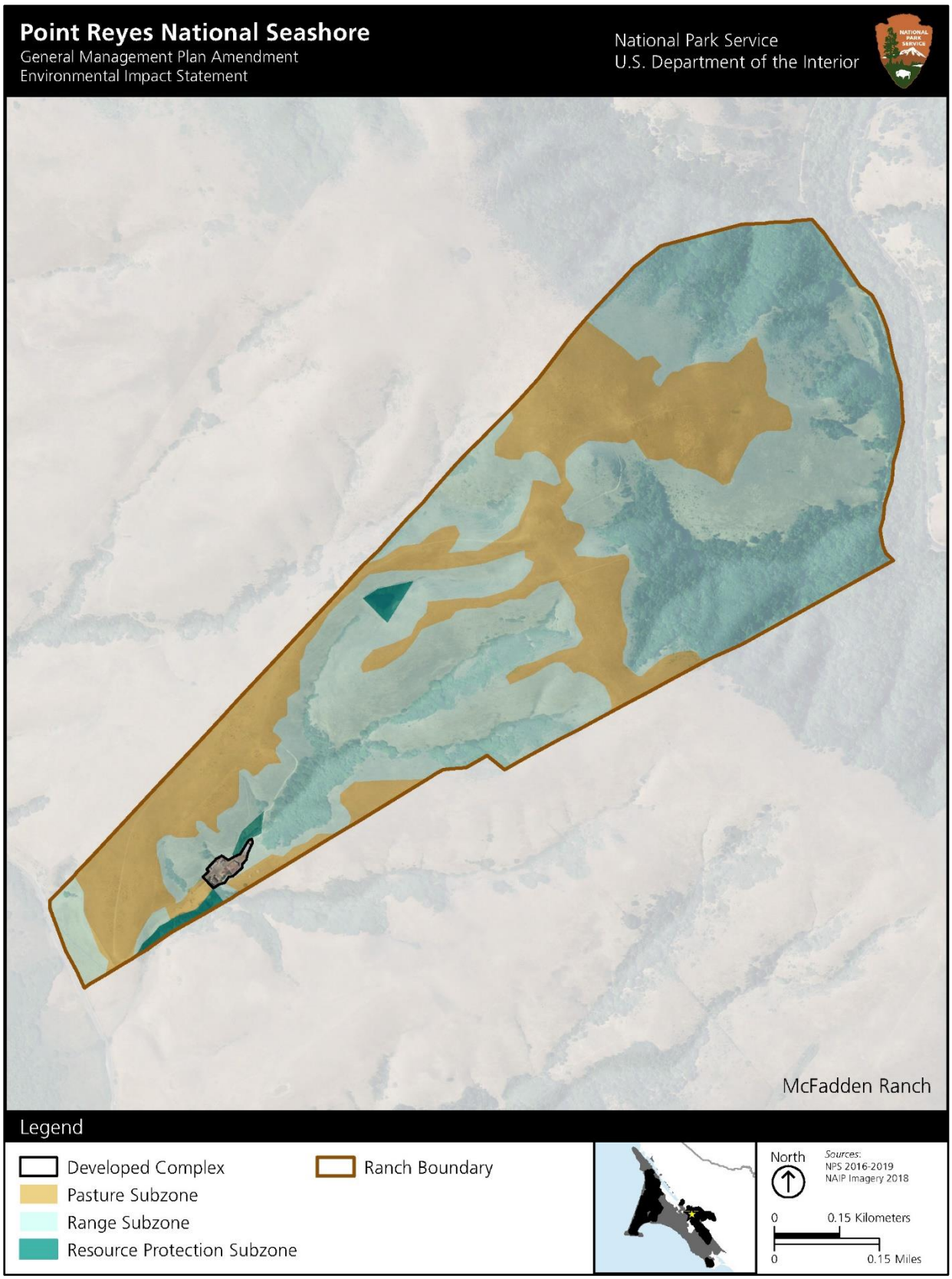

FIGURE 25: MCFADDEN RANCH ZONING MAP

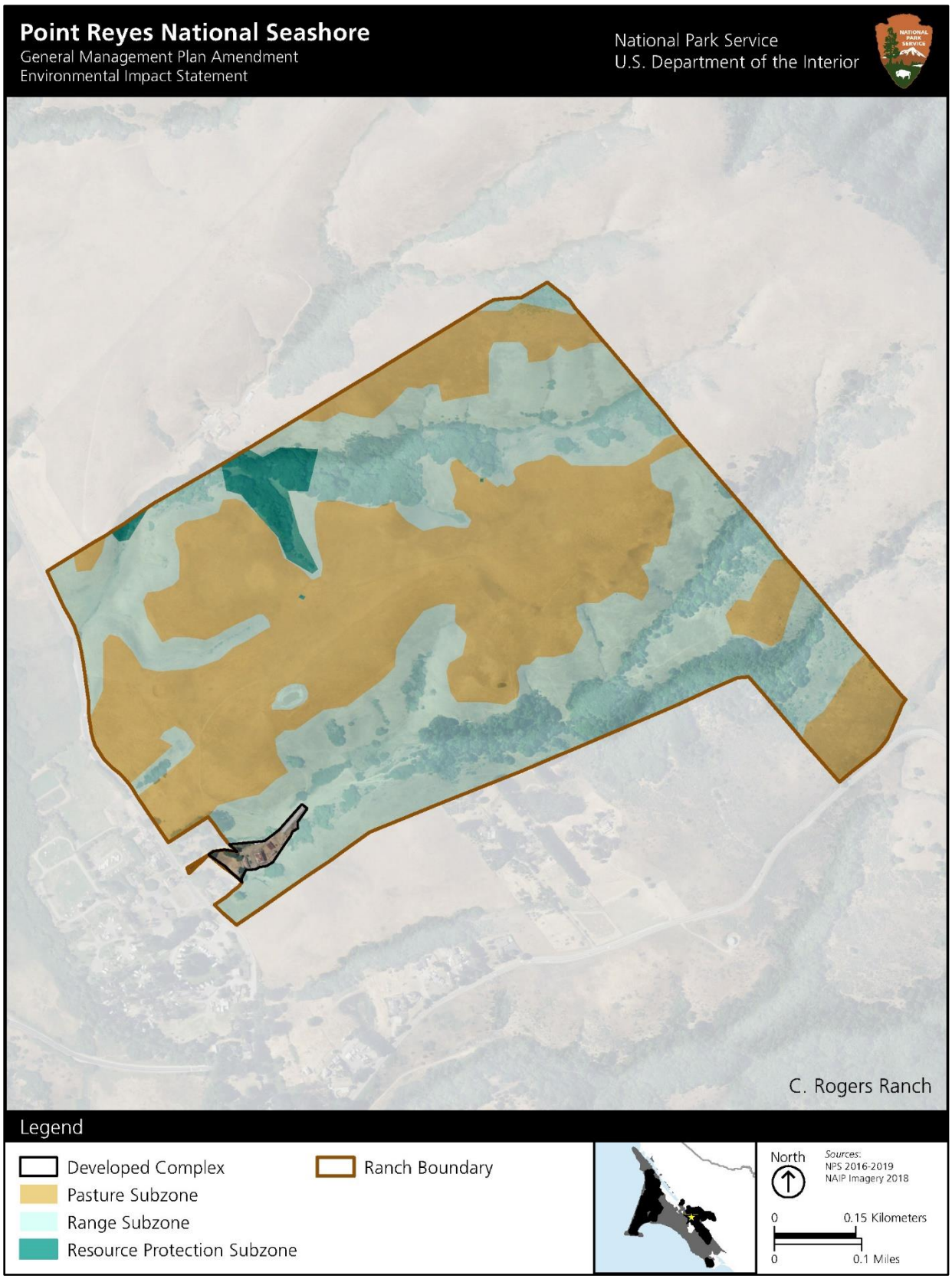

FIGURE 26: C. ROGERS RANCH ZONING MAP

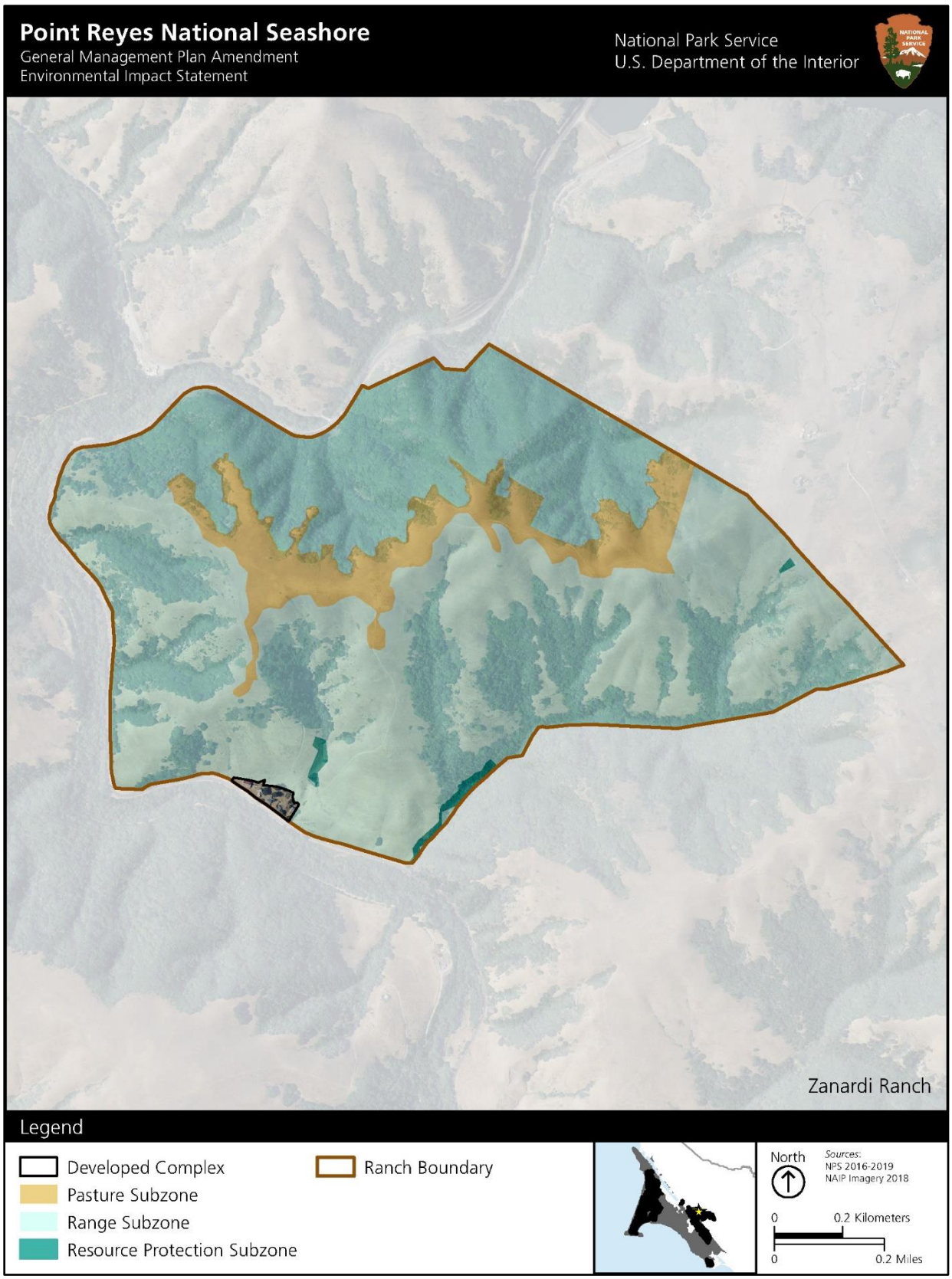

FIGURE 27: ZANARDI RANCH ZONING MAP

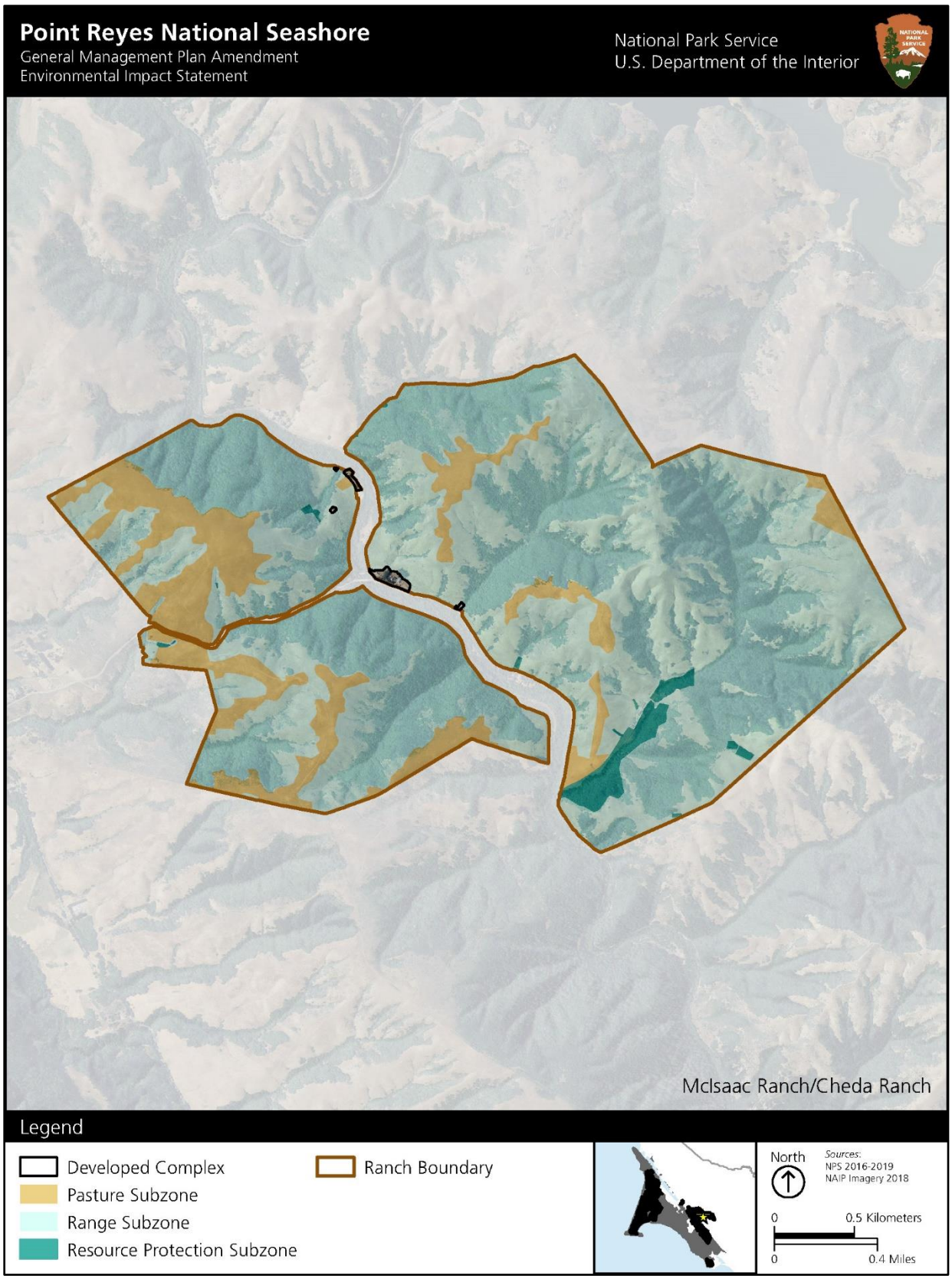

FIGURE 28: MCISAAC RANCH/CHEDA RANCH ZONING MAP

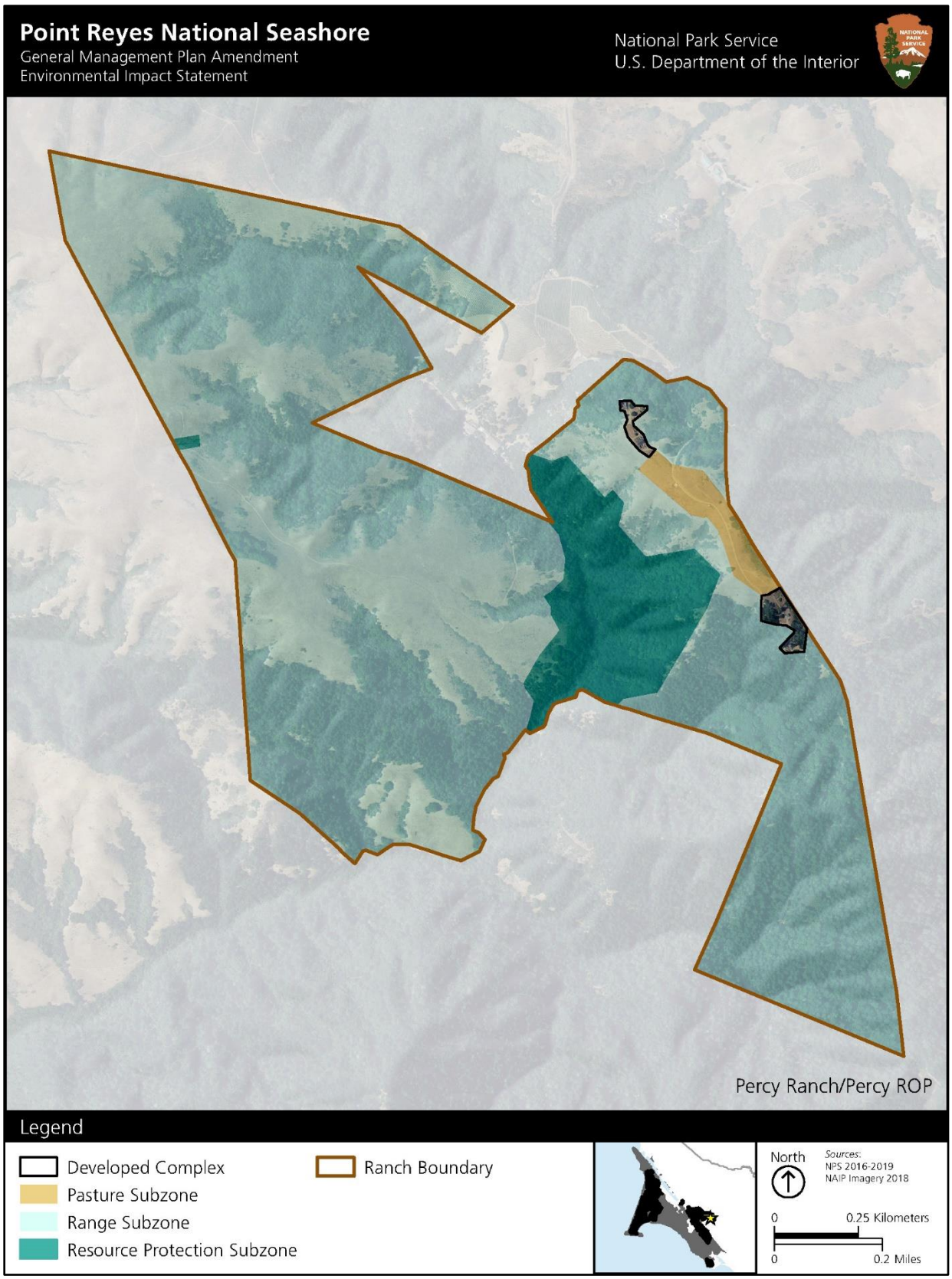

FIGURE 29: PERCY RANCH/PERCY ROP ZONING MAP

FIGURE 30: STEWART RANCH/LUPTON/TRUTTMAN ZONING MAP

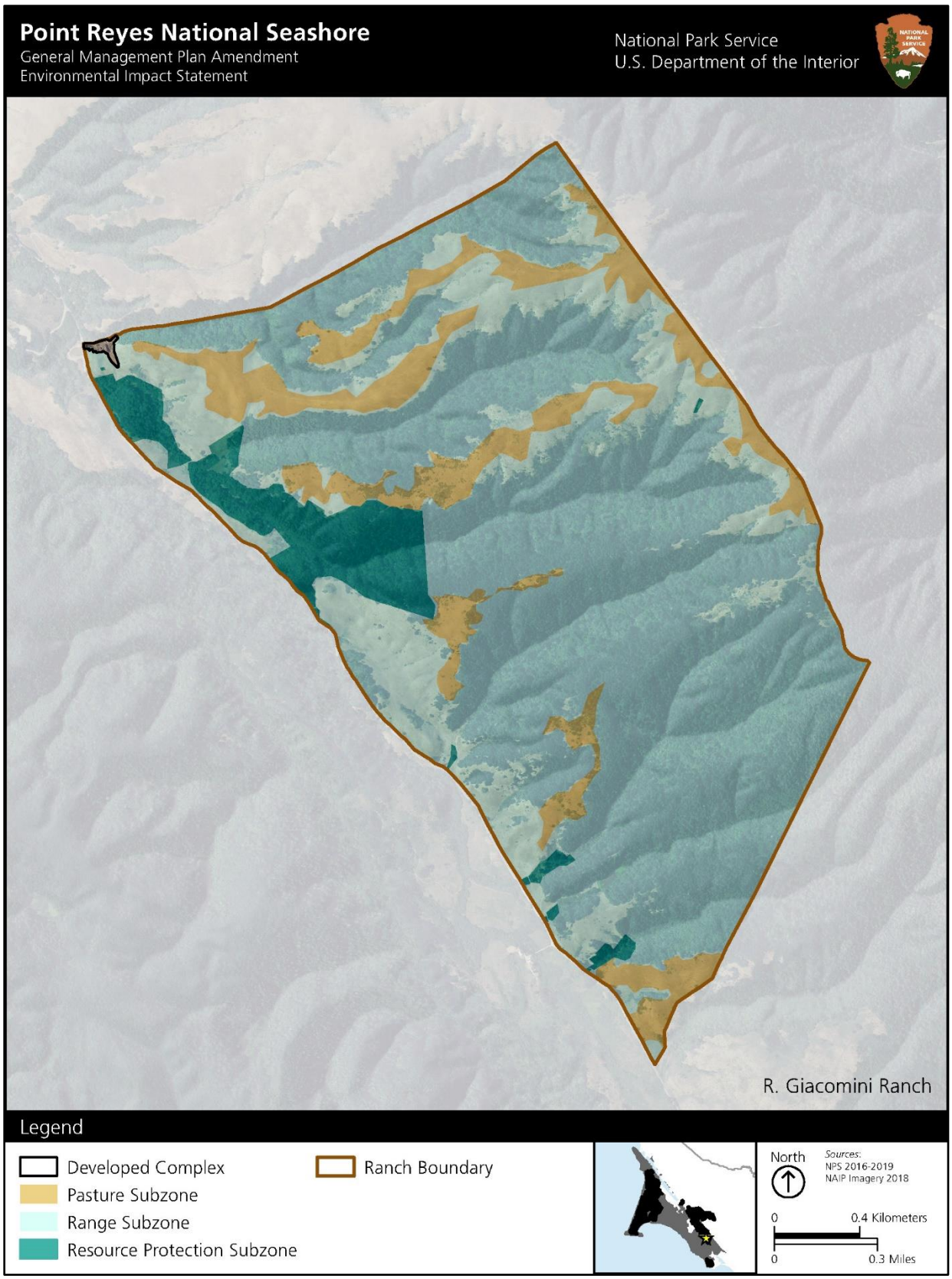

FIGURE 31: R. GIACOMINI RANCH ZONING MAP

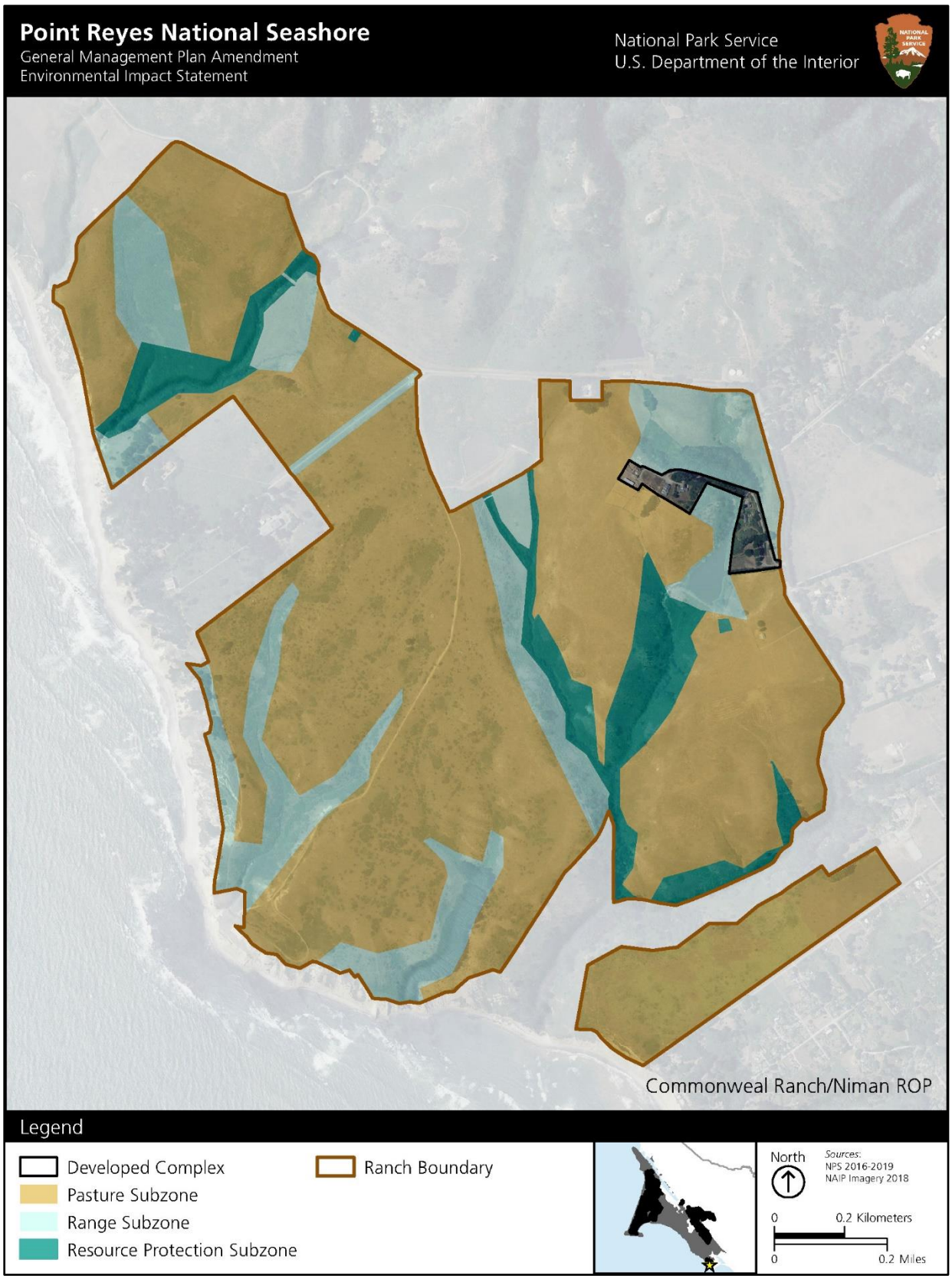

FIGURE 32: COMMONWEAL RANCH/NIMAN ROP ZONING MAP

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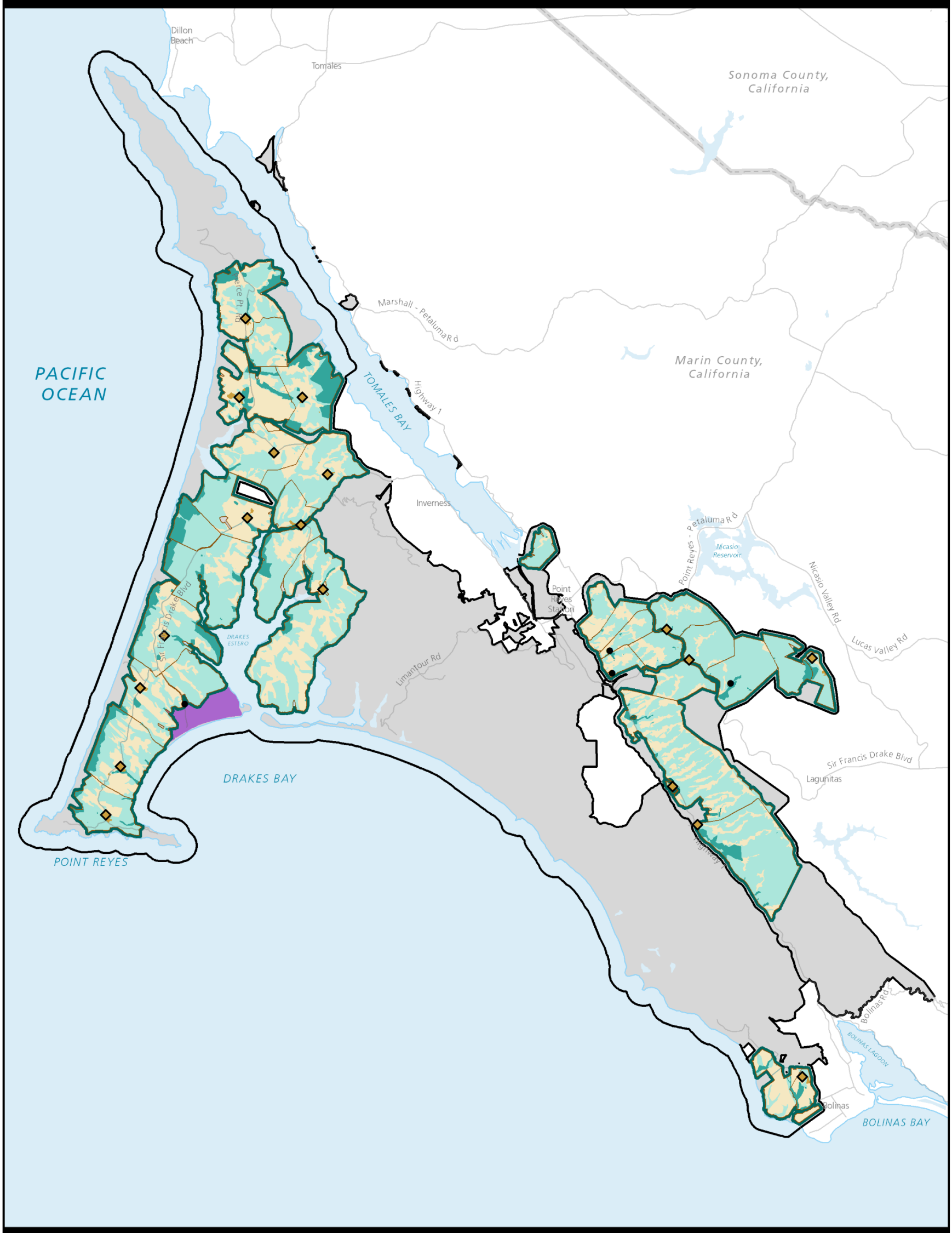

FIGURE 33: ALTERNATIVE C ZONING MAP

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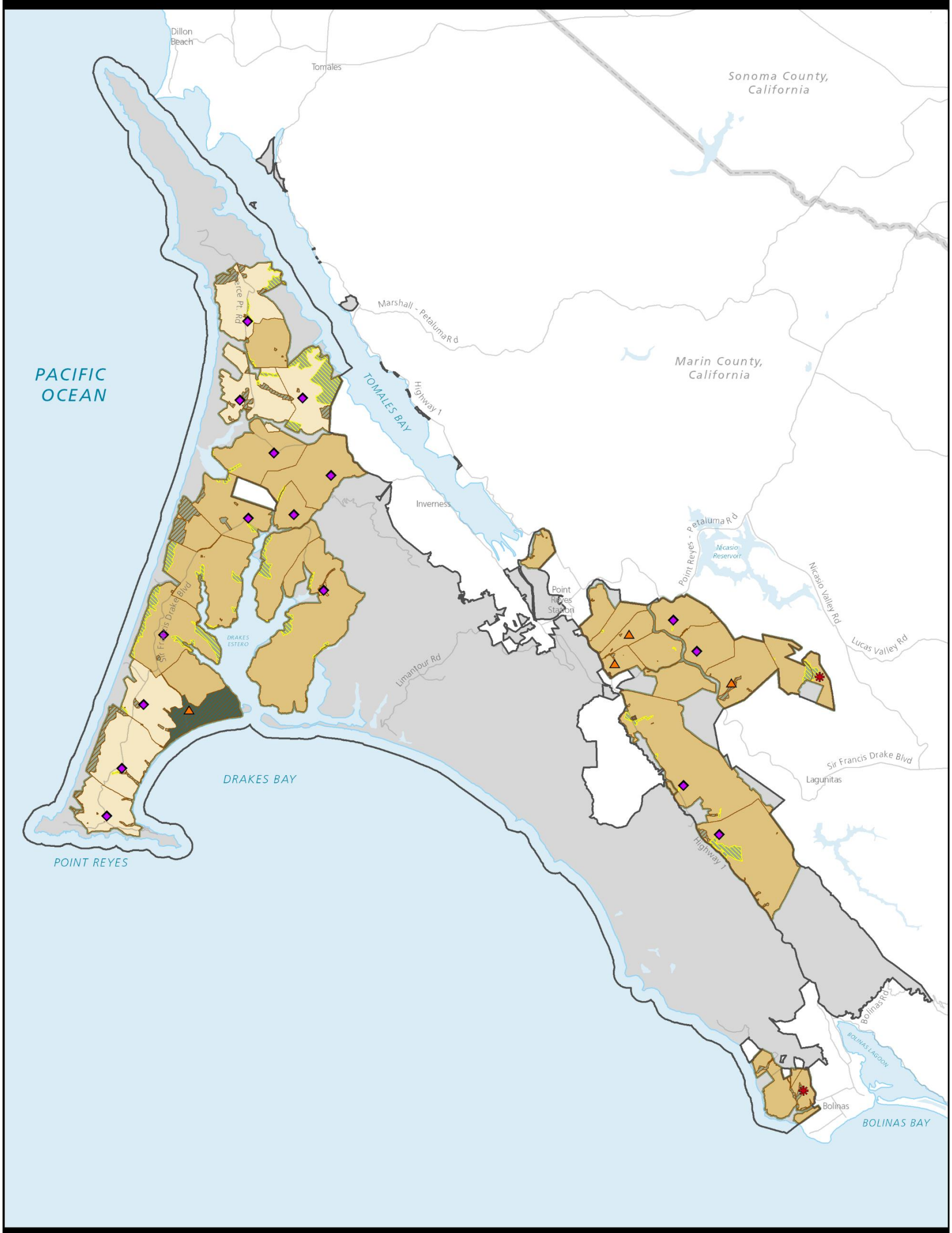

FIGURE 34: ALTERNATIVE C

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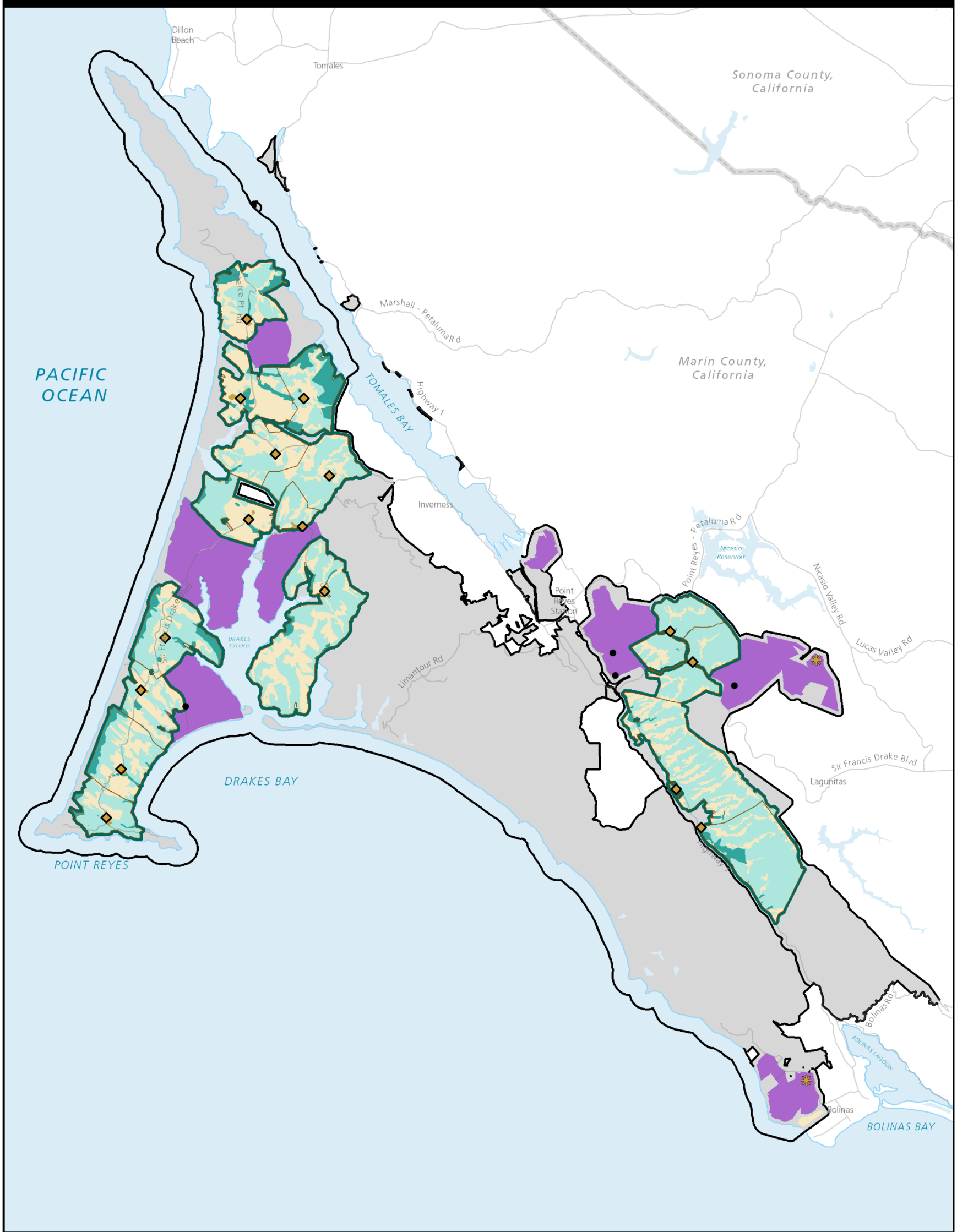

FIGURE 35: ALTERNATIVE D ZONING MAP

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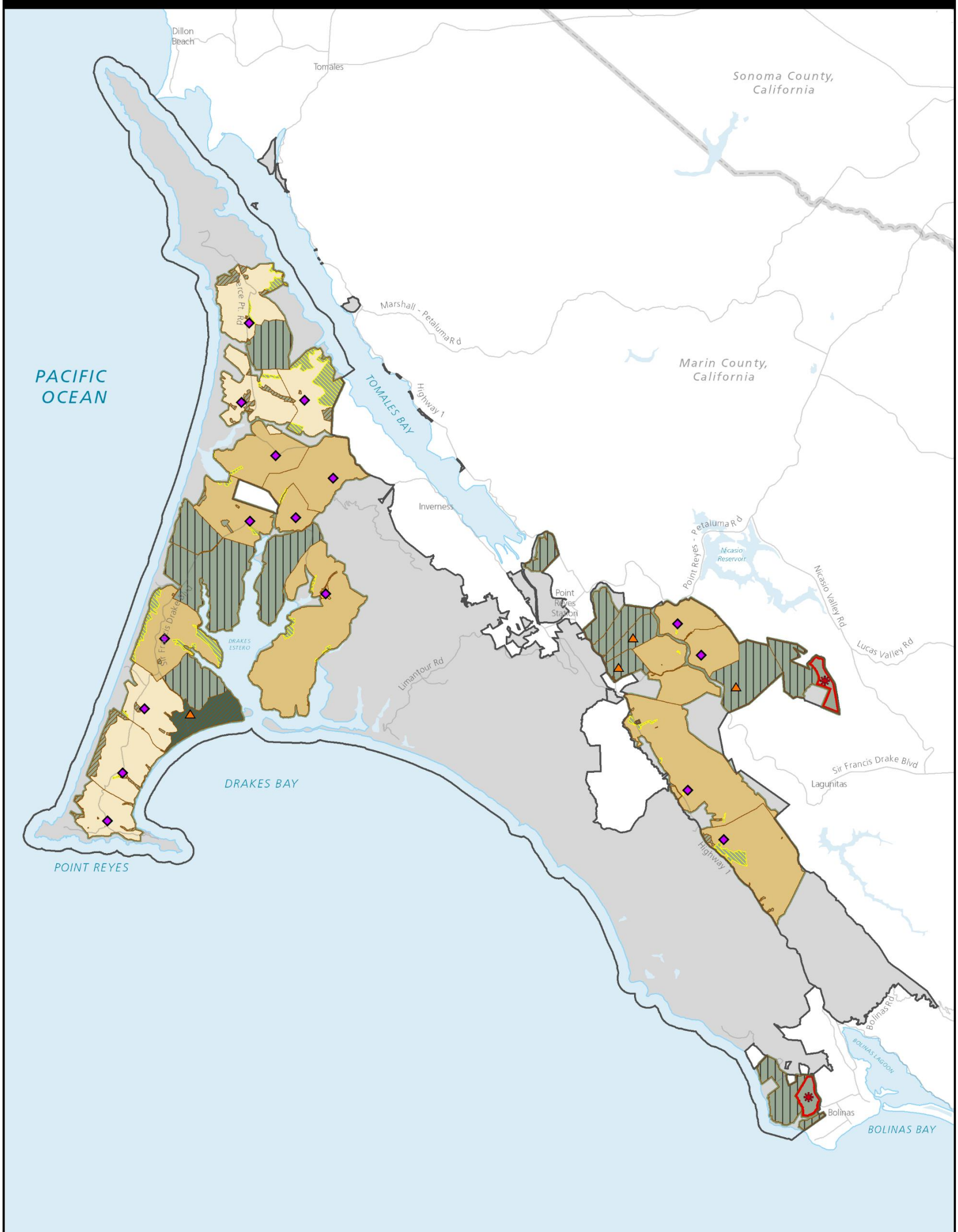

FIGURE 36: ALTERNATIVE D

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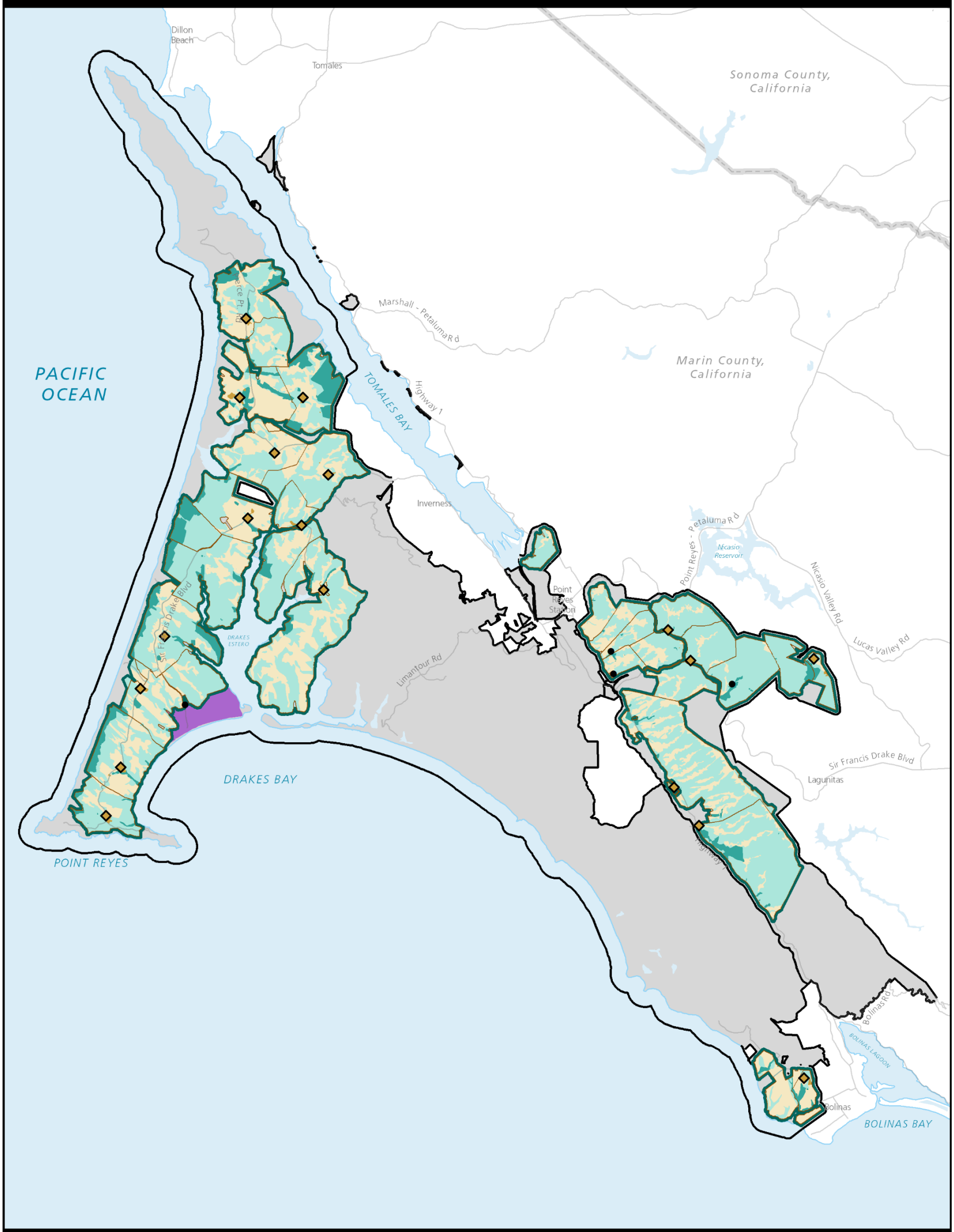

FIGURE 37: ALTERNATIVE E ZONING MAP

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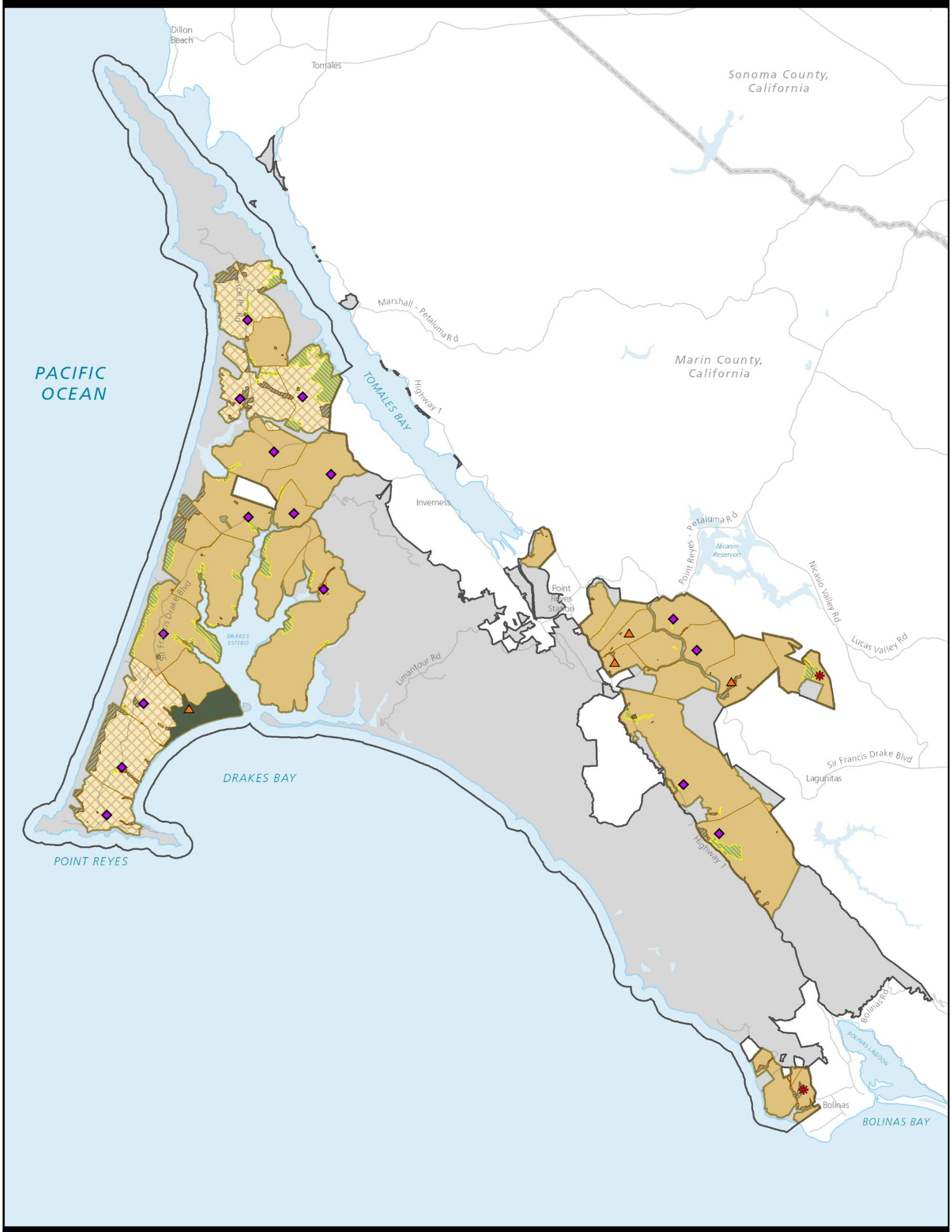

FIGURE 38: ALTERNATIVE E

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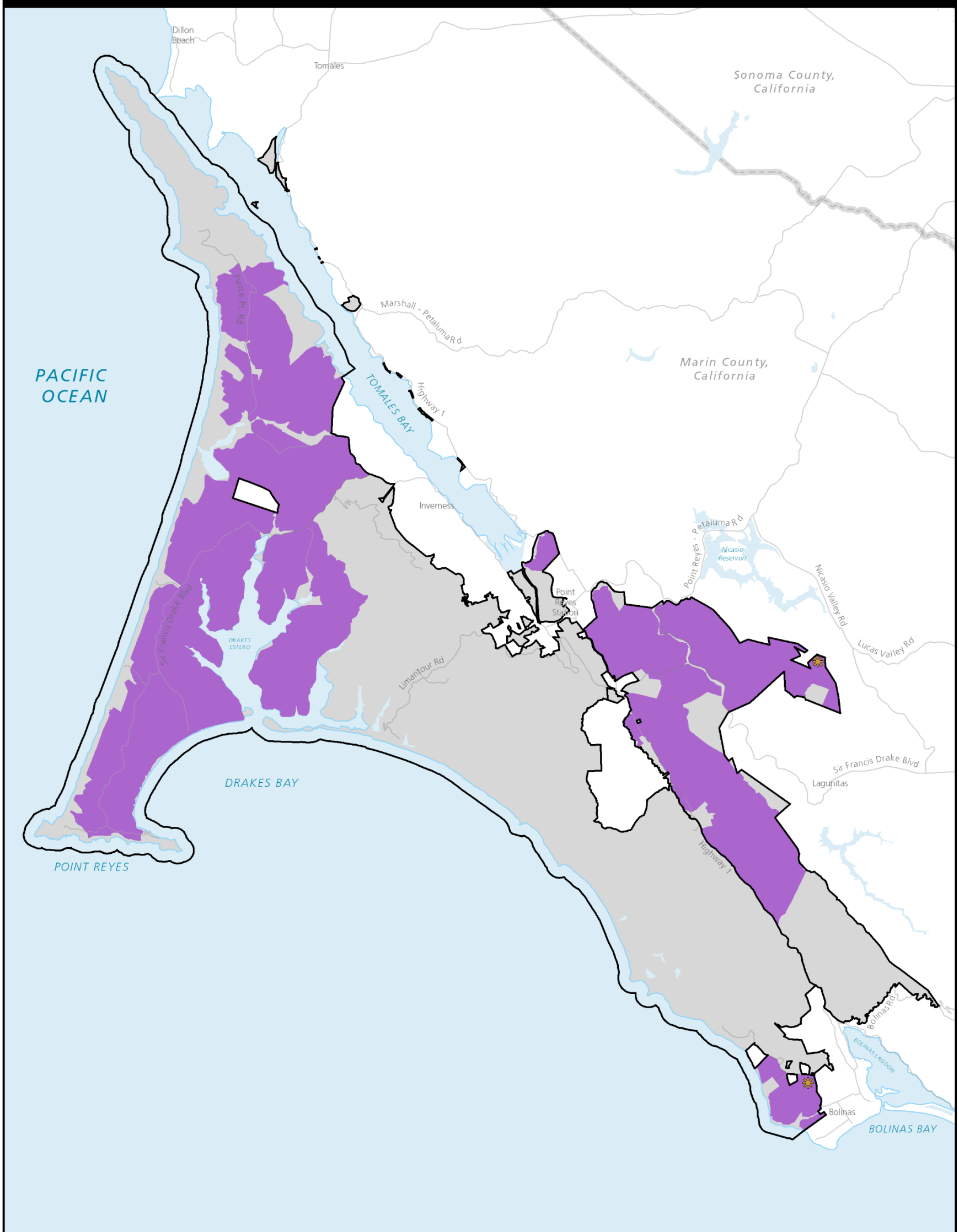

FIGURE 39: ALTERNATIVE F ZONING MAP

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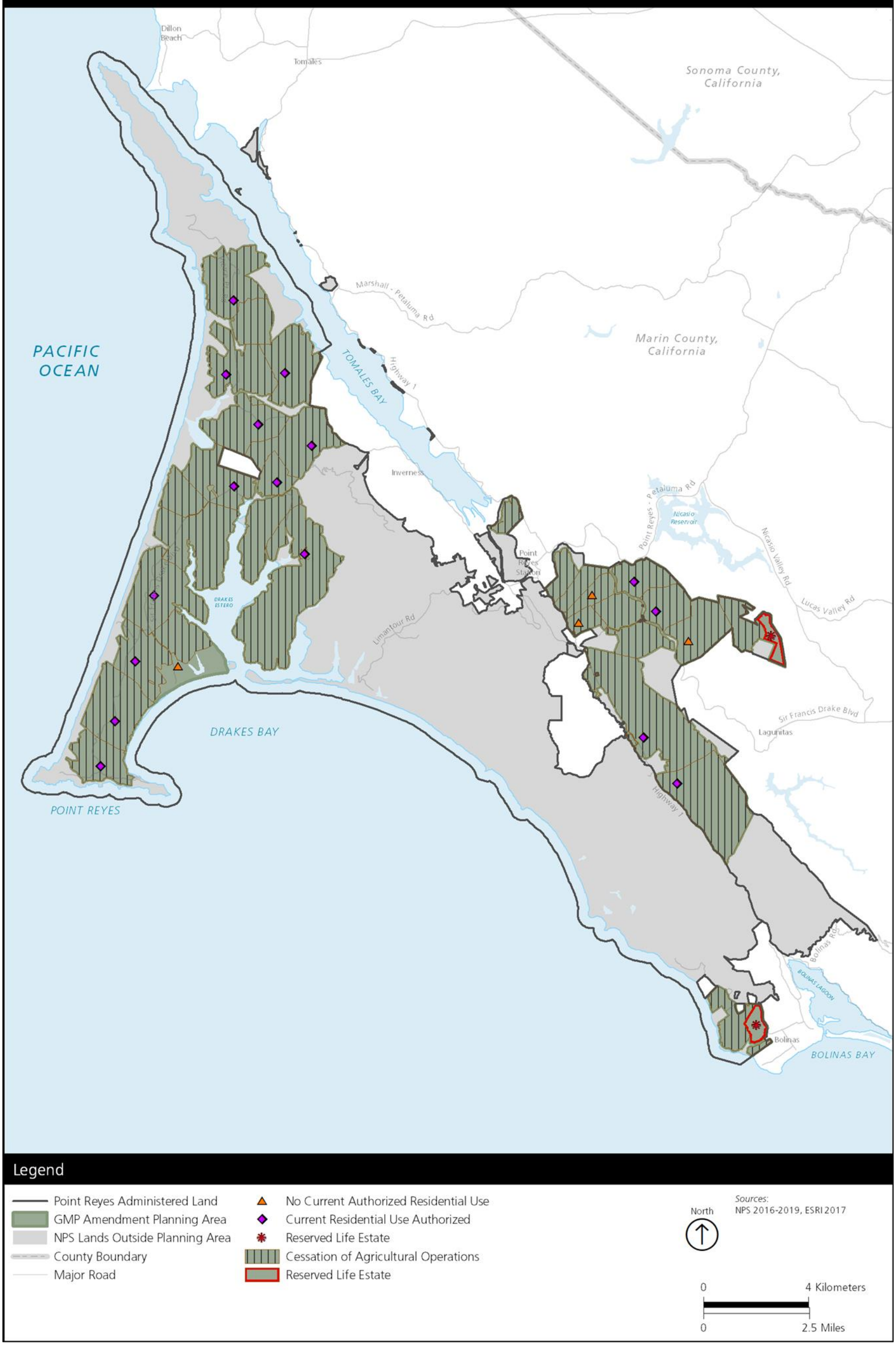

FIGURE 40: ALTERNATIVE F

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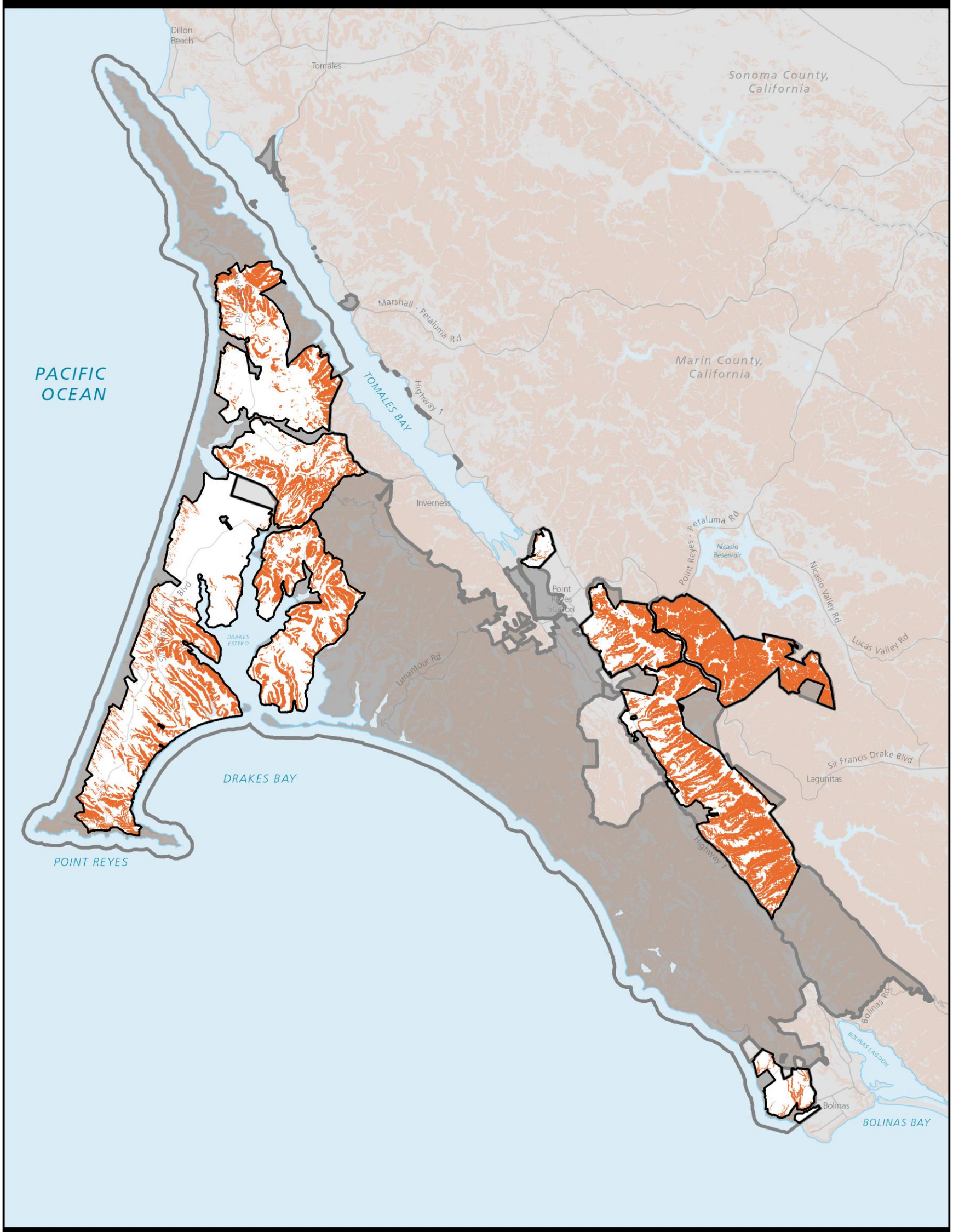

FIGURE 41: SLOPES GREATER THAN 20% IN THE PLANNING AREA

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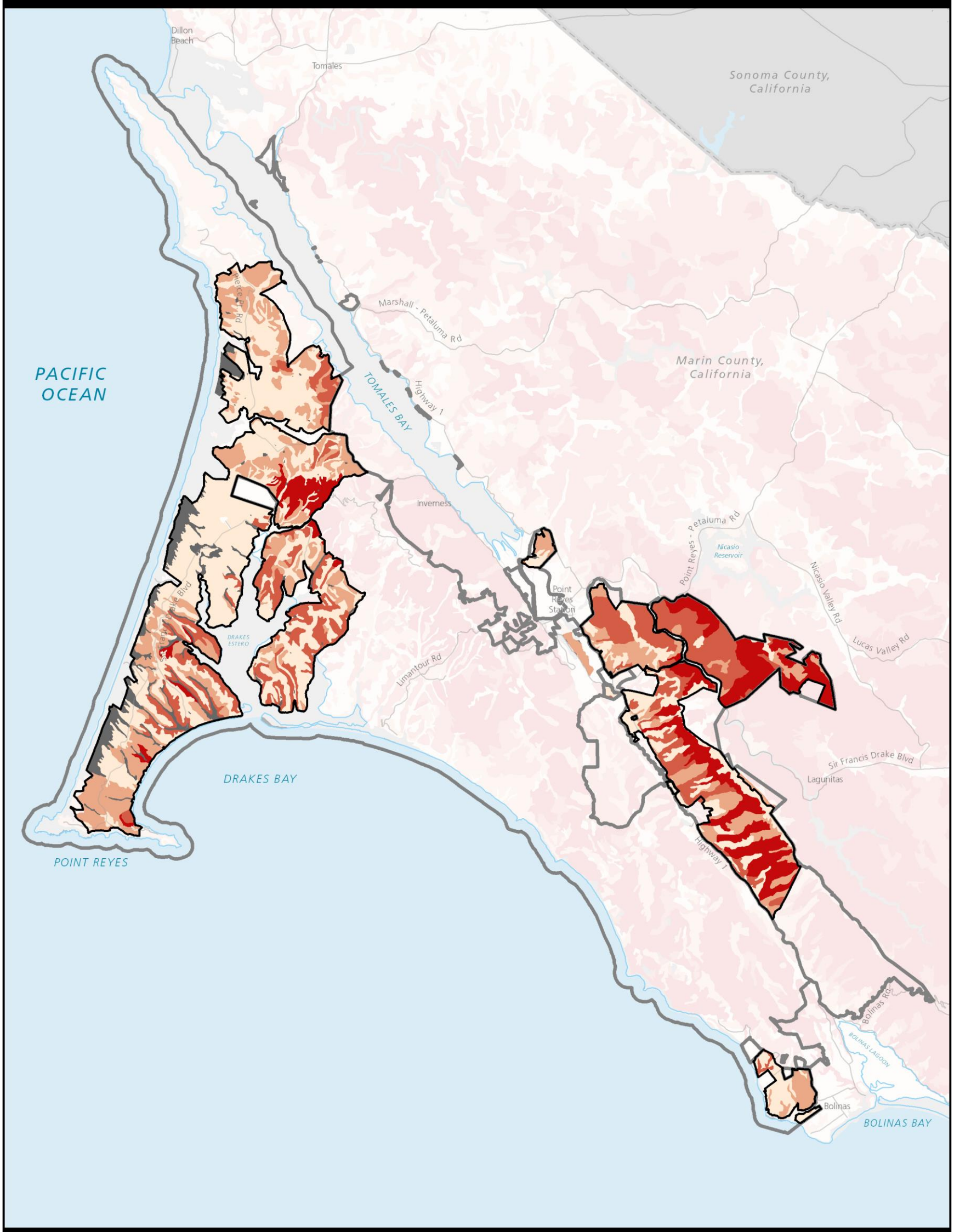

FIGURE 42: SOIL EROSION HAZARDS IN THE PLANNING AREA

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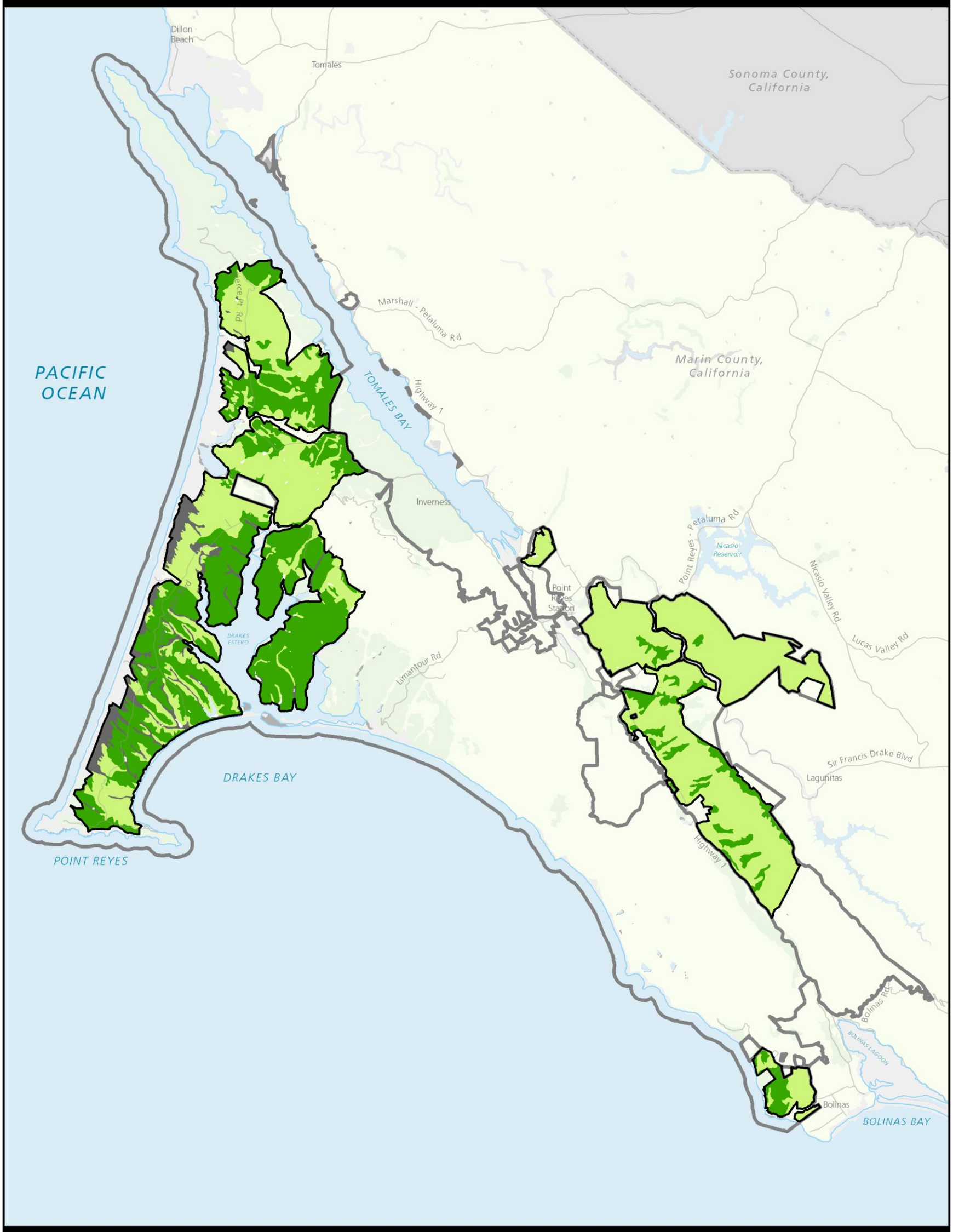

FIGURE 43: SOIL COMPACTION RESISTANCE IN THE PLANNING AREA

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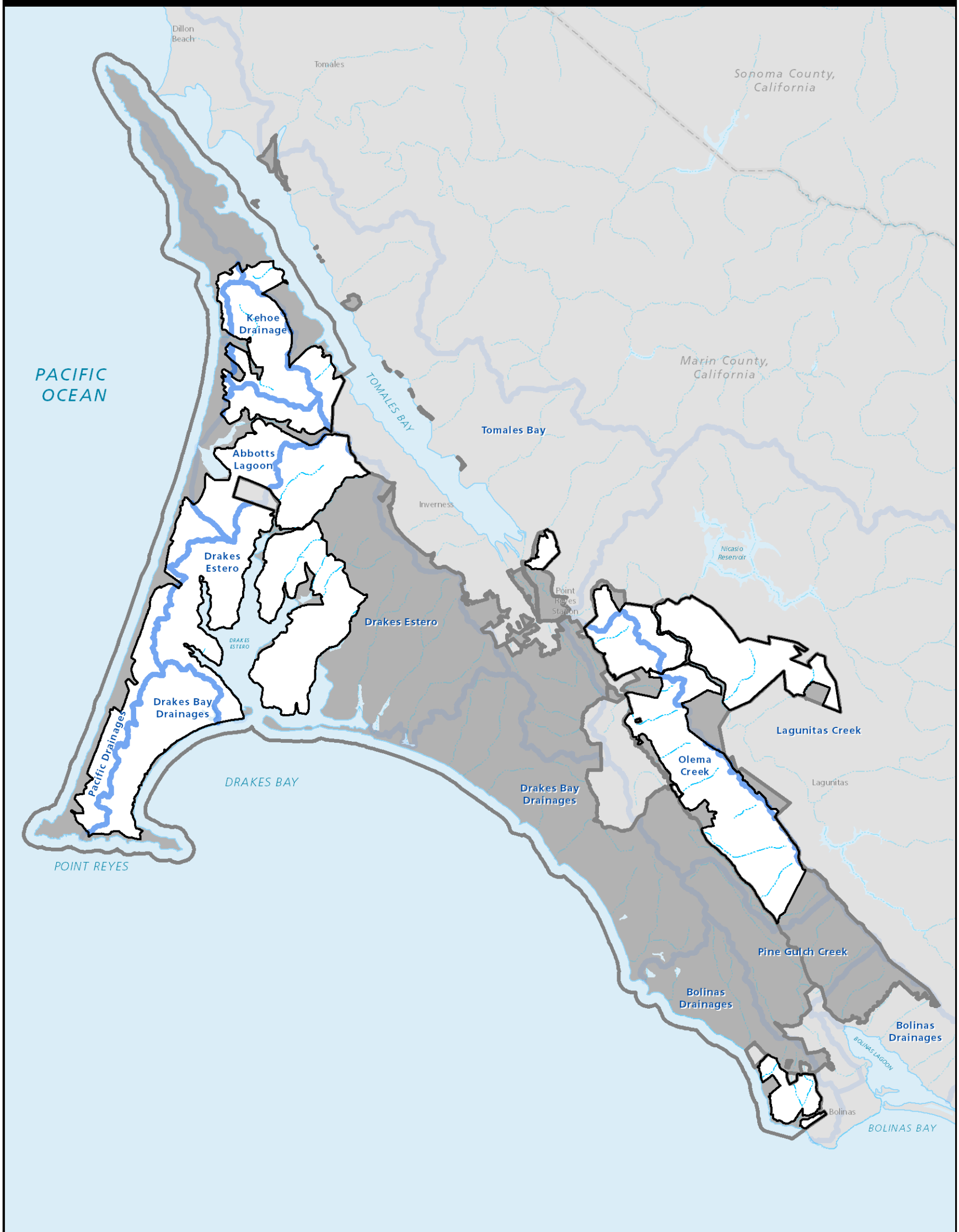

FIGURE 44: HYDROLOGY IN THE PLANNING AREA

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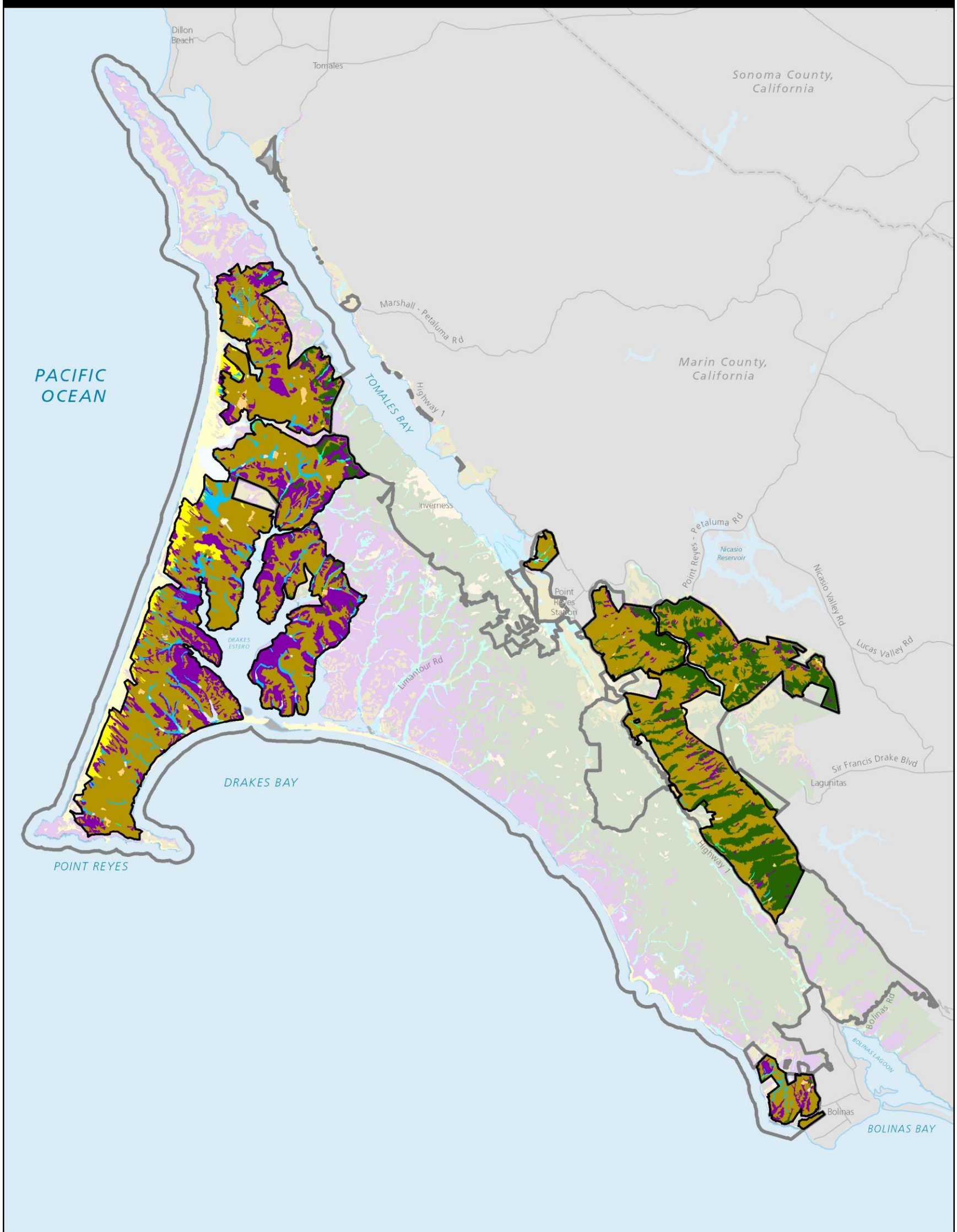

FIGURE 45: VEGETATION IN THE PLANNING AREA

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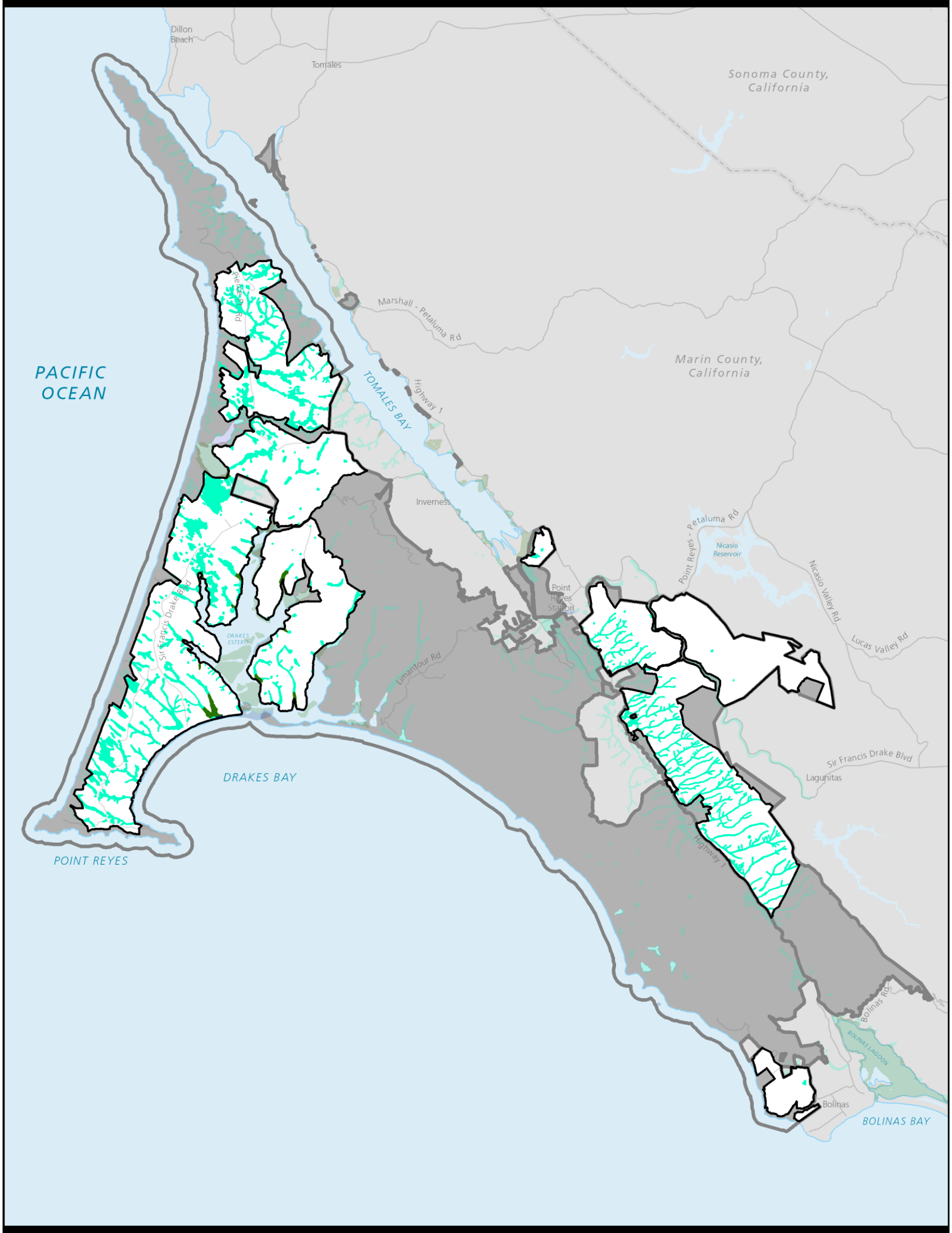

FIGURE 46: WETLANDS IN THE PLANNING AREA

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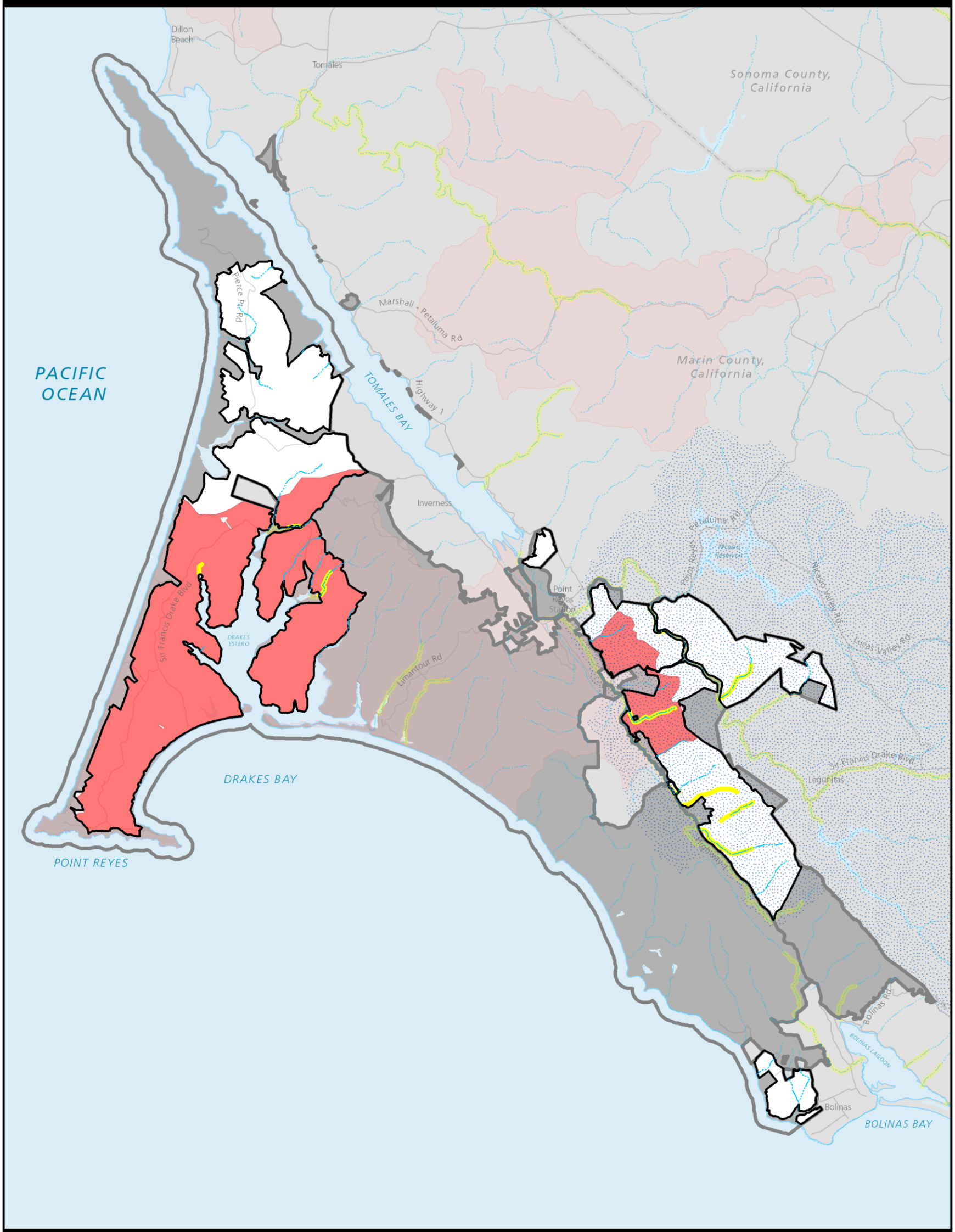

FIGURE 47: CRITICAL HABITAT IN THE PLANNING AREA

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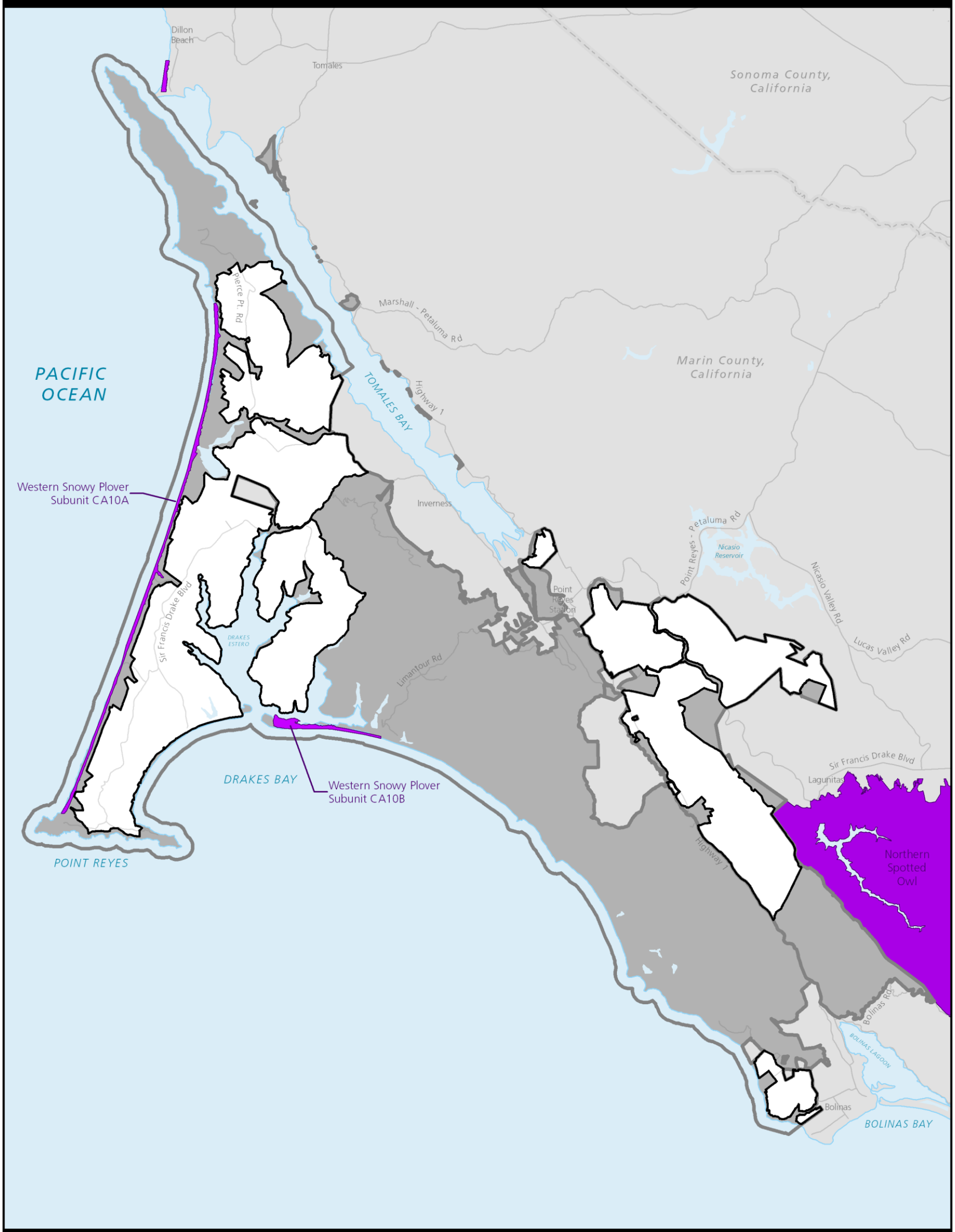

FIGURE 48: CRITICAL HABITAT FOR AVIAN SPECIES IN THE PLANNING AREA

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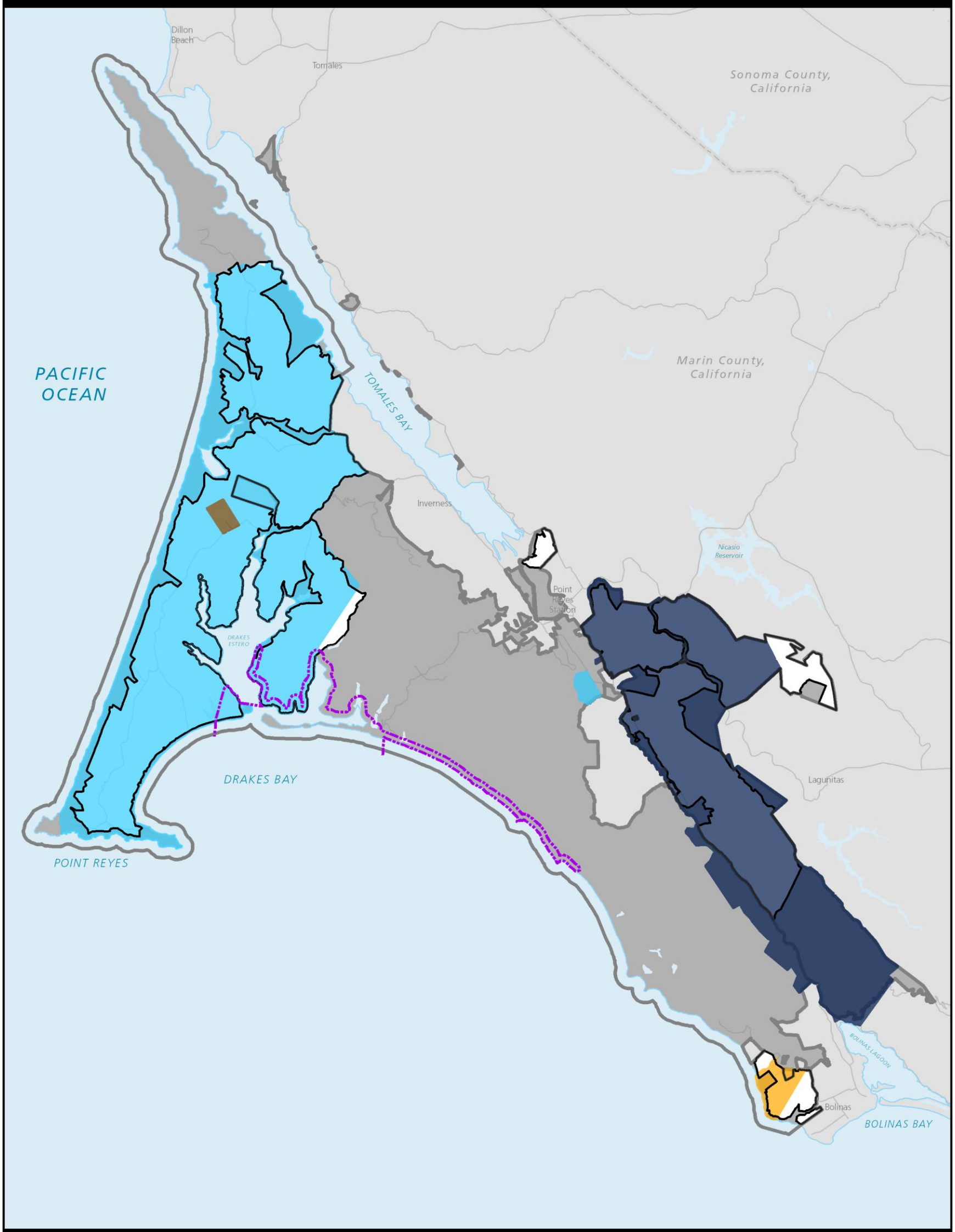

FIGURE 49: HISTORIC DISTRICTS IN THE PLANNING AREA

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APPENDIX B—ACRONYMS AND ABBREVIATIONS, REFERENCES, INDEX

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APPENDIX B: ACRONYMS AND ABBREVIATIONS, REFERENCES, INDEX

Acronyms and Abbreviations

1980 GMP	1980 *Point Reyes National Seashore and Golden Gate National Recreation Area General Management Plan*
1998 EA	1998 Tule Elk Management Plan/Environmental Assessment
2014 GMP	2014 *Golden Gate National Recreation Area and Muir Woods National Monument General Management Plan*
ASBS	Area of Special Biological Significance
AQRV	air quality related values
AU	animal unit
AUE	animal unit equivalent
AUM	animal unit month
AVSO	(The US Department of the Interior) Appraisal and Valuation Services Office
BA	Biological Assessment
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
BMP	best management practice
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWD	chronic wasting disease
dv	deciviews
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FMV	fair market value
FR	Federal Register
GHG	greenhouse gas
GMP Amendment	general management plan amendment
gpd	gallons of water per day

GPS	global positioning system
I/O	Input-Output
IPM	Integrated Pest Management
IVUMC	Interagency Visitor Use Management Council
kg-N/ha/yr	kilogram of nitrogen per hectare per year
kg-S/ha/yr	kilogram of sulfur per hectare per year
lease/permits	agricultural lease/special use permits
LQ	location quotient
Marin RCD	Marin Resource Conservation District
$MTCO_2e$	Metric tons of CO_2e
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NASS	(USDA) National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NH_3	ammonia
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
north district of Golden Gate	north district of Golden Gate National Recreation Area
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NPS	National Park Service
NRCA	Natural Resources Condition Assessment
NRCS	(USDA) Natural Resources Conservation Service
O_3	ozone
park	Point Reyes National Seashore and the north district of Golden Gate National Recreation Area
PCE	primary constituent elements
PEPC	Planning, Environment, and Public Comment
PG&E	Pacific Gas & Electric
PM	particulate matter
$PM_{2.5}$	particulate matter of 2.5 micrometers in diameter or less
PM_{10}	particulate matter of 10 micrometers in diameter or less
Point Reyes	Point Reyes National Seashore
ppb	parts per billion
ppm-hrs	parts per million-hours

Practice Standards	Natural Resources Conservation Service (NRCS) Conservation Practice Standards
PZP	pellucida
RDM	residual dry matter
ROA	ranch operating agreement
ROP	Reservation of Possession
RUO	Reservation of Use and Occupancy
San Francisco Bay RWQCB	San Francisco Bay Regional Water Quality Control Board
SB No. 1383	California Senate Bill Number 1383
SEA/SIS	*Supplemental Environmental Assessment/Subsequent Initial Study for Sir Francis Drake Boulevard Road Improvements*
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPAWN	Salmon Protection and Watershed Network
SWRCB	State Water Resources Control Board
TMDL	total maximum daily loads
Tule Elk Management Plan/EA	*Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment*
UC	University of California
U.S.C.	United States Code
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	volatile organic compound

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References

Adams, D. B.

2004 "Habitat Assessment of the Endangered Myrtle's Silverspot Butterfly." Master of Arts in Biology Thesis, San Francisco State University. 41 pp.

Allen-Diaz, B., and R. Jackson

2000 "Grazing Effects on Spring Ecosystem Vegetation of California's Hardwood Rangelands." *Journal of Range Management* 53(2):215–220. doi:10.2307/4003286.

Allen-Diaz, B. H., R. D. Jackson, J. Bartolome, K. W. Tate, and L. G. Oates

2004 "Long-term Grazing Study in Spring-fed Wetlands Reveals Management Tradeoffs." *California Agriculture* 58(3):144–148.

Allen-Diaz, B., R. D. Jackson, and C. Phillips

2001 "Spring-fed Plant Communities of California's East Bay Hills Oak Woodlands." *Madroño* 48(2):98–111.

Allen, G. T., and P. Ramirez

1990 "A Review of Bird Deaths on Barbed Wire Fences." *Wilson Bulletin* 102(3):553–558.

Ancillotto, L., A. Ariano, V. Nardone, I. Budinski, J. Rydell, and D. Russo

2017 "Effects of Free-ranging Cattle and Landscape Complexity on Bat Foraging: Implications for Bat Conservation and Livestock Management." *Agriculture, Ecosystems and Environment* 241:54–61.

Ansari, S.

2018 "Soil Erosion, Types and Causes." Agriculture Notes. Accessed May 30, 2019. https://agriculturenotes.com/soil-erosion/

Aoyama, L., L. Waks, P. Hopkinson, and J. Bartolome

2018 "Grazing Plan: Recommendations for Point Reyes National Seashore Managed Grazing Lands." Report prepared for Point Reyes National Seashore. UC Berkeley. Final version – August 14, 2018.

Bagne, K, P. Ford, and M. Reeves

2012 "Grasslands." US Department of Agriculture, Forest Service, Climate Change Resource Center. Accessed February 6, 2020. www.fs.usda.gov/ccrc/topics/grasslands/

Bailey, D. W., J. C. Mosley, R. E. Estell, A. F. Cibils, M. Horney, J. R. Hendrickson, J. W. Walker, K. L. Launchbaugh, and E. A. Burritti

2019 "Synthesis Paper: Targeted Livestock Grazing: Prescription for Healthy Rangelands." *Rangeland Ecology & Management* 72(6):865–877.

Bartolome, J. W., B. H. Allen-Diaz, S. Barry, L. D. Ford, M. Hammond, P. Hopkinson, F. Ratcliff, S. Spiegal, and M. D. White

2014 "Grazing for Biodiversity in Californian Mediterranean Grasslands." *Rangelands* 36(5):36–43.

Bartolome, J. W., W. E. Frost, N. K. McDougald, and J. M. Connor

2006 "California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands." *University of California Division of Agricultural Natural Resources Rangeland Management Series Publication 8092 (Revised)*. 8 pp. http://anrcatalog.ucdavis.edu/Details.aspx?itemNo=8092

Bartolome, J. W., M. Hammond, P. Hopkinson, and F. Ratcliff

2015 "1987–2014 Residual Dry Matter Analysis Report and Updated Rangeland Monitoring Guidelines for Livestock Grazed Grasslands within Point Reyes National Seashore and Golden Gate National Recreation Area". Point Reyes National Seashore (PORE) Project Phase 1: CESU Task Agreement # P11AC91045. Range Ecology Lab, Department of Environmental Science, Policy, and Management. University of California, Berkeley. August 15, 2015.

Bartolome, J. W., R. D. Jackson, A. D. K. Betts, J. M. Connor, G. A. Nader, and K. W. Tate

2007 "Effects of Residual Dry Matter on Net Primary Production and Plant Functional Groups in Californian Annual Grasslands." *Grass and Forage Science* 62:445–452. doi:10.1111/j.1365-2494.2007.00599.x.

Barry, S., L. Bush, S. Larson, and L. D. Ford

2015 *Understanding Working Rangelands: The Benefits of Grazing – Livestock Grazing: A Conservation Tool on California's Annual Grasslands*. ANR Publication 8517. April 2015. Accessed February 20, 2019. http://cesonoma.ucanr.edu/files/225913.pdf

Bay Area Economics

2006 "Economic Impacts Study. Point Reyes National Seashore." Final Report. Submitted to Point Reyes National Seashore, NPS.

Baye, P. R.

2008 "Point Reyes National Seashore Memorandum: NEPA Support for Assessment of Impacts to Wetlands and Sensitive Plants Affected by Ammophila Control/Removal in Dunes West of Southern Abbotts Lagoon, Point Reyes National Seashore." (not seen, as cited in NPS 2009)

Beck, J. J., D. L. Hernández, J. R. Pasari, and E. S. Zavaleta

2015 "Grazing Maintains Native Plant Diversity and Promotes Community Stability in an Annual Grassland." *Ecological Applications* 25(5):1259–1270.

Becker, B., D. Press, S. Kraft, R. Foss and D. Voeller

2019 "Rationale, Workflow, and Examples for the Forage Package." Unpublished NPS Report.

Beitler, J.

2006 "Tracking Nature's Contribution to Pollution." NASA's Earth Observing System, Project Science Office, Greenbelt, MD.

Belsky, A. J., A. Matzke, and S. Uselman

1999 "Survey of Livestock Influences on Stream and Riparian Ecosystems in the Western United States." *Journal of Soil and Water Conservation* 54:419–431.

Berg, L., and T. G. Northcote

1985 "Changes in Territorial, Gill-Flaring, and Feeding Behavior in Juvenile Coho Salmon (*Oncorhynchus kisutch*) following Short-Term Pulses of Suspended Sediment." *Canadian Journal of Fisheries and Aquatic Science* 42:1410–1417.

Bernot, T., and D. Press

2016 "Tule Elk Monitoring at Point Reyes National Seashore: 2013–2014 Report." Natural Resource Report NPS/SFAN/NRR—2016/1317. National Park Service, Fort Collins, CO.

2018 "Tule Elk Monitoring and Management at Point Reyes National Seashore: 2015–2016 Report." Natural Resource Report NPS/SFAN/NRR—2018/1656. National Park Service, Fort Collins, CO.

Best, T. L.

1996 "Lepus californicus." *Mammalian Species* 530:1–10.

Black, R.

2018 Personal Communication. August 28, 2018. Discussion of Ranch Operations and Marin County Ranching Statistics with Randi Black, UC Cooperative Extension Sonoma County; Laura Totten and Chris Dixon, Louis Berger; Brannon Ketcham, David Lewis, and Dylan Voeller, NPS.

Black, R.

2019 Personal Communication. April 11, 2019. Discussion of Ranch Operations and Marin County Ranching Statistics with Randi Black, UCCE and Chris Dixon, Louis Berger.

Bock, C. E, V. A. Saab, T. D. Rich, and D. S. Dobkin

1993 "Effects of Livestock Grazing on Neotropical Migratory Landbirds in Western North America." In *Status and Management of Neotropical Migratory Landbirds*, edited by P. W. Stangel, 296–309. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. https://www.fs.fed.us/rm/pubs_rm/rm_gtr229/rm_gtr229_296_309.pdf

Bush, L.

2006 *Grazing Handbook: A Guide for Resource Managers in Coastal California*. Santa Rosa, CA: Sotoyome Resource Conservation District. http://www.sonomarcd.org/documents/Grazing-Handbook.pdf

Bylo, L. N., N. Koper, and K. A. Molloy

2014 "Grazing Intensity Influences Ground Squirrel and American Badger Habitat Use in Mixed-grass Prairies." *Rangeland Ecology and Management* 67:247–254.

Byrnes, R. C., D. J. Eastburn, K. W Tate, and L. M. Roche

2018 "A Global Meta-Analysis of Grazing Impacts on Soil Health Indicators." *J. Environ. Qual.* 47:758–765. doi:10.2134/jeq2017.08.0313.

California Department of Conservation, California Geological Survey

2003 *Rehabilitation of Disturbed Lands in California: A Manual for Decision-Making*. Special Publication 123. 2003. Prepared by G. A. Newton, Department of Conservation, Office of Mine Reclamation, and V. P. Claasen, Department of Land, Air and Water Resources, UC Davis.

California Department of Food and Agriculture

2018 *2019 Alternative Manure Management Program. Request for Grant Applications*. December 28, 2018. Accessed March 15, 2019. https://www.cdfa.ca.gov/oefi/AMMP/docs/2019_AMMP_RGA.pdf

California Environmental Protection Agency

2009 *Air Resources Board, California Regional Haze Plan*. January 2009.

California Herps

2016 "Guide to the Amphibians and Reptiles of California." Accessed April 9, 2018. http://www.californiaherps.com/index.html

CARB (California Air Resources Board)

2004 Section 7.6 Livestock Husbandry. May 2004. Accessed June 12, 2019. https://www.arb.ca.gov/ei/areasrc/fullpdf/FULL7-6.PDF

2008 California Regional $PM_{10}/PM_{2.5}$ Air Quality Study Ammonia Emissions Improvement Projects in Support of CRPAQS Aerosol Modeling and Data Analyses: Draft Ammonia Inventory Development. Accessed June 12, 2019. https://www.arb.ca.gov/ei/areasrc/ammonia.htm

2011 Bay Area Winter Emissions Inventory for Primary $PM_{2.5}$ & PM Precursors: Year 2010. Accessed June 12, 2019. https://www.arb.ca.gov/planning/sip/planarea/PMSIPTable2010WinterHB.pdf

2015 Documentation of California's Greenhouse Gas Inventory. https://www.arb.ca.gov/cc/inventory/doc/docs3/3a2i_manuremanagement_pasture_livestockpopulation_broilers_ch4_2015.htm

2016 Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust. https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf

2018 "Annual Report to the Legislature on California Climate Investments using Cap-and-Trade Auction Proceeds." March 2018. Accessed March 15, 2019. https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/2018_cci_annual_report.pdf

Carey, K. A., A. Ortiz, K. Gram, D. Elkins, J. W. Turner, and A. T. Rutberg

2019 "Efficacy of Dart-Delivered PZP-22 Immunocontraceptive Vaccine in Wild Horses (*Equus caballus*) in Baited Traps in New Mexico, USA." *Wildlife Research* 46(8):713–718. https://doi.org/10.1071/WR18112

Carlisle, S., B. McNeill, and M. Reichmuth

2018 *Long-term Monitoring of Coho Salmon and Steelhead Trout During Freshwater Life Stages in Coastal Marin County: 2016 Annual Report*. Natural Resource Report. NPS/SFAN/NRR—2017/1577. National Park Service. Fort Collins, CO.

Carson, R.

2013 *Tomales Bay Wetlands Restoration and Monitoring Program 2007–2012 Final Water Quality Technical Report and Program Summary*. California State Water Resources Control Board SRF Project No. C-06-6926-110. Prepared by R. Carson, Tomales Bay Watershed Council Foundation. www.tomalesbaywatershed.org/assets/2011_12_tbwc_finalwqreport_complete_finalv4_sm.pdf

CDFW (California Department of Fish and Wildlife)

2011 Gray Wolves in California: An Evaluation of Historical Information, Current Conditions, Potential Natural Recolonization and Management Impacts. Accessed February 20, 2020. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=76636&inline

2014 "California Wildlife Habitat Relationships Life History Accounts and Range Maps." California Interagency Wildlife Task Group. Sacramento, California. Accessed March 13, 2019. https://map.dfg.ca.gov/imaps/cwhr/cwhrlife.html

2018a "Special Animals List." November 2018. Accessed March 13, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

2018b "Chronic Wasting Disease." Accessed April 18, 2018. https://www.wildlife.ca.gov/Conservation/Laboratories/Wildlife-Investigations/Monitoring/CWD

2018c "Final Elk Conservation and Management Plan." Sacramento, CA. 481 pages.

2019 "Fully Protected Animals." Accessed March 13, 2019. http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html

California Department of Public Health

2011 *2010–2011 Annual Sanitary Survey Update Report for Commercial Shellfish Growing Areas in Drakes Estero, California*. California Department of Health Services, Division of Drinking Water and Environmental Management Technical Report #11-21. Prepared by V. Zubkousky, October 2011.

Center for Climate and Energy Solutions

2019 "Main Greenhouse Gases." Accessed January 9, 2020. https://www.c2es.org/content/main-greenhouse-gases/

CEQ (Council on Environmental Quality)

1981 *Memorandum to Agencies: Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*. Executive Office of the President, Council on Environmental Quality. March 23, 1981.

2005 *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.* June 24, 2005. Accessed June 12, 2019. https://www.fs.fed.us/rmrs/sites/default/files/documents/CEQ%20%282005%29-Cumulative%20effects.pdf

Chuong, J., J. Huxley, E. N. Spotswood, L. Nichols, P. Mariotte, and K. N. Suding

2016 "Cattle as Dispersal Vectors of Invasive and Introduced Plants in a California Annual Grassland." *Rangeland Ecology & Management* 69:52–58.

CNDDB (California Natural Diversity Database)

2018 "State and Federally Listed Endangered, Threatened, and Rare Plants of California." August 6, 2018. California Department of Fish and Wildlife, Biogeographic Data Branch. Accessed March 13, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline

CNPS (California Native Plant Society)

2019 "Inventory of Rare and Endangered Plants of California" Accessed March 13, 2019. http://www.rareplants.cnps.org/

Cobb, M. A., P. J. P. Gogan, D. Press, and R. H. Barrett

2020 "Evaluating Density Dependence and Climate Effects on the Dynamics of Reintroduced Tule Elk Herds Using Integrated Population Models." Unpublished peer-reviewed report to the National Park Service. 46 pp.

Collins, P. W.

1998 "Point Reyes Jumping Mouse, *Zapus trinotatus orarius*." In *Terrestrial Mammal Species of Special Concern in California*, edited by B. C. Bolster, 132–135. Accessed February 4, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84509

Cooprider, M.

2004 "San Francisco Bay Area Network Preliminary Water Quality Status Report." National Park Service, San Francisco Area Network. December 2004.

Crunkilton, R.

2000 "Acute and Chronic Toxicity of Nitrate to Brook Trout (*Salvelinus fontinalis*) Eggs and Fry." Wisconsin Cooperative Fisheries Extension Unit Annual Report, 1999–2000. (not seen, as cited in NPS 2013)

Dangremond, E. M., E. A. Pardini, and T. M. Knight

2010 "Apparent Competition with an Invasive Plant Hastens the Extinction of an Endangered Lupine." *Ecology* 91(8):2261–2271.

D'Antonio, C., S. Bainbridge, C. Kennedy, J. Bartolome, and S. Reynolds

2002 "Ecology and Restoration of California Grasslands with Special Emphasis on the Influence of Fire and Grazing on Native Grassland Species." Unpublished report prepared for the David and Lucille Packard Foundation. University of California, Berkeley.

Davis, H., and R.J. Sherman

1992 "Ecological Study of the Rare *Chorizanthe valida* (Polygonaceae) at Point Reyes National Seashore California." *Madroño* 39:271–280.

Day, F.

n.d. Principles of Impact Analysis & IMPLAN® Applications. Technical Advisors: Greg Alward, Doug Olsen, and Jenny Thorvaldsen.

Dean Runyan Associates

2013 *A Regional Analysis of the California Travel Industry & other Industry Sectors 2007–201*2. Published August 2013. Accessed April 24, 2018. http://www.deanrunyan.com/doc_library/CAReg_CoIndRpt.pdf

2016 *California Travel Impacts by County, 1992–2016*. Published May 2017. Accessed April 24, 2018. http://www.deanrunyan.com/doc_library/CAImp.pdf

Debano, S. J.

2006 "Effects of Livestock Grazing on Aboveground Insect Communities in Semi-arid Grasslands of Southeastern Arizona." *Biodiversity and Conservation* 15:2547–2564.

Dechant, J. A., M. L. Sondreal, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss

2002 *Effects of Management Practices on Grassland Birds: Ferruginous Hawk*. Northern Prairie Wildlife Research Center, Jamestown, ND. 23 pp. Accessed February 4, 2019. https://pubs.usgs.gov/unnumbered/93879/report.pdf

Derner, J. D., W. K. Lauenroth, P. Stapp, and D. J. Augustine

2009 "Livestock as Ecosystem Engineers for Grassland Bird Habitat in the Western Great Plains of North America." *Rangeland Ecology and Management* 62:111–118.

Diaz, S., S. Lavorel, S. Mclntyre, V. Falczuk, F. Casanoves, D. G. Milchunas, C. Skarpe, G. Rusch, M. Sternberg, I. Noy-Meir, J. Landsberg, W. Zhang, H. Clark, and B. D. Campbel

2007 "Plant Trait Responses to Grazing - A Global Synthesis." *Global Change Biology* 13:313–341.

Diemer, K. M., and J. J. Nocera

2016 "Bobolink Reproductive Response to Three Hayfield Management Regimens in Southern Ontario." *Journal of Nature Conservation* 29:123–131.

DiGaudio, R.

2010 "Grassland Bird Monitoring at the Jenner Headlands: A Report of the 2010 Field Season." Point Reyes Bird Observatory. Petaluma, CA.

DiGaudio, R. T., D. L. Humple, and T. Gardali

2015 *Estimating Impact of Mowing in the Silage Fields of Point Reyes National Seashore on Breeding Birds*. Final Report to the National Park Service. Blue Point Conservation Science Contribution #2048. August 31, 2015. Petaluma, CA. https://www.nps.gov/pore/getinvolved/upload/planning_ranch_cmp_background_report_pointblue_impact_of_mowing_on_breeding_birds_150831.pdf

2016 *Estimating Impact of Mowing in on Breeding Birds in the Silage Fields of Point Reyes National Seashore in 2015 and 2016*. Final Report to the National Park Service. Blue Point Conservation Science Contribution #2090. September 16, 2016. Petaluma, CA.

DiTomaso, J. M., G. B. Kyser, S. R. Oneto, R. G. Wilson, S. B. Orloff, L. W. Anderson, S. D. Wright, J. A. Roncoroni, T. L. Miller, T. S. Prather, C. Ransom, K. G. Beck, C. Duncan, K. A. Wilson, and J. J. Mann

2013 *Weed Control in Natural Areas in the Western United States*. Davis, CA: University of California Weed Research and Information Center.

Duffy, W., P. Garone, B. J. Grewell, S. Kahara, J. Fleskes, B. Helm, P. Moyle, R. Records, and J. Silveira

2016 "Wetlands." In *Ecosystems of California—A Source Book*, edited by H. Mooney and E. Zavaleta, 669–692. Oakland, CA: University of California Press.

East Contra Costa County Habitat Conservancy

2006 "Species Accounts – Reptiles: Western Pond Turtle (*Clemmys marmorata*)." In the *East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan*. Accessed February 4, 2019. http://www.co.contra-costa.ca.us/depart/cd/water/HCP/archive/hcp_nccp_content/hcp_nccp/app_figs/App%20D%20components/APP_D-10a_Western_pond_turtle_1-18-05.pdf

Ender, C. L., C. E. Christian, and J. H. Cushman

2017 "Native Herbivores and Environmental Heterogeneity as Mediators of an Exotic Grass Invasion." *Ecology and Evolution* 7:1561–1571.

Eviner, V. T.

2016 "Grasslands." In *Ecosystems of California—A Source Book*, edited by H. Mooney and E. Zavaleta. 449–477. Oakland, CA: University of California Press.

Fehmi, J. S., and J. W. Bartolome

2002 "Species Richness and California Voles in an Annual and a Perennial Grassland." *Western American Naturalist* 62(1):73–81.

Fellers, G. M., and D. Pratt

2002 "Terrestrial Vertebrate Inventory, Point Reyes National Seashore, 1998–2001." Unpublished Report to the National Park Service. Point Reyes National Park, California. 73 pp.

Ferry, D., and C. LaFayette

1997 "Point Reyes National Seashore Visitor Use Survey." Sonoma State University. Spring 1997.

Fidenci, P.

2000 "Relationship between Cattle Grazing and the Western Pond Turtle (*Clemmys marmorata*) Populations in Point Reyes National Seashore." Master's Thesis. University of San Francisco, San Francisco.

Fites-Kaufman, J., A. F. Bradley, and A. G. Merrill

2006 "Fire and Plant Interactions." In *Fire in California's Ecosystems*, edited by N. G. Sugihara, J. W. Van Wagtendonk, K. E. Shaffer, J. Fites-Kaufman, and A. E. Thode, 94–117. Berkeley CA: University of California Press.

Foin, T. C., and M. M. Hektner

1986 "Secondary Succession and the Fate of Native Species in a California Coastal Prairie Community." *Madroño* 33:189–206.

Ford, L., and G. F. Hayes

2007 "Northern Coastal Scrub and Coastal Prairie." In *Terrestrial Vegetation of California*. 3rd edition, edited by M. G. Barbour, T. Keeler-Wolf, and A. Schoenherr, 180–207. Berkeley CA: University of California Press.

Ford, L. D., P. A. Van Hoorn, D. R. Rao, N. J. Scott, P. C. Trenham, and J. W. Bartolome

2013 Managing Rangelands to Benefit California Red-legged Frogs and California Tiger Salamanders. Livermore, CA: Alameda County Resource Conservation District.

Foufopoulos, J., S. Altizer, and A. Dobson

2002 "Interactions between Wildlife and Domestic Livestock in the Tropics." *Tropical Agroecosystems* 219–244.

Fuhlendorf, S. D., and D. M. Engle

2004 "Restoring Heterogeneity on Rangelands: Ecosystem Management Based on Evolutionary Grazing Patterns." *Bioscience* 51:625–632.

Fungi, A. J.

1999 "Point Reyes National Seashore Visitor Use Satisfaction Survey: A Compilation of Four Seasons of Data."

GAMA (Groundwater Ambient Monitoring Assessment) Program

2020 California Water Boards, Groundwater Ambient Monitoring Assessment Program (GAMA). Groundwater Information System Map. Accessed March 2020. https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/Default.asp

Gea-Izquierdo G., S. Gennet, and J. W. Bartolome

2007 "Assessing Plant–Nutrient Relationships in Highly Invaded Californian Grasslands Using Non-Normal Probability Distributions." *Applied Vegetation Science* 10:343–350.

Gehring, T. M., K. C. VerCauteren, and J. M. Landry

2010 "Livestock Protection Dogs in the 21st Century: Is an Ancient Tool Relevant to Modern Conservation Challenges?" *BioScience* 60: 299–308.

Gehring T. M., K. C. VerCauteren, M. L. Provost, and A. C. Cellar

2011 "Utility of Livestock-Protection Dogs for Deterring Wildlife from Cattle Farms." *Wildlife Research* 37:715–721.

Geiser, L. H., P. R. Nelson, S. E. Jovan, H. T. Root, and C. M. Clark

2019 "Assessing Ecological Risks from Atmospheric Deposition of Nitrogen and Sulfur to US Forests Using Epiphytic Macrolichens." *Diversity* 11(87):29 pages. doi:10.3390/d11060087.

Gennet, A. S.

2004 "Experimental Introductions of the Endangered Grass Sonoma Alopecurus (*Alopecurus Aequalis Var. sonomensis*) at Point Reyes National Seashore, Marin County, CA." M.S. Thesis. University of California, Berkeley.

Gennet, S., E. Spotswood, M. Hammond, and J. W. Bartolome

2017 "Livestock Grazing Supports Native Plants and Songbirds in a California Annual Grassland." *PLOS ONE* 12(6): e0176367. Accessed February 11, 2019. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5470661/

George, M. R., R. D. Jackson, C. S. Boyd, and K. W. Tate

2011 "A Scientific Assessment of the Effectiveness of Riparian Management Practices." In *Conservation Benefits of Rangeland Practices,* edited by D. D. Briske. United States Department of Agriculture Natural Resources Conservation Service. pp. 213–252.

Gerber P., C. Opio, and H. Steinfeld

2007 Poultry Production and the Environment – A Review. Accessed June 12, 2019. http://www.fao.org/ag/againfo/home/events/bangkok2007/docs/part2/2_2.pdf

Germano, D. J, Rathbun, G. B. and L. R. Saslaw

2001 "Managing Exotic Grasses and Conserving Declining Species." *Wildlife Society Bulletin* 29(2):551–559.

Ghodrati, F., and R. Tuden

2005 *Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL) Staff Report*. California Regional Water Quality Control Board, San Francisco Bay Region.

Gogan, P. J. P, M. Akenson, and D. A. Jessup

1989 "Copper Deficiency in Tule Elk at Point Reyes, California." *Journal of Range Management* 42(3):233.

Goodrich L.B., C. B. Parnell, S. Mukhtar, R. E. Lacey, and B. W. Shaw

2002 Preliminary PM_{10} Emission Factor for Freestall Dairies. Paper number 022148 presented to the 2002 ASAE Annual International Meeting, July, by the Department of Biological and Agricultural Engineering, Texas A&M University. As cited in Bryan M. Penfold, Dana Coe Sullivan, Stephen B. Reid, and Lyle R. Chinkin "Development of Agricultural Dust Emission Inventories for the Central States Regional Air Planning Association."

Greig, D. J., F. M. D. Gulland, W. A. Smith, P. A. Conrad, C. L. Field, M. Fleetwood, J. T. Harvey, H. S. Ip, S. Jang, A. Packham, E. Wheeler, and A. J. Hall

2014 "Surveillance for Zoonotic and Selected Pathogens in Harbor Seals *Phoca vitulina* from Central California." *Diseases of Aquatic Organisms* Vol. 111: 93–106.

Grewell, B. J., J. C. Callaway, and W. R. Ferren, Jr.

2007 "Estuarine Wetlands." In *Terrestrial Vegetation of California*, 3rd edition, edited by M. G. Barbour, T. Keeler-Wolf, and A. A. Schoenherr, 124–154. Berkeley, CA: University of California Press.

Gutzwiller, K. J.

1995 "Recreational Disturbance and Wildlife Communities." In *Wildlife and Recreationists: Coexistence through Management and Research*, edited by R. L. Knight and K. J. Gutzwiller, chapter 10. Washington, DC: Island Press.

Hallett, L. M., C. Stein, and K. N Suding

2017 Functional Diversity Increases Ecological Stability in a Grazed Grassland. *Oecologia* 183:831–840. https://doi.org/10.1007/s00442-016-3802-3

Hamza, M., and W. Anderson

2005 "Soil Compaction in Cropping Systems: A Review of the Nature, Causes and Possible Solutions." *Soil and Tillage Research* 82:121–145. Doi: 10.1016/j.still.2004.08.009.

Hayes, D. W., K. R. McAllister, S. A. Richardson, and D. W. Stinon

1999 *Washington State Recovery Plan for the Western Pond Turtle*. Washington Department of Fish and Wildlife. Olympia, WA: 7:376–381. Accessed May 14, 2019. https://wdfw.wa.gov/sites/default/files/publications/00398/wdfw00398.pdf

Hayes, G. F., and K. D. Holl

2003 "Cattle Grazing Impacts on Annual Forbs and Vegetation Composition of Mesic Grasslands in California." *Conservation Biology* 17:1694–1702.

2011 "Manipulating Disturbance Regimes and Seeding to Restore Mesic Mediterranean Grasslands." *Applied Vegetation Science* 14:304–315.

Headwaters Economics

2018 "Economic Profiling System (EPS). Reports: Socioeconomic Measures, a Profile of Land Use and a Profile of Agriculture for Marin County, CA." Accessed April 20, 2018. https://headwaterseconomics.org/tools/economic-profile-system/

Hickey, C., W. D. Shuford, G. W. Page, and S. Warnock

2003 Version 1.1. The Southern Pacific Shorebird Conservation Plan: A Strategy for Supporting California's Central Valley and Coastal Shorebird Populations. PRBO Conservation Science, Stinson Beach, CA. https://www.shorebirdplan.org/wp-content/uploads/2013/01/SoPacificRev04.pdf

Holmes, A. L., D. L. Humple, T. Gardali, and G. R. Guepel

1999 "Songbird Habitat Associations and Response to Disturbance in the Point Reyes National Seashore and Golden Gate Recreation Area." Unpublished Report to the Point Reyes National Seashore and Golden Gate National Recreation Area. Point Reyes Bird Observatory. Accessed February 6, 2019. https://www.researchgate.net/publication/242413267_Songbird_Habitat_Associations_and_Response_to_Disturbance_in_the_Point_Reyes_National_Seashore_and_Golden_Gate_National_Recreation_Area

Holstein, G.

2011 "Invertebrates of California's Prairies." *Fremontia* 39(2)/39(3):36–39.

HSU (Humboldt State University) Wildlife

2004 "Kites and Cows: Effects of Grazing on White-tailed Kites and Other Raptors." HSU Wildlife Techniques Poster Series #6. Accessed February 5, 2019. https://www2.humboldt.edu/wildlife/faculty/johnson/project/s04_kite_poster.pdf

Hughey, L. F., K. Shoemaker, K. Stewart, and H. Cushman

2019 "Seasonal Dynamics of Habitat Selection by Tule Elk in the Pastoral Zone at Point Reyes National Seashore."

Huntsinger, L. J., W. Bartolome, and C. M. D'Antonio

2007 "Grazing Management on California's Mediterranean Grasslands." In *California Grasslands: Ecology and Management*, edited by J. Corbin, M. Stromberg, and C. D'Antonio, 223–253. Berkeley: University of California Press. https://www.researchgate.net/profile/Lynn_Huntsinger/publication/281603841_Grazing_Management_on_California%27s_Mediterranean_Grasslands/links/5624fae508aea35f268719e0/Grazing-Management-on-Californias-Mediterranean-Grasslands.pdf?origin=publication_detail

IMPLAN

2019 IMPLAN Group, Data Sources and Methodology: Output Information. Accessed May 8, 2019. https://implanhelp.zendesk.com/hc/en-us/articles/115009505807-Output-Information

Jackson, R. D., and B. Allen-Diaz

2006 "Spring-fed Wetland and Riparian Plant Communities Respond Differently to Altered Grazing Intensity." *Journal of Applied Ecology* 43:485–498. doi:10.1111/j.1365-2664.2006.01150.x.

Jackson, R. D., and J. W. Bartolome

2002 "A State-Transition Approach to Understanding Nonequilibrium Plant Community Dynamics in Californian Grasslands." *Plant Ecology* 162:49–65.

2007 "Grazing Ecology of California's Grasslands." In *California Grasslands: Ecology and Management,* edited by M. R. Stromberg, J. D. Corbin, and C. M. D'Antonio, 197–206. Berkeley: University of California Press.

Jeffery, D.

2016 "Final Performance Report [Showy Indian Clover Coastal Ecotype Project]." Report on Activities at Point Reyes National Seashore to U.S. Fish & Wildlife Service.

Jennings, C. W., R. G. Strand, T. H. Rogers, R. T. Boylan, R. R. Moar, and R. A. Switzer

1977 Geologic Map of California: California Geological Survey, Geologic Data Map 2, Scale 1:750,000.

Jensen, H. P., D. Rollins, and R. L. Gillen

1990 "Effect of Cattle Stock Density on Trampling Loss of Simulated Ground Nests." *Wildlife Society Bulletin* 18:71–74.

Jerrentrup, J. A., N. Wrage-Monnig, K. Rover, and J. Isselstein

2014 "Grazing Intensity Affects Insect Diversity via Sward Structure and Heterogeneity in a Long-term Experiment." *Journal of Applied Ecology* 51:968–977.

Jessup, D. A., B. Abbas, D. Behymer, and P. Gogan

1981 "Paratuberculosis in Tule Elk in California." *J. Am. Veterinary Med. Assoc.* 179(11):1252–1254. (not seen, as cited in NPS 1998a)

Jones, K. B.

1981 "Effects of Grazing on Lizard Abundance and Diversity in Western Arizona." *Southwestern Naturalist* 26(2):107–115.

Johnson, B. E. and J. H. Cushman

2007 "Influence of a Large Herbivore Reintroduction on Plant Invasions and Community Composition in a California Grassland." *Conservation Biology* 21:515–516.

Karhu R.

2008 "Fence Designs Accommodate Wildlife but Keep Livestock In." *Barnyard and Backyards*. Wyoming Natural Resources Conservation Service. http://www.uwyo.edu/barnbackyard/_files/documents/magazine/2008/summer/wildlife-friendly-fence-summer-2008-web.pdf

Kay, D., J. Crowther, C. M. Stapleton, and M. D. Wyer

2018 "Faecal Indicator Organism Inputs to Watercourses from Streamside Pastures Grazed by Cattle: Before and After Implementation of Streambank Fencing." *Water Res.* 2018:143, 229–239.

Keeler-Wolf, T., P. van der Leeden, and D. Schirokauer

2003 *Field Key to the Plant Communities. Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks. Appendix A. Point Reyes National Seashore, Golden Gate National Recreation Area, and Surrounding Wildlands Plant Community and Mapping Project Final Report*. Point Reyes National Seashore, National Park Service.

Kelly, J. P.

2001 "Abundance and Distribution of the Common Raven and American Crow in the San Francisco Bay Area, California: The Birds." Audubon Canyon Ranch's Annual Journal, *The Ardeid* 2001:8–10.

Kelly, J. P., K. L. Etienne, and J. E. Roth

2002 "Abundance and Distribution of the Common Raven and American Crow in the San Francisco Bay Area, California." *Western Birds* 33:202–107.

Kohut, R. J.

2004 Assessing the Risk of Foliar Injury from Ozone on Vegetation in Parks in the San Francisco Bay Area Network. October. Accessed May 3, 2019. https://irma.nps.gov/DataStore/DownloadFile/442226

2007 Ozone Risk Assessment for Vital Signs Monitoring Networks, Appalachian National Scenic Trail, and Natchez Trace National Scenic Trail. NPS/NRPC/ARD/NRTR—2007/001. National Park Service, Fort Collins, CO. Accessed May 3, 2019. https://irma.nps.gov/DataStore/DownloadFile/152846

Kovacs, K. E., K. E. Converse, M. C. Stopher, J. H. Hobbs, M. L. Sommer, P. J. Figura, D. A. Applebee, D. L. Clifford, and D. J. Michaels

2016 *Conservation Plan for Gray Wolves in California.* California Department of Fish and Wildlife, Sacramento, CA 329 pp.

Krausman, P. R., V. C. Bleich, W. M. Block, D. E. Naugle, and M. C. Wallace

2011 "An Assessment of Rangeland Activities on Wildlife Populations and Habitats." Chapter 6 In: Briske, D.D., ed. *Conservation Benefits of Rangeland Practices: Assessment, recommendations*. Accessed February 5, 2019. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1045801.pdf

Kupper T., C. Bonjour, and H. Menzi

2015 "Evolution of Farm and Manure Management and their Influence on Ammonia Emissions from Agriculture in Switzerland between 1990 and 2010". Accessed June 10, 2019. https://www.sciencedirect.com/science/article/pii/S1352231014009728

Larson, S., S. Barry, and L. Bush

2015 "Cattle, Sheep, Goats, and Horses: What's the Difference for Working Rangelands?" *Understanding Working Rangelands Series*. ANR Publication 8524. Richmond, CA: University of California, Agriculture and Natural Resources. http://anrcatalog.ucanr.edu/Details.aspx?itemNo=8524

Launer, A. E., D. D. Murphy, J. M. Hoekstra, and H. R. Sparrow

1992 "The Endangered Myrtle's Silverspot Butterfly: Present Status and Initial Conservation Planning." *Journal of Research on the Lepidoptera* 31(1-2):132–146.

Legislative Analyst's Office

2017 Residential Water Use Trends and Implications for Conservation Policy. Accessed May 31, 2019. https://lao.ca.gov/Publications/Report/3611

Le Riche, E. L., A. C. VanderZaag, S. Burtt, D. R. Lapen, and R. Gordon

2017 "Water Use and Conservation on a Free-Stall Dairy Farm." *Water* 9(12):1–14.

Lewis, E. R., and S. E. Schwartz

2004 "Sea Salt Aerosol Production: Mechanisms, Methods, Measurements and Models - A Critical Review." American Geophysical Union, Washington, DC.

Lewis, D. J., D. Voeller, T. L. Saitone, and K. W. Tate

2019 "Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters." *Sustainability* 11(5516). doi:10.3390/su11195516.

Line, D. E.

2003 "Changes in a Stream's Physical and Biological Conditions Following Livestock Exclusion." *Trans. ASAE* 2002, 46:287–293.

Line, D. E., W. A. Harman, G. D. Jennings, E. J. Thompson, and D. L. Osmond

2000 "Nonpoint-Source Pollutant Load Reductions Associated with Livestock Exclusion." *Journal of Environmental Quality* 29:1882–1890. doi:10.2134/jeq2000.00472425002900060022x.

Louis, N.

2016 "Effects of Livestock Grazing on Invertebrate-Provided Ecosystem Services in the Aegean." M.S. Thesis. University of Michigan.

Malan, J. C, N. Flint, E. L. Jackson, A. D. Irving, and D. L. Swain

2018 "Offstream Watering Points for Cattle: Protecting Riparian Ecosystems and Improving Water Quality?" *Agriculture, Ecosystems & Environment* 256,144–152. doi: 10.1016/j.agee.2018.01.013.

Manning, E. J., T. E. Kucera, N. B. Gates, L. M. Woods, and M. Fallon-McKnight

2003 "Testing for Mycobacterium Avium Subsp. Paratuberculosis Infection in Asymptomatic Free-Ranging Tule Elk from an Infected Herd." *Journal of Wildlife Diseases* 39(2):323–328.

Marin Carbon Project

2018 "What is Carbon Farming?" Accessed March 15, 2019. https://www.marincarbonproject.org/carbon-farming

Marin County

2015 *Marin County Climate Action Plan (2015 Update)*. Prepared by ICF International. Accessed February 6, 2020. https://www.marincounty.org/-/media/files/departments/cd/planning/sustainability/climate-and-adaptation/full-cap-2015/marincapupdate_final_20150731.pdf?la=en

2019 *County of Marin, Interim Community Greenhouse Gas Emissions Assessment*. September. Accessed December 27, 2019. https://www.marincounty.org/-/media/files/departments/cd/planning/sustainability/climate-and-adaptation/county-of-marin_inventory-report_2019.pdf

Marin County Department of Public Works

n.d. "Marin County Watershed Program, Our Water." Accessed February 26, 2015. http://www.marinwatersheds.org/our_water.html

Marin County Department of Agriculture, Weights and Measures

2010 "2010 Livestock and Crop Report." Accessed March 31, 2019. https://www.marincounty.org/-/media/files/departments/ag/crop-reports/2010.pdf?la=en

2011 "2011 Livestock and Crop Report." Accessed March 31, 2019. https://www.marincounty.org/-/media/files/departments/ag/crop-reports/2011.pdf?la=en

2013 "2013 Livestock and Crop Report." Accessed March 31, 2019. https://www.marincounty.org/-/media/files/departments/ag/crop-reports/2013.pdf

2017 "2017 Livestock and Crop Report." Accessed February 11, 2019. https://www.marincounty.org/-/media/files/departments/ag/crop-reports/2017.pdf?la=en

Marin RCD (Marin Resource Conservation District)

2018 Permit Coordination Program. Available at: https://www.marinrcd.org/pcp/

Martin, B. A., M. K. Saiki, and D. Fong

2009 "Habitat Requirements of the Endangered California Freshwater Shrimp (*Syncaris pacifica*) in Lagunitas and Olema Creeks, Marin County, California, USA." *Journal of Crustacean Biology* 29:595–604.

Marty, J.

2005 "Effects of Cattle Grazing on Diversity in Ephemeral Wetlands." *Conservation Biology* 19. doi: 10.111/j1523-1739.2005.00198.x.

Masin, E., C. R. Nelson, and M. T. Valliant

2018 "Can Sheep Control Invasive Forbs Without Compromising Efforts to Restore Native Plants?" *Rangeland Ecology & Management* 71, 185–188.

McClelland, E. J.

1963 "A Brief Ground-water Reconnaissance, Point Reyes National Seashore, Muddy Hollow Drainage." Prepared for the National Park Service, US Department of the Interior.

McCullough, D. R., J. K. Fisher, and J. D. Ballou

1996 "From Bottleneck to Metapopulation: Recovery of the Tule Elk in California." In *Metapopulations and Wildlife Conservation*, edited b D. R. McCullough, 375–403. Washington, DC: Island Press (not seen, as cited in NPS 1998a)

McKenzie, R.H., J.F. Dormaar, B. Adams, and W. Willms

2003 "Manure Application and Nutrient Balance on Rangeland." *Agri-Facts*. Alberta Agriculture, Food and Rural Development. Accessed May 30, 2019. https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex6609/$file/538-1.pdf?OpenElement

Medhanie, G. A., D. L. Pearl, S. A. McEwen, M. T. Guerin, C. M. Jardine, and J. T. LeJeune

2015 "Dairy Cattle Management Factors that Influence On-farm Density of European Starlings in Ohio, 2007–2009." *Preventative Veterinary Medicine* 120(2):162–168.

MMWD (Marin Municipal Water District)

2017a "Juvenile Salmonid Monitoring in the Lagunitas Creek Watershed – 2016." Prepared by E. Ettlinger, B. Fowler, and K. Strailey, Marin Municipal Water District. April 2017. Corte Madera, CA. Accessed April 19, 2019. https://www.marinwater.org/DocumentCenter/View/5133/Lagunitas-Juvenile-Salmonid-Monitoring-2016?bidId=

2017b *Draft Environmental Assessment for the Lagunitas Creek Winter Habitat and Floodplain Enhancement Project*. March 2017. Accessed June 10, 2019. https://parkplanning.nps.gov/document.cfm?parkID=333&projectID=61955&documentID=78592

2018 "Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2016-17." Prepared by G. Andrew and E. Ettlinger, Marin Municipal Water District. In association with the National Park Service and the Salmon Protection and Watershed Network. March 2018. Corte Madera, CA.

Morrison, M. L., L. S. Hall, S. K. Robinson. S. I. Rothstein, D. C. Hahn, and T. D. Rich

1997 Management of the Brown-headed Cowbird in Western Landscapes. Studies in Avian Biology No. 18. Proceedings of a Symposium of Partners in Flight Research Working Group, U.S. Bureau of Land Management, U.S.G.S. Biological Resources Division, and California State University, Sacramento. A Publication of the Cooper Ornithological Society.

Murphy, D. D., and A. E. Launer

1991 "Report on the Status of Myrtle's Silverspot Butterfly, *Speyeria zerene myrtleae*, at the Proposed Marin Golf Ranch Site and in Surrounding Areas." Center for Conservation Biology, Department of Biological Sciences, Stanford University.

National Atmospheric Deposition Program

2017 Total Deposition Maps. Accessed June 11, 2019. http://nadp.slh.wisc.edu/committees/tdep/tdepmaps/

Newcombe, C. P.

1994 "Suspended Sediment in Aquatic Ecosystems: Ill Effects as a Function of Concentration and Duration of Exposure." British Columbia Ministry of Environment, Lands and Parks, Habitat Protection Branch, Victoria.

New York Times

2013 "5 Stops on a California Cheese Trail." Accessed April 23, 2019. https://www.nytimes.com/2013/06/02/travel/5-stops-on-a-california-cheese-trail.html

Niebrugge, L., and J. Creque

n.d. "Carbon Farm Planning." 43 pp. Accessed March 15, 2019. https://www.marincarbonproject.org/document.doc?id=107

NMFS (National Marine Fisheries Service)

2004 "Biological Opinion on the Continued Issuance of Grazing Leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California." Submitted by the R. R. McInnis, Acting Regional Administrator of National Marine Fisheries Service, Southwest Region, to D. L. Neubacher, Superintendent of Point Reyes National Seashore. April 5, 2004. Prepared by the Southwest Region Office, Long Beach, California.

2018 "West Coast Salmon & Steelhead Listings." http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/salmon_and_steelhead_listings.html

NPS (National Park Service)

1980 *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan*. September 1980. https://parkplanning.nps.gov/document.cfm?parkID=303&projectID=15075&documentID=65697

1990a *Range Management Guidelines, Point Reyes National Seashore*. National Park Service—US Department of Interior. March 1990.

1990b *Range Management Handbook, Point Reyes National Seashore*. National Park Service—US Department of Interior. December 1990.

1998a *Point Reyes National Seashore. Tule Elk Management Plan and Environmental Assessment*. Point Reyes, CA. https://www.nps.gov/pore/learn/management/upload/planning_tule_elk_mp_ea_1998.pdf

1998b *Director's Order #28: Cultural Resource Management*. US Department of the Interior, National Park Service, Washington, DC. Accessed November 4, 2016. http://www.nps.gov/policy/DOrders/DOrder28.html

2001a *Point Reyes National Seashore – Water Quality Monitoring Report, May 1999–May 2001*. Accessed March 13, 2019. http://www.krisweb.com/biblio/southmarin_nps_pore_2001_wqreport.pdf

2001b *Biological Assessment on the Renewal of Livestock Grazing Permits in Point Reyes National Seashore and the North District of Golden Gate National Recreation Area, Marin County, California*. 65 pp.

2004a *Environmental Assessment (EA) for Kehoe Dairy Barn Additions and New Manure Holding Pond, Point Reyes National Seashore, Marin County*. Point Reyes National Seashore, National Park Service. April 26, 2004. Accessed March 14, 2019. https://www.nps.gov/pore/learn/management/upload/planning_kehoedairy_ea_draft_2004.pdf

2004b *Final Fire Management Plan Environmental Impact Statement for Point Reyes National Seashore and North District of Golden Gate National Recreation Area*. National Park Service. July 2004.

2004c "Cultural Landscape Inventory: L Ranch, Point Reyes National Seashore." National Park Service. 2004.

2004d "Cultural Landscape Inventory: M Ranch, Point Reyes National Seashore." National Park Service. 2004.

2006a *Management Policies*. US Department of the Interior, National Park Service, Washington, DC. https://www.nps.gov/policy/MP_2006.pdf

2006b *Point Reyes National Seashore Non-Native Deer Management Plan: Protecting the Seashore's Native Ecosystems Final Environmental Impact Statement.* July 2006.

2007a *Final Environmental Impact Statement/Environmental Impact Report for Giacomini Wetlands Restoration Project Golden Gate National Recreation Area/Point Reyes National Seashore, Marin County*. National Park Service/California State Lands Commission. http://www.nps.gov/pore/parkmgmt/upload/planning_giacomini_wrp_eiseir_final_2007.pdf

2007b "Fish of Point Reyes National Seashore". June 26, 2007. Accessed April 18, 2019. https://www.nps.gov/pore/learn/nature/upload/animalspecieslist_fish.pdf

2007c "Reptiles of Point Reyes National Seashore". March 5, 2007. Accessed April 9, 2018. http://www.nps.gov/pore/learn/nature/loader.cfm?csModule=security/getfile&PageID=138839

2009 Abbotts Lagoon Area Dune Restoration Plan Environmental Assessment, Point Reyes National Seashore. January 2009.

2011a "Cultural Landscape Inventory: Hagmaier Ranch, Point Reyes National Seashore." National Park Service. 2011.

2011b "Cultural Landscape Inventory: McFadden Ranch, Point Reyes National Seashore." National Park Service. 2011.

2011c "Cultural Landscape Inventory: Rogers Ranch, Point Reyes National Seashore." National Park Service. 2011.

2011d "Cultural Landscape Inventory: Truttman Ranch, Point Reyes National Seashore." National Park Service. 2011.

2011e "Cultural Landscape Inventory: Wilkins Ranch, Point Reyes National Seashore." National Park Service. 2011.

2012a *Final Environmental Impact Statement for the Drakes Bay Oyster Company Special Use Permit, Point Reyes National Seashore, California*. November 2012.

2012b "Mammals of Point Reyes National Seashore." Point Reyes National Seashore. Last updated April 9, 2012. Accessed March 14, 2019. http://www.nps.gov/pore/learn/nature/upload/animalspecieslist_mammal.pdf

2013 Methods for Determining Air Quality Conditions and Trends for Park Planning and Assessment. National Park Service, Air Resources Division, Denver, CO. Accessed May 9, 2019. https://irma.nps.gov/DataStore/DownloadFile/517568

2014a Golden Gate Natural Recreation Area, Muir Woods National Monument Final General Management Plan and Environmental Impact Statement, Volume 1.

2014b GIS Data provided by NPS on 10-7-2014 with original vegetative coverage.

2014c "Cultural Landscape Inventory: Cheda Ranch, Point Reyes National Seashore." National Park Service. 2014.

2014d "Cultural Landscape Inventory: Lupton/Five Brooks Ranch, Point Reyes National Seashore." National Park Service. 2014.

2014e "Cultural Landscape Inventory: Teixeira Ranch, Point Reyes National Seashore." National Park Service. 2014.

2014f GIS data on threatened and endangered species provided by NPS on October 31, 2014.

2015a *Review of Ungulate Fertility Control in the National Park Service: Outcomes and Recommendations from an Internal Workshop*. February 2012. https://www.researchgate.net/publication/285055319_Review_of_ungulate_fertility_control_in_the_National_Park_Service_Outcomes_and_recommendations_from_an_internal_workshop_-_February_2012

2015b "Coastal Dune Restoration Environmental Assessment for Point Reyes National Seashore." Point Reyes National Park. January 2015.

2018a Personal communication via email from B. Ketcham, National Park Service, Point Reyes National Seashore, CA, to E. Hagan, Louis Berger, Washington, DC, regarding Water Use Information, July 16, 2018.

2018b "Mammals." Point Reyes National Seashore. Accessed April 9, 2018. http://www.nps.gov/pore/learn/nature/mammals.htm

2018c "Birds." Point Reyes National Seashore. Accessed April 9, 2018. http://www.nps.gov/pore/learn/nature/birds.htm

2018d Fish." Point Reyes National Seashore. Accessed April 9, 2018. https://www.nps.gov/pore/learn/nature/fish.htm

2018e "Reptiles." Point Reyes National Seashore. Accessed April 9, 2018. https://www.nps.gov/pore/learn/nature/reptiles.htm

2018f "Amphibians." Point Reyes National Seashore. Accessed April 9, 2018. http://www.nps.gov/pore/learn/nature/amphibians.htm

2018g "National Park Service Visitor Use Statistics." https://irma.nps.gov/Stats/Reports/Park

2018h "Tule Elk" Point Reyes National Seashore http://www.nps.gov/pore/naturescience/tule_elk.htm

2018i "Olema Valley Dairy Ranches Historic District. National Register of Historic Places Nomination." On file at the National Park Service, Seattle, WA.

2018j "18_PORE Ranch Maintenance." Excel file created July 17, 2018, and updated August 15, 2018. File was sent to Louis Berger on February 19, 2019.

2018k "Point Reyes Peninsula Dairy Ranching Historic District. National Register of Historic Places Nomination." On file at the National Park Service, Seattle, WA.

2018l "Marconi/RCA Bolinas Transmitting Station. National Register of Historic Places Nomination." On file at the National Park Service, Seattle, WA.

2018m "RCA Point Reyes Receiving Station. National Register of Historic Places Registration Form." On file at the National Park Service, Seattle, WA.

2018n "Park Conditions and Trends" Accessed May 3, 2019. https://www.nps.gov/subjects/air/park-conditions-trends.htm

2018o Visibility Monitoring: Overview. Accessed June 11, 2019. https://www.nps.gov/subjects/air/air-monitoring.htm

2019a *A Natural Resource Condition Assessment for Point Reyes National Seashore*. Natural Resource Report. NPS/PORE/NRR—2019/1895. National Park Service. Fort Collins, Colorado.

2019b Personal communication from L. Parsons, NPS, to R. Byron, WSP, Philadelphia, PA, regarding dune restoration.

2019c Personal communication via email from D. Press to R. Byron, WSP, Philadelphia, PA, regarding elk numbers. February 12, 2019.

2019d "Visitor Spending Effects - Economic Contributions of National Park Visitor Spending." Point Reyes National Seashore 2018. May 2019.

2019e Personal communication, including a spreadsheet (GMPA_RancherResidentsEmployee.xlsx) from Dylan Voeller, Range Program Manager/Ecologist, Point Reyes National Seashore, to R. Byron, Director, WSP, regarding ranch residents and employee counts for socioeconomics. May 23, 2019.

2019f Nitrogen and Sulfur Pollution in Parks. Accessed June 11, 2019. https://www.nps.gov/subjects/air/nature-nitrogensulfur.htm

2019g Personal communication on federally listed plants, NPS, Point Reyes National Seashore, CA, to Louis Berger, Denver, CO. April 24, 2019.

2019h "Threatened and Endangered Vascular Plant Species Activities within the Golden Gate National Recreation Area Calendar Year 2018." Prepared by M. R. Chassé, A. Forrestel, S. Bennett, M. Burkett, and L. Stringer, for US Fish & Wildlife Service, Sacramento and Ventura Offices. UPermit #: TE-036499-9 February 26, 2019.

2019i GIS data for threatened and endangered species." Received from NPS on May 8, 2019.

2020a Foundation Document. *Point Reyes National Seashore, California.* April 2020. https://parkplanning.nps.gov/document.cfm?parkID=333&projectID=89540&documentID=97139

2020b Personal communication from D. Press, Wildlife Ecologist, Point Reyes National Seashore, to J. Dalrymple, Biologist, WSP, regarding elk AU. May 22, 2020.

2020c GIS Data Provided by NPS with Existing Wetlands Coverage.

2020d Personal communication from D. Press, Wildlife Ecologist, Point Reyes National Seashore, to M. Carter, Washington Support Office, Environmental Quality Division, B. Ketcham, Management Assistant, Point Reyes National Seashore, and M. Stedeford, Washington Support Office, Environmental Quality Division, regarding elk numbers. June 4, 2020.

Ochterski, J.

2006 *Hayfield Management and Grassland Bird Conservation*. Cornell University Cooperative Extension. 8 pp. https://www.nyfoa.org/application/files/6314/7948/6092/HayfieldsGrassland_Birds_3MB.pdf

Pachepsky, Y. A., and D. R. Shelton

2011 "Escherichia Coli and Fecal Coliforms in Freshwater and Estuarine Sediments." *Critical Reviews in Environmental Science and Technology* 41:1067–1110.

Paige, C.

2012 *A Landowner's Guide to Wildlife Friendly Fences: How to Build Fence with Wildlife in Mind*. Second Edition, updated 2012. Montana Fish, Wildlife and Parks. Helena, MT. 56 pp. http://fwp.mt.gov/fwpDoc.html?id=34461

Paine, L., D. J. Undersander, D. W. Sample, G. A. Bartelt, and T. A. Sceiatteman

1996 "Cattle Trampling of Simulated Ground Nests in Rotationally Grazed Pastures." *Journal of Range Management* 49:294–300.

Pandolfino, E. R., M. Herzog, S. Hooper, and Z. Smith

2011 "Winter Habitat Associations of Diurnal Raptors in California's Central Valley." *Western Birds* 42:62–84.

Pardo, L. H., M. E. Fenn, C. L. Goodale, L. H. Geiser, C. T. Driscoll, E. B. Allen, J. S. Baron, R. Bobbink, W. D. Bowman, C. M. Clark, B. Emmett, F. S. Gilliam, T. L. Greaver, S. J. Hall, E. A. Lilleskov, L. Liu, J. A. Lynch, K. J. Nadelhoffer, S. S. Perakis, M. J. Robin-Abbott, J. L. Stoddard, K. C. Weathers, and R. L. Dennis

2011 "Effects of Nitrogen Deposition and Empirical Nitrogen Critical Loads for Ecoregions in the United States." *Ecological Applications* 21(8)3049–3082.

Parsons, L.

2018 "Annual Report 2017 Tidestrom's Lupine (*Lupinus tidestromii*)." USFWS Permit TE018180-2. Point Reyes National Seashore, Marin County, California. April 2018.

Parsons, L., C. Ender, A. Ryna, and S. Minnick

2019 "PORE Coastal Dune Restoration Vegetation Monitoring Report." May 2019.

Parsons, L., and A. Ryan

2015 *Year Five of the Giacomini Wetland Restoration Project: Analysis of Changes in Physical and Ecological Conditions in the Project Area*. Point Reyes National Seashore, National Park Service.

2019a "Sonoma Alopecurus (*Alopecurus aequalis* var. *sonomensis*) Annual Report 2018." TE018180-4. April 2019.

2019b "Sonoma Spineflower (*Chorizanthe valida*) Annual Report 2018". TE018180-4. April 2019.

Pawley, A., and M. Lay

2013 *Coastal Watershed Assessment for Golden Gate National Recreation Area and Point Reyes National Seashore*. Natural Resource Report NPS/PWR/NRR—2013/641. Fort Collins, CO: National Park Service.

Peach, W. J., S. Dodd, D. B. Westbury, S. R. Mortimer, P. Lewis, A. J. Brook, S. J. Harris, R. Kessock-Philip, D. L, Buckingham, K. Chaney

2011 "Cereal-based Wholecrop Silages: A Potential Conservation Measure for Farmland Birds in Pastoral Landscapes." *Biological Conservation* 144:836–850.

PennState Extension

2014 "How much Drinking Water Does Your Horse Need?" Accessed May 30, 2019. https://extension.psu.edu/how-much-drinking-water-does-your-horse-need

Pickering C. M., R. Hill, D. Newsome, and Y-F. Leung

2010 "Comparing Hiking, Mountain Biking and Horse Riding Impacts on Vegetation and Soils in Australia and the United States of America." J. Environ. Manag. 91:551–562.

Powers, J. G., R. J. Monello, M. A. Wild, T. R. Spraker, J. P. Gionfriddo, T. M. Nett, and D. L. Baker

2014 "Effects of GonaCon Immunocontraceptive Vaccine in Free-Ranging Female Rocky Mountain Elk (*Cervus elaphus nelson*)" *Wildlife Society Bulletin* 38(3):650–656. doi: 10.1002/wsb.434.

Project Drawdown

2020 "Food: Managed Grazing." Accessed February 5, 2020 https://www.drawdown.org/solutions/food/managed-grazing

Pyke, C. R., and J. Marty

2005 "Cattle Grazing Mediates Climate Change Impacts on Ephemeral Wetlands." *Conservation Biology* 19:1619–1625. doi:10.1111/j.1523-1739.2005.00233.x

Rawluk, A., G. Crow, G. Legesse, D. Veira, P. Bullock, L. González, M. Dubois, and K. Ominski

2014 *Off-Stream Watering Systems and Partial Barriers as a Strategy to Maximize Cattle Production and Minimize Time Spent in the Riparian Area*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4494426/

Reckendorf, F. F.

2009 "Causes of Streambank Erosion." Geological Society of America, Abstracts with Programs 41(7): 575. https://gsa.confex.com/gsa/2009AM/finalprogram/abstract_159236.htm

Redden, R. R., J. M. Tomeček, and J. W. Walker

2015 Livestock Guardian Dogs. Texas A&M AgriLife Extension. Accessed February 26, 2020. https://sanangelo.tamu.edu/files/2013/08/Livestock-Guardian-Dogs1.pdf

Reinsche, D. L.

2008 "Effect of Cattle Grazing on Lizard Diversity in Managed Central California Grasslands." *Transactions of the Western Section of the Wildlife Society* 44:4–10. Accessed February 7, 2019. https://www.wildlifeprofessional.org/western/transactions/transactions_2008_2.pdf

Riemann, H. P, M. R. Zaman, R. Ruppanner, O. Aalund, J. B. Jorgensen, H. Worsaae, and D. E. Behymer

1979 "Paratuberculosis in Cattle and Free-living Exotic Deer." *Journal of the American Veterinary Medical Association* 174:841–843. (not seen, as cited in NPS 1998a)

Roche, L. M., L. Kromschroeder, E. R. Atwill, R. A. Dahlgren, and K. W. Tate

2013 "Water Quality Conditions Associated with Cattle Grazing and Recreation on National Forest Lands." *PLOS ONE*. https://doi.org/10.1371/journal.pone.0068127

Rodic, V., L. Peric, M. Dukie-Stojeie, and N. Vukelic

2011 "The Environmental Impact of Poultry Production." *Biotechnology on Animal Husbandry* 27(4):1673–1679.

Roth, J., J. Kelly, W. Sydeman, M. Parker, and S. Allen

1999 "Ecosystem-Level Management of Common Ravens on the Point Reyes National Seashore." Report to the Point Reyes National Seashore. Point Reyes Station, CA.

Russell, W. H, and J. R. McBride

2003 "Landscape Scale Vegetation-type Conversion and Fire Hazard in the San Francisco Bay Area Open Spaces." *Landscape and Urban Planning* 64:201–208.

Ryan, A. and L. Parsons

2014 *Sonoma Alopecurus, Alopecurus Aequalis Var. Sonomensis, Annual Report 2012-2013.* Point Reyes, CA: Point Reyes National Seashore

2015 "National Park Service Report. Grant Project: MO #4500035592; NPS Agreement #G8530120004. Point Reyes National Seashore, Point Reyes Station, CA.

Salls W., R. Larsen, D. Lewis, L. Roche, D. Eastburn, A. Hollander, M. Walkinshaw, S. Kaffka, K. Tate, and A. O'Geen

2018 "Modeled Soil Erosion Potential is Low Across California's Annual Rangelands." *Calif Agr* 72(3):179–191. https://doi.org/10.3733/ca.2018a0021

San Francisco Bay RWQCB (San Francisco Regional Water Quality Control Board)

2013 *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan).* http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf

2014 *Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Improving Habitat Management for Sonoma Alopecurus: Developing the Optimal Grazing Regime." Plan.* Staff Report. June 2014. Prepared by Mike Napolitano. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/lagunitascrksediment/LagunitasSedimentHabitat%20StaffReportPublicReviewDraft.pdf

2017 *Clean Water Act Section 303(d) and 305(b) 2016 Integrated Report for the San Francisco Bay Region*. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/303dlist.html

2018 "Renewal of Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay Watershed (Tomales Bay, Lagunitas Creek, Walker Creek, and Olema Creek) in the San Francisco Bay Region." Resolution No. R2-2018-0046. Accessed March 1, 2019. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/agriculture/grgrazi/tomalesbay_grazing.html

2019 "Confined Animal Facilities." Accessed February 4, 2020. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/agriculture/CAF.html

San Joaquin Valley Air Pollution Control District

2012 Air Pollution Control Officer's Revision of the Dairy VOC Emission Factors. Accessed June 12, 2019. https://www.arb.ca.gov/ei/areasrc/districtmeth/sjvalley/2012feb_dairyvocemisfactorsrpt.pdf

2018 *2018 Plan for the 1997, 2006, and 2012 $PM_{2.5}$ Standards*. Proposed - October 16, 2018, San Joaquin Valley Air Pollution Control District. Accessed June 10, 2019. http://www.valleyair.org/pmplans/documents/2018/pm-plan-proposed/2018-PM-25-Plan.pdf

Schirokauer, D., T. Keller-Wolf, J. Meinke, and P. van der Leeden

2003 *Plant Community Classification and Mapping Project Final Report. Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks*. Point Reyes National Seashore, National Park Service.

Serpa, L.

2016 *The California Freshwater Shrimp (Syncaris pacifica) in Salmonid Winter Habitat Enhancement Areas of Lagunitas Creek Watershed, Marin County, California*. Prepared for Marin Municipal Water District. 13 pp. Corte Madera, California.

Sharps, E., J. Smart, L. R. Mason, K. Jones, S. Martin, A. Garbutt, and J. Hiddink

2017 "Nest Trampling and Ground Nesting Birds." *Ecology and Evolution* 7(16):6622–6633. https://research.bangor.ac.uk/portal/files/18928887/Sharps_etal_ACCEPTED_Ecology_Evolution_2July2017_.pdf

Shideler, S. E., M. A. Stoops, N. A. Gee, J. A. Howell, and B. L. Lasley

2002 "Use of Porcine Zona Pellucida (PZP) Vaccine as a Contraceptive Agent in Free-ranging Tule Elk (*Cervus elaphus nannodes*)." *Reproduction Supplement* 60:169–176.

Silver, W. L., R. Ryals, and V. Eviner

2010 "Soil Carbon Pools in California's Annual Grassland Ecosystems." *Rangeland Ecol Manage* 63:128–136. doi:10.2111/REM-D-09-00106.1.

Simberloff, D.

1996 "Hybridization between Native and Introduced Wildlife Species: Importance for Conservation." *Wildlife Biology* 2(3):143–150.

Skaer, M. J., D. J. Graydon, and J. Cushman

2013 "Community-level Consequences of Cattle Grazing for an Invaded Grassland: Variable Responses of Native and Exotic Vegetation." *Journal of Vegetation Science* 24:332–343.

Spiegal, S., L. Huntsinger, P. Hopkinson, and J. W. Bartolome

2016 "Range Ecosystems." In *Ecosystems of California*, edited by H. Mooney and E. Zavaleta, 835–864. Oakland: University of California Press.

Society for Range Management

2017 Does Size Matter? Animal Units and Animal Unit Months. Prepared by the Society for Range Management Rangeland Assessment and Monitoring Committee. February. https://www.fs.fed.us/rm/pubs_journals/2017/rmrs_2017_smith_l001.pdf

South Coast Air Quality Management District

2016 Guidelines for Calculating Emissions from Dairy and Poultry Operations December 2016. Accessed May 9, 2019. http://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/guidecalcemisdairypoultryoperdec13.pdf

Stanford, B., K. D. Holl, D. B. Herbst, an E. Zavaleta

2020 "In-stream Habitat and Macroinvertebrate Responses to Riparian Corridor Length in Rangeland Streams." *Restoration Ecology* 28(1):173–184.

Stocker, M. D., J. G. Rodriguez-Valentin, Y. A. Pachepsky, and D. R. Shelton

2016 "Spatial and Temporal Variation of Fecal Indicator Organisms in Two Creeks in Beltsville, Maryland." *Water Quality Research Journal of Canada* 51(2):167–179.

Stoddard, R. A., R. L. DeLong, B. A. Byrne, S. Jange, and F. M. D. Gulland

2008 "Prevalence and Characterization of *Salmonella* spp. Among Marine Animals in the Channel Islands, California." *Diseases of Aquatic Organisms* 81:5–11. doi: 1-.3354/dao01905.

Stromberg, M. R., P. Kephart, and V. Yadon

2001 "Composition, Invasibility, and Diversity in Coastal California Grasslands." *Madroño* 48:236–252.

Stull, C., N. Peterson, G. Nader, J. Maas, T. Lehenbauer, and C. Colla

2012 "Cattle Care Standards: Recommendations for Meeting California Legal Requirements." Accessed February 7, 2019. https://ucanr.edu/sites/UCCE_LR/files/227985.pdf

Sugnet, P. W., and J. W. Bartolome

1983 "A Guide to Monitoring Livestock Use within the Pastoral Zone at Point Reyes National Seashore." 29 pp.

SWRCB (State Water Resources Control Board)

2010 "2010 Integrated Report (Clean Water Act Section 303(d) List/305(b) Report)." Accessed February 13, 2015. http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

2017 "California's Areas of Special Biological Significance." https://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_map.shtml

2019a *California Ocean Plan. Water Quality Control Plan, Ocean Waters of California*. Established 1972, Revised 2019. State Water Resources Control Board and California Environmental Protection Agency. Accessed April 30, 2020. https://www.waterboards.ca.gov/water_issues/programs/ocean/docs/oceanplan2019.pdf

2019b Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California–Bacteria Provisions and a Water Quality Standards Variance Policy. February 19, 2019. 9pp. https://www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf

Tabler, T., J. Wells, Y. Liang, J. R. Moyle, and F. D. Clark

2017 Water Quality and Quantity Influence Flock Performance. Mississippi State University Extension. Publication 2869 (POD-11-17).

Tate, K. W., D. M. Dudley, N. K. McDougald, and M. R. George

2004 "Effect of Canopy and Grazing on Soil Bulk Density." *Journal of Range Management* 57(4):411–417. doi:10.2307/4003867.

Taylor, K. A.

2017 National Park Service Air Quality Analysis Methods: August 2017. Natural Resource Report NPS/NRSS/ARD/NRR—2017/1490. National Park Service, Fort Collins, CO.

Taylor, K., P. Anderson, R. Taylor, K. Longden, and P. Fisher

2005 *Dogs, Access and Nature Conservation*. English Nature Research Reports. Report Number 649. Accessed February 25, 2020. http://publications.naturalengland.org.uk/file/70026

Thompson, A., and K. W. Goyne

2012 "Introduction to the Sorption of Chemical Constituents in Soils." *Nature Education Knowledge* 4(4):7. https://www.nature.com/scitable/knowledge/library/introduction-to-the-sorption-of-chemical-constituents-94841002

Tricolored Blackbird Working Group

2007 "Conservation plan for the Tricolored Blackbird (*Agelaius tricolor*)." Susan Kester, ed. Sustainable Conservation. San Francisco, CA. Accessed March 21, 2019. https://www.fws.gov/migratorybirds/pdf/management/focal-species/TricoloredBlackbird.pdf

UC ANR (University of California Agriculture and Natural Resources)

2018 Livestock Protection Tools for California Ranchers. Accessed February 26, 2020. https://anrcatalog.ucanr.edu/pdf/8598.pdf

UC Cooperative Extension (University of California Cooperative Extension)

2004 "Sample Costs for a Cow-Calf/Grass-Fed Beef Operation: 200 Head Cowheard with 30 Grass-Fed Cattle in the North Coast Region, Marin and Sonoma Counties." Accessed June 12, 2019. https://coststudyfiles.ucdavis.edu/uploads/cs_public/83/84/838417e7-bdad-40e6-bcaa-c3d80ccdcd71/beefgfnc2004.pdf

2011 "Riparian Zone Monitoring Results for Stability, Sediment Loads and Revegetation Survival from Conservation Practices 2008–2011." Prepared for Marin Resource Conservation District. December 2011.

University of Idaho Cooperative Parks Studies Unit

2005 Point Reyes National Seashore 2005 Visitor Survey Card Data Report. Report #PORE605.

US Bureau of Economic Analysis

2016a "Local Area Personal Income and Employment. Table CA25N. Years 2000–2016. Geographic Areas: State of California; Marin, Sonoma and San Francisco Counties, CA." Accessed April 24, 2018. www.bea.gov

2016b "Quarterly Census of Employment and Wages: Text Files: CSVs by Area, Annual Averages. Years 2007 and 2016. For California, Marin County, CA, and the United States." Accessed March 23, 2017. https://www.bls.gov/cew/datatoc.htm

2017 "Local Area Unemployment Statistics. Table CA25N. Years 2000-2016. Geographic Areas: State of California; Marin, Sonoma and San Francisco Counties, CA; San Francisco-Oakland-Hayward Metropolitan Statistical Area." Accessed April 24, 2018. https://www.bls.gov/lau/

US Bureau of Labor Statistics

2018 "Historical Consumer Price Index for All Urban Consumers (CPI-U): US City Average, All Items, by month." Updated December 2018. Accessed February 11, 2019. https://www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-201812.pdf

US Census Bureau

2000 "Table DP-1, SF1. For Geographies: State of California; Marin, Sonoma and San Francisco Counties, CA; Census Tracts 1321, 1322, and 1330 in Marin County, CA." Accessed April 24, 2018. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

2016 "Table DP-05. ACS 2012 to 2016 Statistics. For Geographies: State of California; Marin, Sonoma and San Francisco Counties, CA; Census Tracts 1321, 1322, and 1330 in Marin County, CA; Bolinas CDP, CA; Dillon Beach CDP, CA; Inverness CDP, CA; Lagunitas-Forest Knolls CDP, CA; Nicasio CDP, CA; Point Reyes Station CDP, CA; San Geronimo CDP, CA; Tomales CDP, CA; Woodacre CDP, CA." Accessed April 24, 2018. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

US Census of Agriculture

2013 *Organic Livestock Requirements*. July 2013. https://www.ams.usda.gov/sites/default/files/media/Organic%20Livestock%20Requirements.pdf

2019a "Table 1. County Summary Highlights: 2017. State of California, Marin County." Accessed April 17, 2020. https://www.agcensus.usda.gov/Publications/2017/Full_Report/Volume_1,_Chapter_2_County_Level/California/st06_2_001_001.pdf

2019b "Table 2. Market Value of Agricultural Products Sold Including Landlord's Share, Food Marketing Practices, and Value-added products: 2017 and 2012 State of California." Accessed April 17, 2020. https://www.agcensus.usda.gov/Publications/2017/Full_Report/Volume_1,_Chapter_2_County_Level/California/st06_2_002_002.pdf

2019c "Table 11. Cattle and Calves – Inventory: 2017 and 2012."

2019d "Appendix B – General Explanation and Census of Agricultural Report Form." USDA-AMS (US Department of Agriculture, Agricultural Marketing Service).

USDA-APHIS (US Department of Agriculture, Animal and Plant Health Inspection Service)

2008 "Questions and Answers: Johne's Disease in Cattle." Accessed December 11, 2019. https://www.aphis.usda.gov/publications/animal_health/content/printable_version/faq_johnes_disease08.pdf.

2010 *Uniform Program Standards for the Voluntary Bovine Johne's Disease Control Program*. Accessed December 11, 2019. https://johnes.org/wp-content/uploads/2018/11/USDA_Program_Standards_Sept-2010.pdf

USDA-NASS (US Department of Agriculture, National Agricultural Statistics Service)

2017 Certified Organic Survey – 2016 Summary. Accessed January 31, 2020. https://downloads.usda.library.cornell.edu/usda-esmis/files/zg64tk92g/70795b52w/4m90dz33q/OrganicProduction-09-20-2017_correction.pdf

2018 National Statistics for Eggs 2012–2017. Last Modified May 4, 2018. Accessed June 12, 2019. https://www.nass.usda.gov/Statistics_by_Subject/result.php?C46DABB6-CBD0-3AEF-9BC7-E18C48180BE9&sector=ANIMALS%20%26%20PRODUCTS&group=POULTRY&comm=EGGS

2019 Economic Research Service. Farm Income and Wealth Statistics: Annual Cash Receipts by Commodity. State of California, 2016. Accessed May 8, 2019. https://data.ers.usda.gov/reports.aspx?ID=17832#Pcb63ec9069934a05a67c2a4097bad56f_2_17iT0R0x5

USDA-NRCS (US Department of Agriculture, Natural Resource Conservation Service)

n.d. COMET-Planner. Accessed March 15, 2019. http://www.comet-planner.com/

2003 "Soil Compaction: Detection, Prevention, and Alleviation." *Soil Quality – Agronomy Technical Note No. 17*. June 2003.

2006a *National Range and Pasture Handbook*. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

2006b "Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin." *US Department of Agriculture Handbook 296*.

2012 "Introduction to Waterborne Pathogens in Agricultural Watersheds." *Nutrient Management Technical Note No. 9*. September 2012.

2013 "Conservation Practice Standard, Residue and Tillage Management, No Till (329)." December 2013. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1249901.pdf

2014a "Soil Surveys and the Soil Survey Geographic Database." Accessed April 2015. http://websoilsurvey.nrcs.usda.gov

2014b Web Soil Survey. Marin County California – CA041. Accessed June 26, 2019. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

2019 Comet Planner. Carbon and Greenhouse Gas Evaluation for NRCS Conservation Practice Planning. Accessed February 20, 2020. http://comet-planner.com/

USDA-SCS (US Department of Agriculture, Soil Conservation Service)

1985 Soil Survey of Marin County California. Accessed June 26, 2019. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/california/marinCA1985/marinCA1985.pdf

USEPA (US Environmental Protection Agency)

n.d. "Ozone." Accessed May 3, 2019. https://cfpub.epa.gov/airnow/index.cfm?action=aqibasics.ozone

1995 AP-42 Compilation of Air Pollutant Emission Factors: Volume I: Stationary Point and Area Sources. Accessed June 12, 2019. https://www3.epa.gov/ttnchie1/ap42/ch14/final/c14s04.pdf

2012 *Our Nation's Air: Status and Trends Through 2010*. EPA 454/R-12-001. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

2014 "Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards." Second External Review Draft. Environmental Protection Agency, Office of Air Quality Planning and Standards, Ambient Standards Group, Research Triangle Park, NC.

2016 "Health Effects of Ozone Pollution." Accessed March 16, 2016. https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution

2017a "Ground-level Ozone Pollution. Ecosystem Effects of Ozone Pollution. Accessed May 3, 2019. https://www.epa.gov/ground-level-ozone-pollution/ecosystem-effects-ozone-pollution

2017b Air Quality Design Values. Ozone Design Values, 2017. Accessed May 3, 2019. https://www.epa.gov/air-trends/air-quality-design-values#report

2018a "Particulate Matter (PM) Basics." Accessed June 4, 2019. https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM

2018b Inventory of U.S. GHG Emissions and Sinks.

2019 *Green Book. California Nonattainment / Maintenance Status for Each County by Year for All Criteria Pollutants*. Accessed February 28, 2019. https://www3.epa.gov/airquality/greenbook/anayo_ca.html

USFWS (US Fish and Wildlife Service)

1998 "Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan." Portland, OR. 141 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/980930d.pdf

2002a "Formal Consultation [Biological Opinion] on the Grazing Permit Renewal Program, Point Reyes National Seashore and the Golden Gate National Recreation Area, Marin County, California." September 25, 2002. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Acting Field Supervisor, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2001-F-0310 (formerly 1-1-01-F-310).

2002b *Recovery Plan for the California Red-legged Frog (Rana aurora draytonii)*. USFWS, Portland, OR. 173 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/020528.pdf

2007 *Showy Indian Clover (Trifolium amoenum) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc1876.pdf

2009a *Myrtle's Silverspot Butterfly (Speyeria zerene myrtle) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. January 2009. Accessed October 2, 2018. http://ecos.fws.gov/docs/five_year_review/doc2394.pdf

2009b Bay Checkerspot Butterfly (*Euphydryas editha bayensis*) 5-Year Review: Summary and Evaluation. August 2009. 42 pp.

2010a *Chorizanthe valida (Sonoma spineflower) 5-Year Review: Summary and Evaluation.* U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. August 2010. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc3558.pdf

2010b "Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-legged Frog. Final Rule." *Federal Register* 75(51):12816–12959.

2011 *Alopecurus aequalis var. sonomensis (Sonoma alopecurus) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3898.pdf

2012 *Trifolium amoenum (Showy Indian Clover) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. June 2012. Accessed February 6, 2019. https://ecos.fws.gov/docs/five_year_review/doc4018.pdf

2018a "Information for Planning and Conservation (IPaC)." Accessed April 9-18, 2018. https://ecos.fws.gov/ipac/

2018b "Critical Habitat Geospatial Data." Accessed April 2018. https://ecos.fws.gov/ecp/report/table/critical-habitat.html

USGS (US Geological Survey)

2005 "Assessment of Hydrologic and Water Quality Data Collected in Abbotts Lagoon Watershed, Point Reyes National Seashore, California, during Water Years 1999 and 2000."

2010 "California Water Use, 2010." California Water Science Center. https://ca.water.usgs.gov/water_use/2010-california-water-use.html

2018 Water Quality after a Wildfire. California Water Science Center. Available at: https://ca.water.usgs.gov/wildfires/wildfires-water-quality.html

US House Committee on Appropriations

2019 "Explanatory Statement Submitted by Mrs. Lowey, Chairwoman of the House Committee on Appropriations Regarding H.J. Res. 31." National Park Service. Operation of the National Park System. Accessed March 27, 2019. https://docs.house.gov/billsthisweek/20190211/116hrpt9-JointExplanatoryStatement-u1.pdf

Valentino, M. A.

1989 "An Assessment of the Groundwater Nutrient and Freshwater Contribution to Tomales Bay, Western Marin County, California." Master's Theses, San Jose State University.

Vavra, M.

2005 "Livestock Grazing and Wildlife: Developing Compatibilities." *Rangeland Ecology and Management* 58:128–134.

Voeller, D., D. Lewis, B. Becker, K. W. Tate, and T. Saitone

2018 "Olema Creek Watershed Water Quality Analysis and Condition Assessment." May 31, 2018.

Walling, D. E., B. W. Webb, and M. A. Russell

1997 *Sediment-associated Nutrient Transport in UK Rivers*. Freshwater Contamination, IAHS Publication No. 243, p. 69–81.

Wallitner, K.

2013 *Freshwater Quality Monitoring in the San Francisco Bay Area Network 2011–2012 Biennial Report*. Natural Resource Technical Report NPS/SFAN/NRTR—2013/801. October 2013. https://irma.nps.gov/DataStore/DownloadFile/483886

2016 *Freshwater Quality Monitoring in the San Francisco Bay Area: 2013–2014 Biennial Report*. Natural Resource Report NPS/SFAN/NRR—2016/1188. National Park Service, Fort Collins, CO.

Wallitner, K., and A. Pincetich

2017 *Freshwater Quality Monitoring in the San Francisco Bay Area: Biennial Report on Water Years 2015 and 2016*. Natural Resource Report NPS/SFAN/NRR—2017/1471. National Park Service, Fort Collins, CO.

Weiss, S. B.

1999 "Cars, Cows, and Checkerspot Butterflies: Nitrogen Deposition and Management of Nutrient-Poor Grasslands for a Threatened Species." *Conservation Biology* 13:1476–1486.

West Marin Chamber of Commerce

2019 "Point Reyes Station, California." Accessed March 19, 2019. https://pointreyes.org/point-reyes-station-marin-county-california/

Whittier, T.R., and J. Van Sickle

2010 "Macroinvertebrate Tolerance Values and an Assemblage Tolerance Index (ATI) for Western USA Streams and Rivers." *Journal of the North American Benthological Society* 29:852–866.

Wohlgemuth, P., J. L. Beyers, C. D. Wakeman, and S. G. Conrad

2019 "Effects of Fire and Grass Seeding on Soil Erosion in Southern California Chaparral." 19th Forest Vegetation Management Conference. Accessed April 19, 2019. https://www.fs.fed.us/psw/publications/4403/EffectsofFireand.pdf

Wood, P. J., and P. D. Armitage

1997 "Biological Effects of Fine Sediment in the Lotic Environment." *Journal of Environmental Management* 21(2):203–217.

Zavaleta, E., E. M. Olimpi, A. A. Wolf, B. Stanford, J. R. Pasari, S. A. Skikne, P. Quadri Barba, K. K. Ennis, and F. C. de Oliveira

2016 "Biological Invasions." In *Ecosystems of California*, edited by H. Mooney and E. Zavaleta, 229–249. Oakland: University of California Press.

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

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

Analysis in an environmental impact statement (EIS) should focus on significant issues (meaning pivotal issues, or issues of critical importance) and only discuss insignificant issues briefly (1502.2(b)). Therefore, the following issues and impact topics were not carried forward for detailed analysis in the EIS.

Other Listed Species

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

Soundscapes

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

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

Wilderness

None of the alternatives include actions in designated wilderness. However, some actions may result in impacts that extend into designated wilderness. Some impacts on water quality, wildlife, and tule elk may be detectable in designated wilderness as noted in the methodology sections for those resource topics in "Chapter 4: Environmental Consequences." These impacts may adversely affect the natural quality of wilderness, since they would affect the natural condition of the environment. There would not be any impacts on the other qualities of wilderness character. For example, there would be no trammeling effects from any of the proposed alternatives because none of the alternatives involve actions intentionally designed to manipulate conditions in wilderness. In addition, none of the alternatives propose any

development in wilderness that would affect the developed character of wilderness. Opportunities for solitude in the wilderness would also not be affected because the alternatives do not propose actions that would change visitor use conditions in wilderness. In summary, wilderness was not carried forward as an impact topic because the impacts on wilderness resources that may occur are already disclosed in the "Environmental Consequences" sections, and a detailed analysis of the impacts on wilderness character is not necessary to make a reasoned choice between alternatives.

Archeological Resources, including Impacts on the Drakes Bay Historic and Archaeological District and Point Reyes Peninsula Indigenous Archaeological District

The GMP Amendment Planning Area is intersected by two archeological districts, the Drakes Bay Historic and Archaeological District and the Point Reyes Peninsula Indigenous Archaeological District. The Drakes Bay Historic and Archaeological District was designated a National Historic Landmark in 2012 under criteria 1, 2, and 6 under the National Historic Landmark thematic framework category of Peopling Places, in the areas of significance of maritime history, exploration, and archeology-historic-aboriginal and archeology-historic-nonaboriginal. The district is a nationally significant 16th century landscape associated with the earliest interactions between Europeans and native peoples. Significant under National Register criteria A, B, and D, the landscape includes 15 California Indian sites, the likely site of Francis Drake's 1579 landing in California, and the 16th century shipwreck of the Spanish galleon San Agustin. The Point Reyes Peninsula Indigenous Archaeological District consists of 72 recorded archeological sites distributed among seven noncontiguous clusters within the boundaries of Point Reyes. The district is eligible for listing in the National Register of Historic Places under criterion D for its potential to yield important data on prehistory and on the period of initial contact between Native Americans and European explorers.

Only a small portion of the Drakes Bay Historic and Archaeological District (approximately 8%) occurs within the planning area, and all the archeological resources that comprise the district are located outside the planning area or are excluded from agricultural-related activities by existing resource protection measures. Similarly, the majority of archeological sites that comprise the Point Reyes Peninsula Indigenous Archaeological District are located outside the planning area or have already been excluded from agricultural activities. Only six archeological resources associated with the significance of this district occur in the planning area and have not been excluded from agricultural activities. Two of these resources would be included in the resource protection subzone under the various alternatives, and the remaining four resources are a resource type not vulnerable to impacts from periodic grazing. Future developments related to visitor use and experience considered in the GMP Amendment would consider impacts on these resources as the specific proposals are developed. Moreover, existing park protocols designed to protect archeological resources would be implemented upon discovery of previously unknown archeological resources. For these reasons, impacts on archeological resources were dismissed from detailed analysis in the EIS.

Human Health and Safety

Health and safety issues associated with some of the actions under consideration include use of herbicides, potential conflicts with livestock guardian animals that could be introduced under diversification activities, and measures considered for tule elk management. NPS is responsible for public safety associated with proposed elk management efforts such as lethal removal operations and would implement area closures to keep visitors safely away from such operations. NPS would also monitor the operations and post signage to ensure that visitors understand safety precautions. As described in chapter 2 of the EIS, use of herbicides by either NPS staff or ranchers would be subject to safety protocols included in an approved Pesticide Use Permit. Further, all pesticides would be applied under the supervision of trained NPS personnel. Specific requirements related to the use of livestock guardian animals (i.e., dogs, llamas, donkeys) would be outlined in the ranch operating agreements and would

include reporting any wildlife and visitor conflicts to NPS. Livestock guardian animals would only be allowed with the use of established mitigation measures that would reduce risks to public safety (see appendix F). Impacts related to livestock guardian animals are analyzed in chapter 4 under the visitor use, experience and access impact topic. Implementation of area closures and mitigation measures would avoid health and safety issues related to the actions considered in the EIS. Because potential human health and safety impacts are already addressed in other topics where relevant, human health and safety as a stand-alone topic was dismissed from detailed analysis in the EIS.

Energy Conservation Potential and Sustainability

Pursuant to NPS *Management Policies 2006* (NPS 2006), "The National Park Service will conduct its activities in ways that use energy wisely and economically. Park resources and values will not be degraded to provide energy for NPS purposes. The Service will adhere to all federal policies governing energy and water efficiency, renewable resources, use of alternative fuels, and federal fleet goals as established in the Energy Policy Act of 1992." Although some actions considered under the alternatives could result in slight increases in water and energy demand, NPS would ensure that permitted activities remain consistent with all applicable policy requirements. Individual ranch operating agreements would include ranch-specific management activity standards and mitigation measures (see appendix F) that would be required when implementing ranching activities to minimize impacts on water demand; impacts on water quantity are analyzed under each alternative. Therefore, this topic was dismissed from further analysis.

Geomorphic and Hydrologic Processes

Water resources and water quality, including impacts from stormwater runoff, are analyzed in chapter 4 of the EIS. One commenter requested analysis of geomorphic and hydrologic processes. Geomorphic processes include sediment generation and transport processes as well as stream and floodplain geomorphic functions. Hydrology includes impacts to stormwater runoff characteristics (e.g., runoff volume and timing, percolation, and Horton overland flow due to soil compaction); streamflow (e.g., volume, peak flow magnitude and timing, seasonal persistence); and groundwater recharge and discharge. Many aspects of current conditions, hydrology, and runoff patterns are analyzed in the "Water Resources" section of chapter 4, including water quantity and nonpoint source pollution. The alterations identified by the commenter are related to larger scale, morphic changes to the stream systems that are essentially permanent conditions. Many of the changes to stream channel morphology, sediment, and transport processes are driven by natural extreme events or are legacy conditions. The planning area straddles the San Andreas Fault zone with one of the primary watersheds, Olema Creek, flowing parallel and within the zone for its entire length, making it naturally subject to extensive and unique erosion and sedimentation patterns. Extreme events, such as the January 1982 flood and debris flow dramatically affected and reshaped the stream systems in the planning area (USGS 1989). Other changes to stream channel morphology relate to the legacy effects that ranching has had on these systems, which occurred long before current management and regulatory practices were established. Therefore, while the geologic and hydrologic processes in these systems are altered by historical changes, the systems are generally in a stabilized and recovering condition as evidenced by the water quality analysis presented in chapter 4, which indicates that under current levels of grazing and management, erosion and sedimentation do not significantly affect water resources and water quality in the planning area. Long-term sediment monitoring in the Olema Creek watershed indicates that approximately 90% of collected samples were below a threshold of 25 nephelometric turbidity units; most of the samples above this threshold were collected during storm conditions. In the peninsula drainages, limited sediment monitoring indicates that except for one sampling station, turbidity was below the 25 nephelometric turbidity unit threshold target more than 85% of the time (Wallitner 2013, 2016; Wallitner and Pincetich 2017). The range of alternatives would not affect the amount of water in the basin (e.g., groundwater recharge, discharge, or floodplains). Any specific proposals that would expand water use (e.g., proposals to irrigate) would require (1) the rancher to demonstrate that groundwater is available to support the action, and (2)

appropriate approvals, including meeting California State Water Resources Control Board requirements. In addition, the zoning framework would protect waterbodies in the planning area from wider impacts, and any proposed changes in the Ranch Core subzone that may affect water quality would be required to implement additional structural improvements to minimize these impacts.

NPS considered geomorphic and hydrologic processes during internal and agency scoping. Following the guidance provided in section 4.2(E) of the NPS National Environmental Policy Act Handbook (2015), NPS determined that a detailed analysis related to the issue of watershed-scale processes was not necessary to make a reasoned choice between the alternatives for the reasons described above. Therefore, watershed-scale processes as a stand-alone topic was dismissed from detailed analysis in the EIS.

Scenic Resources

Consistent with the Organic Act and the Point Reyes enabling legislation, the Point Reyes foundation document identifies wild beaches, dramatic cliffs, detached coastal formations, and coastal grasslands as the primary scenic resources that NPS seeks to protect in managing the park. Other scenic resources in the planning area include those within the Golden Gate Natural Recreation Area. Scenic resources in the Golden Gate Natural Recreation Area include a dramatic contrast between urban environments and undeveloped spaces ranging from the open waters of the Pacific Ocean and San Francisco Bay to beaches, estuaries, headlands, and valleys. These resources contribute greatly to the scenic experience enjoyed by area residents and visitors alike, as described in the 2014 GMP.

The GMP Amendment does not propose any physical changes to detached coastal formations, cliffs, or beaches. Grassland vegetation types are a contributing element to both the Olema Valley Dairy Ranches and Point Reyes Peninsula Dairy Ranches Historic Districts. As such, impacts on grasslands are addressed in the "Cultural Landscapes, Historic Districts, and Historic Structures" section of chapter 4 in the EIS. This section also addresses maintenance of ranch structures and the impact of such maintenance on aesthetic qualities such as scenery and setting. The vegetation section of the EIS also addresses impacts on grasslands and coastal dunes. Finally, the GMP Amendment proposes some actions that would improve recreational opportunities, including improved trails and trail connections and additional day-use and overnight opportunities that would enhance the ability of visitors to experience the park's scenic resources. These topics are addressed in the "Visitor Use, Experience, and Access" section of chapter 4 in the EIS. Because scenic resources affected by plan actions are adequately addressed in these sections, scenic resources as a standalone topic was dismissed from detailed analysis in the EIS.

Evergreen Forests and Woodlands

On moderate to steep slopes in the Golden Gate lands, several forest types occur. Mixed forests dominated by either California bay and coast live oak, which can include California buckeye (*Aesculus californica*) and tanoak (*Notholithocarpus densiflorus*) are found primarily on the east side of Bolinas Ridge, growing mostly in canyons or valleys. The understory is variable but often includes poison oak and other shrub species. These forests make up about 8% of the planning area. The planning area constitutes 18% of evergreen forests and woodlands in the park. Two-tiered Douglas fir (*Pseudotsuga menziesii*) dominated forests also occur here and extend to the eastern portion of the planning area with the lower canopy containing a similar suite of mixed forest species described above. Drier stands can also contain coffeeberry as co-dominant in the understory. At low elevations, stands of mixed Douglas fir with a shrub layer dominated by coyote brush can be found where disturbance has previously occurred. A few areas of Coast redwood (*Sequoia sempervirens*) forests with tanoak, huckleberry (*Vaccinium ovatum*), and ferns common in the lower layers occur mostly at the top of Bolinas Ridge and typically show signs of past logging activity. Some stands include mixed Douglas fir and California bay in the lower canopy, and generally lack huckleberry. Bishop pine (*Pinus muricata*) forests occur mostly in the Point Reyes portion of the planning area (on a total of about 1% of lands) adjacent to Mount Vision. They often contain an understory of huckleberry and can be found mixed with California bay, and coast live oak (Keeler-Wolf et al. 2003). Small non-native stands of eucalyptus (*Eucalyptus* spp.), Monterey cypress

(*Hesperocyparis macrocarpa*), and Monterey pine (*Pinus radiata*) are found scattered throughout the park. Together, these Douglas fir, coast redwood, and Bishop pine forests make up about 14% of the planning area.

Evergreen forests and woodlands are not used as forage for cattle, but in some cases, cattle use them for shade or cover. Often these forests are accessed along the edges of pastures, and in many cases, access to the forest and woodland habitat is limited by topography, dense understory vegetation, or Management Activities such as Fencing. In areas where access occurs, cattle disturb understory conditions but not the overlying forest and woodland habitat. Overall, grazing intensity in evergreen forests and woodlands in the planning area is variable but light, with the majority of impacts occurring in the riparian forests and associated with soils and water quality, which are described in detail in chapter 3 and analyzed in chapter 4 of the EIS. In addition, no visitor use improvements are proposed for any of these areas. Impacts on evergreen forests and woodlands were considered but dismissed from detailed analysis because a more detailed analysis related to this vegetation type is not necessary to make a reasoned choice between alternatives, given that this vegetation type is not used as forage for cattle and impacts would be minimal.

References

NPS (National Park Service)

2006 *Management Policies*. US Department of the Interior, National Park Service, Washington, DC.

2015 *National Environmental Policy Act Handbook*.

USGS (US Geological Survey)

1989 *Flood of January 1982 in the San Francisco Bay Area, California*. USGS Water-Resources Investigations Report 88-4236. Prepared by J. C. Blodgett, USGS, And E. H. Chin, National Weather Service, National Oceanic and Atmospheric Administration. Prepared in cooperation with the National Oceanic and Atmospheric Administration. https://pubs.usgs.gov/wri/1988/4236/report.pdf

Wallitner, K.

2013 *Freshwater Quality Monitoring in the San Francisco Bay Area Network: 2011–2012 Biennial Report*. Natural Resource Technical Report NPS/SFAN/NRTR—2013/801. National Park Service, Fort Collins, CO.

2016 *Freshwater Quality Monitoring in the San Francisco Bay Area: 2013–2014 Biennial Report*. Natural Resource Report NPS/SFAN/NRR—2016/1188. National Park Service. Fort Collins, CO.

Wallitner, K., and A. Pincetich

2017 *Freshwater Quality Monitoring in the San Francisco Bay Area Biennial Report on Water Years 2015 and 2016*. Natural Resource Report NPS/SFAN/NRR—2017/1471. National Park Service. Fort Collins, CO.

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APPENDIX D—ESTIMATED COSTS OF THE ALTERNATIVES

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APPENDIX D: ESTIMATED COSTS OF THE ALTERNATIVES

The costs of the proposals within each alternative are summarized in the following table, including alternative B the preferred alternative. Costs shown in table D-1 are not intended for budgeting purposes; instead they are used to show a relative comparison of costs among the alternatives. These costs are in 2019 dollars, are general in nature, and reflect a broad-based vision and direction rather than detailed, focused estimates.

The alternatives describe the potential capital improvements that would occur; fewer improvements may be implemented or constructed in phases if necessary, as implementation would be dependent upon available funding. The approval of this plan does not guarantee that the funding and staffing needed to implement the plan will be forthcoming. Full implementation of the actions in the approved general management plan could be achieved over many years in the future. Additionally, some of the funding needed to implement the various actions in the alternatives is anticipated to come from nonfederal partners, consistent with current practices of the park.

TABLE D-1: COSTS OF ALTERNATIVES (2019)

	Alt. A	Alt. B - Preferred Alternative	Alt. C	Alt. D	Alt. E	Alt. F
Recurring Costs						
Annual Operating Costs	$7,000,000	$7,400,000	$7,400,000	$7,400,000	$7,400,000	$7,000,000
Total Staffing (FTE)	52 (existing conditions)	56	56	56	56	52
One-time Costs						
Total for One Time Costs Implementation Actions	$0	$4,850,000	$5,150,000	$4,600,000	$4,850,000	$14,900,000
Deferred maintenance	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000	$31,000,000

Note: FTE = full-time equivalent

Notes Regarding Summary of Costs Table

1. Annual operating costs are the total costs per year for maintenance and operations associated with each alternative, including utilities, supplies, staff salaries, and benefits.
2. The total number of full-time equivalents (FTE) is the number of person-years of staff required to maintain the assets of the park at a good level, provide acceptable visitor services, protect resources, and generally support the park's operations. The FTE number indicates Operations of the National Park Service (NPS)-funded NPS staff only, not volunteer positions or positions funded by partners. FTEs are from the 2019 Green Book. FTE is one person working 40 hours per week for one year or the equivalent.
3. One-time costs for alternative A only include costs associated with projects already approved and fully funded in contrast to costs for other alternatives that include all major projects forecast over the next 20 years.

4. Deferred maintenance is maintenance and repair activities that were not performed when they should have been or were scheduled to be and which, therefore, are put off or delayed for a future period. Maintenance and repairs are activities directed toward keeping fixed assets in an acceptable condition. Total costs for deferred maintenance are the same for each alternative.

ALTERNATIVE A (NO ACTION)

Annual Operating Costs

The operating budget for fiscal year 2019 was $7.0 million which includes costs for the park's overall administration, maintenance, and day to day operations. Under alternative A, there would be no change to the annual operating costs to continue current park operations. Current expenditures associated with the ranch management program are partially covered through rental revenues from the existing agreements, in addition to NPS investments.

Staffing

The no action alternative assumes that current staffing levels would be maintained at 52 FTE funded from park base operating dollars. The FTE number does not include volunteer positions or positions funded by partners. FTE salaries and benefits are included in the annual operating costs.

One-time Costs

The estimated one-time costs of the no action alternative assume the continuation of current management practices. One-time costs for alternative A are the costs for those projects that are currently approved and funded; any requested but unfunded projects are not included in this analysis. Therefore, while the action alternatives contain estimates for 20 years of proposed projects, alternative A assumes no new projects would take place except those projects anticipated to maintain current operations (such as critical infrastructure upgrades). In alternative A, the current level of facilities would be sustained. Improvements to facilities would include deferred maintenance and rehabilitation projects.

Deferred Maintenance

The park's current deferred maintenance, including park assets managed by partners, as of February 2020 exceeds $109 million. Of this, the deferred maintenance of ranch associated assets is in excess of $34 million. The park has a schedule of facility projects that extends out 10 years and will continue to pursue opportunities for addressing its most critical deferred maintenance needs. The park is pursuing a reduction in deferred maintenance through a variety of funding methods such as the use of leasing as a means to reinvest in priority historic structures, pursuing transportation program funds, competing for special project funds, using a portion of proceeds from concession franchise fee funds, and dedicating some repair and maintenance funds for component renewal. The park continues to look for opportunities to work with partners in addressing deferred maintenance when updating or issuing new partner agreements.

Nearly all the structures in this General Management Plan (GMP) Amendment planning area are affiliated with ranch operations. While the park shares maintenance responsibility for many of these assets, most of the ranches are under existing lease/permit agreements that lack the structure to effectively identify and prioritize maintenance investment. With respect to the deferred maintenance on the historic structures within the Point Reyes Peninsula and Olema Valley Dairy Ranches Historic Districts, the park has prioritized rehabilitation and treatment of 56 historic structures, most of which are in the planning area. Refined condition assessments have identified that treatment efforts on these priority structures require an investment of approximately $31 million to bring them to a condition where ongoing cyclic maintenance would address ongoing needs. These are treatments that are necessary under any future management scenario.

ALTERNATIVE B (PREFERRED ALTERNATIVE)

Costs described below and provided in table D-2 reflect all proposals of alternative B that could be implemented over the 20-year life of the general management plan. The alternatives describe the maximum potential capital improvements; lesser improvements may be implemented or built in phases if necessary. Implementation of the approved plan would depend on future funding.

Annual Operating Costs

The annual operating costs for alternative B comprise the current annual operating costs, with proposed changes for additional staffing required to implement the preferred alternative by addressing critical operations and to meet new and increased management responsibilities associated with the operation of the ranch management program and two historic districts. The annual operating costs of alternative B are estimated at $7.4 million.

Staffing Requirements

Under alternative B, the park would issue long-term agricultural lease/permits with terms up to 20 years. Effective implementation of the ranch leasing program proposed under alternative B would require expanded capacity by the park to take on new management and monitoring responsibilities through the establishment of program-dedicated positions. Total additional staff needed to support alternative B would be 4 FTE.

These additional positions would include a Historical Architect, a Range Specialist, a Wildlife Technician, and a Compliance Ranger. Improved coordination with park ranchers to ensure resource protection, wildlife management, and that rancher infrastructure needs are met is key to the success of this alternative. The Historical Architect would work directly with the ranchers to develop and review annual work plans related to facilities, roads, infrastructure, utilities, maintenance, repair, and inspections. This dedicated position would work as liaison to the ranchers, identify treatment priorities, ensure the *Secretary's Standards* are met, and oversee contract work as appropriate. The range specialist and wildlife technician would assist park managers to ensure that annual monitoring and management is conducted as required by the GMP Amendment and permitting agencies, including the ongoing management of tule elk affecting park ranch operations. The compliance ranger would be dedicated to managing the enforcement of agricultural lease/permits and maintaining ongoing relationships with park ranchers.

Proposed New Staff

- 1 position in visitor resources and protection
- 1 position in cultural resources
- 2 positions in natural resources

One-time Costs

One-time project costs under alternative B would implement proposed amenities such as additional trails, trailhead development, interpretive media, vault toilets, and parking improvements to facilitate public use and enjoyment of the planning area. New fencing for implementation of the Resource Protection subzone is also identified as a one-time cost. These costs estimates are gross estimates. Prior to implementing site specific projects such as but not limited to trails, parking improvements, or the park's adaptive use of a ranch complex, additional planning, design, compliance, and detailed cost estimates would be prepared. Any projects that require submitting funding requests for design and construction would require "Class B" estimates, based upon detailed site and facility designs. "Class A" estimates would be prepared from completed construction documents.

In addition, it is anticipated that the initial implementation period under alternative B would require a dedicated NPS team to work closely with the ranchers. Regular meetings during this period would provide a forum to discuss both short-term and long-term ranch management goals. Ranch operators would have an opportunity to discuss potential projects and receive feedback on implementation and compliance requirements. Regular communications would allow both parties to plan and prepare for these initiatives in an effective manner.

TABLE D-2: ONE TIME COSTS (2019) UNDER ALTERNATIVE B

One-time Project/Action	Cost
Trails and trail amenities	$2,000,000
New visitor access sites	$1,350,000
Resource Protection Subzone Fencing	$1,400,000
Preservation/rehabilitation of non-ranch historic structure at former Radar site on the Great Beach	$100,000
Alternative B – One Time Cost Estimate	**$4,850,000**

Deferred Maintenance

Under alternative B, new appraisals would be prepared as part of the ranch leasing program, which could result in increased rental revenue that would be applied to the ongoing management of the range programs. Under alternative B, new lease/permits with terms up to 20 years, would have a regular adjustment mechanism into the fair market value rental rate. Any increase in ranch rental revenue would be used for the park's ongoing management of the program and reinvestment into priority resources. The new leases and ROAs would include maintenance plans that will then allow park management to work with the ranchers to clearly communicate priorities and recommendations for best addressing maintenance needs for priority park resources, including critical infrastructure integral to the districts and ranch operations.

ALTERNATIVE C

Under alternative C the annual operating costs and staffing requirements would be the same as alternative B. The one-time costs would be similar to alternative B with one additional one-time cost for the contracted removal of the Drakes Beach herd (see table D-3). This would occur over one season, with an anticipated cost of $300,000 for the action. The approach to deferred maintenance would be the same as alterative B.

TABLE D-3: ONE TIME COSTS (2019) UNDER ALTERNATIVE C

One-time Project/Action	Cost
Trails and trail amenities	$2,000,000
New visitor access sites	$1,350,000
Resource Protection Subzone Fencing	$1,400,000
Preservation/rehabilitation of non-ranch historic structure at former Radar site on the Great Beach	$100,000
Removal of the Drakes Beach Herd	$300,000
Alternative C – One Time Cost Estimate	**$5,150,000**

ALTERNATIVE D

Annual Operating Costs

The annual operating costs and staffing needs under alternative D would be the same as that for alternative B. While some ranches would cease operations, they are generally ranches with little to no infrastructure and management oversight, so overall recurring costs would not change. The reduced fencing needed to implement the Resource Protection subzone is reflected in the one-time cost table for alternative D (see table D-4). The approach to deferred maintenance would be the same as alterative B.

TABLE D-4: ONE TIME COSTS (2019) UNDER ALTERNATIVE D

One-time Project/Action	Cost
Trails and trail amenities	$2,000,000
New visitor access sites	$1,350,000
Resource Protection Subzone Fencing	$1,150,000
Preservation/rehabilitation of non-ranch historic structure at former Radar site on the Great Beach	$100,000
Alternative D– One Time Cost Estimate	**$4,600,000**

ALTERNATIVE E

The annual operating costs and staffing requirement would generally be the same as that for alternative B. While closure of dairy operations would change the intensity of some activities occurring in the Ranchland zone (no manure spreading or Forage Production), the overall area of management would be the same as alternative B. One-time costs would be the same as estimated for alternative B at $4,850,000. The approach to deferred maintenance would be the same as alternative B.

ALTERNATIVE F

Under alternative F, the annual operating costs and staffing requirements are anticipated to be the same as for alternative B, though the focus of work for the additional staff would be on implementing specific actions proposed under alternative F. The park would stabilize priority historic structures and would develop potential lease opportunities for reuse of some of the historic complexes. In these cases, the NPS would anticipate addressing much of the deferred maintenance costs through the long-term lease arrangements to ensure rehabilitation and maintenance of the historic structures is achieved. In addition, the NPS has identified one-time costs, associated with the cessation of ranch operations, including decommissioning and removal of non-historic fencing, infrastructure (pipes, troughs, etc.), and ranch roads, as well as the implementation of a new Targeted Grazing program to maintain priority resource habitat conditions, of approximately $14,900,000 for the visitor use and area improvements necessary with the full removal of ranch operations (see table D-5).

TABLE D-5: ONE TIME COSTS (2019) UNDER ALTERNATIVE F

One-time Project/Action	Cost
Trails and trail amenities	$4,000,000
New visitor access sites	$2,700,000
Removal of non-historic Fencing	$2,100,000
Removal of non-historic infrastructure (pipes, troughs, etc.)	$3,000,000
Road Decommissioning (assumes 5 miles)	$2,500,000
Preservation/rehabilitation of non-ranch historic structure at former Radar site on the Great Beach	$100,000
Establishment of Targeted Grazing program needs	$500,000
Alternative F– One Time Cost Estimate	**$14,900,000**

APPENDIX E—RESIDUAL DRY MATTER VISUAL MAPPING AND MONITORING SUMMARY 2015–2019

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RESIDUAL DRY MATTER VISUAL MAPPING AND MONITORING SUMMARY 2015-2019 FOR POINT REYES NATIONAL SEASHORE AND NORTH DISTRICT GOLDEN GATE NATIONAL RECREATION AREA

Background

This document summarizes five consecutive years (2015–2019) of visually mapping and monitoring residual dry matter (RDM) on rangelands at Point Reyes National Seashore and the North District of Golden Gate National Recreation Area (park). Prior to 2015, park RDM monitoring protocols followed the 1990 Range Management Guidelines and Range Monitoring Handbook (Shook 1990). The RDM monitoring protocol was updated in 2015–2016 based on a review of RDM data and recommendations from the UC Berkeley Range Ecology Lab (Bartolome et al. 2015), which included a pilot year of zone mapping in 2015. The description below contains excerpts from the updated park RDM Monitoring Protocol (v2.2.; NPS 2020).

RDM is the herbaceous plant material left standing or on the ground in the fall prior to the onset of germinating rains. RDM monitoring allows land managers to assess whether conservation goals on grazed landscapes are being achieved (Bush 2006). As an important indicator of range condition, RDM levels can be tracked annually and used to adjust grazing levels to better meet conservation goals (Shook 1990; Bartolome et al. 2006). Maintaining a minimum level of RDM minimizes soil erosion, increases seed germination and improves forage production (Bartolome et al. 1980; Jackson and Bartolome 2002). To meet these resource protection goals, the park maintains a minimum RDM standard of 1,200 pounds per acre (lbs/acre).

RDM monitoring at key area transects from 2015–2019 was conducted by clipping three representative samples of herbaceous material, then converting the average dry weight of the three samples to pounds per acre. In addition to measuring RDM at representative transect locations, visual mapping was conducted during a pilot year (2015) and then from 2016–2019. Visual mapping allows broad estimates of RDM across the landscape, providing information about variation in RDM on each ranch that can be used to inform management. Visual mapping of RDM (also called "zone mapping" in the 1990 protocol) involves ocular estimates of RDM across the landscape with a minimum mapping unit set to the size of a key area (~2 acres) in each of four categories:

- <600 lbs/acre
- 600-1200 lbs/acre
- 1200-1800 lbs/acre
- >1800 lbs/acre

Note: In the 2015 pilot year, only 2 categories were used; <1200 lbs/acre and >1200 lbs/acre

Clipping and weighing of individual samples in areas to calibrate visual estimates is also conducted by field staff, particularly in areas where the category is initially uncertain to the observer. As RDM visual mapping takes more time than clipping representative samples at key area transects, mapping is prioritized by ranch each year based on the following:

- Ranch returned RDM results below the 1200 lbs/acre benchmark the previous year
- Ranch was not visually mapped the previous year
- Ranch contains areas of special management concern (e.g., weeds, special status species, fire risk)

Visual mapping surveys are conducted on grassland dominated habitat types and exclude non-grassland vegetation types including evergreen forests and woodlands, riparian forest/shrubland, coastal dunes, dense coastal scrub, and wetlands. Approximately 1,000 acres of silage fields in the park are also not

included in the visual surveys. These habitat types and silage areas are clipped out of the GIS mapping layer prior to reporting. Thus, the total area of ranches that may be surveyed is estimated at between 18,000–19,000 acres of the lands managed under ranching lease/permits.

The RDM monitoring protocol notes that measurements should not include woody plant material, vines, ferns, rushes, manure, hay or other supplemental cattle feed, thatch from previous year's growth, summer annuals, or noxious weeds. While these plants and plant parts do provide soil protection, they do not necessarily help achieve vegetation management goals, including forage production and do not factor into the estimate of consumption by grazing animals. This tradeoff between the goals of protecting soil from erosion, and maintaining vegetative growth not dominated by noxious weeds, has also led to revision of the RDM visual mapping strategy.

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

1) California experienced a period of moderate to extreme drought spanning water years 2012–2016 (figure 1; figure 2; NIDIS 2020; USGS 2020)

2) An increase in common onion grass (*Romulea rosea* var. *australis)* was observed across the park, but this increase was most prominent at three ranches.

Adjustments to management based on these two factors were as follows:

1) During the drought, the park discussed range condition with ranchers and their attempts to adjust stocking rates or increase supplemental feeding to accommodate decreased forage production associated with the drought.

2) In 2015 and 2016 RDM sampling, attempts were made to exclude onion grass from samples and the ocular zone mapping based on protocol guidance that noxious weeds should be excluded. However, due to the challenge of removing the onion grass from clipped herbaceous material and visual estimates of cover during 2015 and 2016, onion grass was included in samples (unless >25% cover) and ocular zone mapping estimates starting in 2017. The rationale for inclusion in zone mapping is that the onion grass provides cover that protects the soil from erosion, so excluding it would result in an underestimate of actual vegetative cover and soil protection across the landscape in these areas. This was only a factor on portions of several ranches, most notably Home, Commonweal/Niman, and R. Giacomini ranches (table 2).

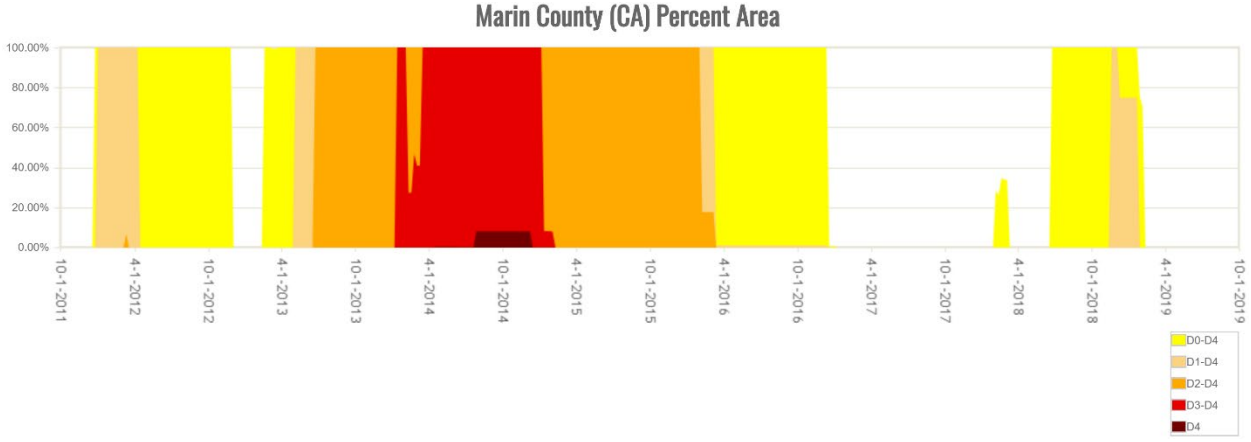

Figure 1: Percent area in Marin County over time within U.S. Drought Monitor five-category system: Abnormally Dry or D0 (a precursor to drought, not actually drought); Moderate (D1); Severe (D2); Extreme (D3); and Exceptional (D4) Drought. Drought categories are experts' assessments of conditions related to dryness and drought including observations of how much water is available in streams, lakes, and soils compared to usual for the same time of year (NIDIS 2020).

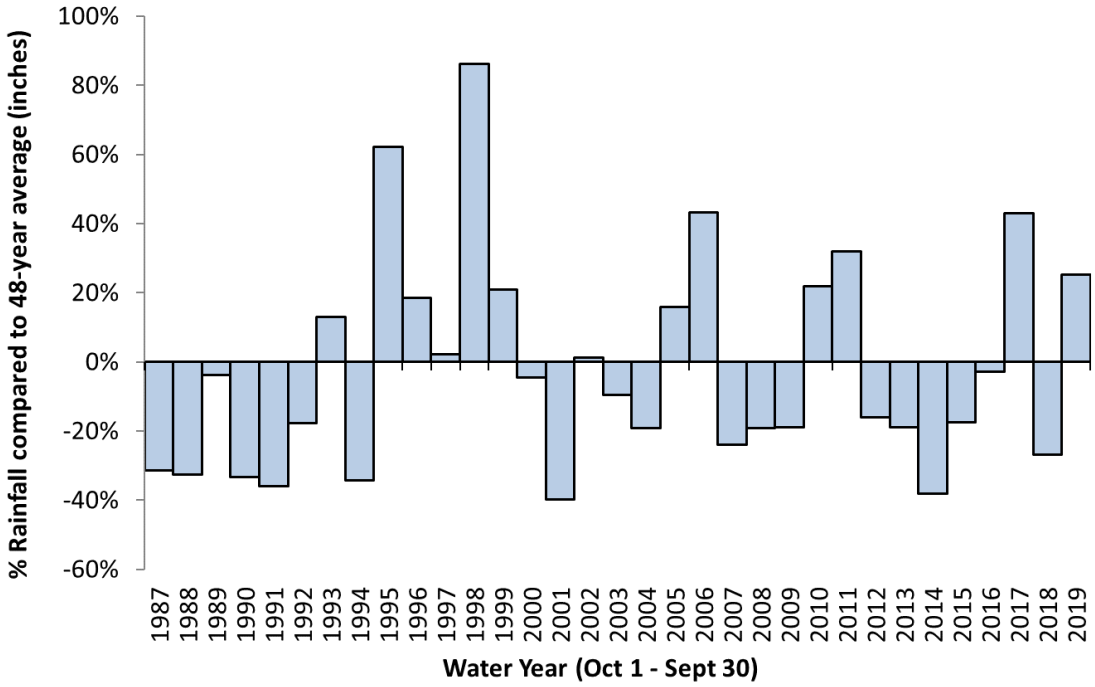

Figure 2: Percentage of running average rainfall (39.1 inches) from 1987–2019 based on data from Point Reyes National Seashore Bear Valley (Olema OVYC1) weather station. The annual rainfall data is a sum of daily rainfall for each water year October 1–September 30. Two additional local weather stations, BBEC1 (located on Mt. Barnabe), or Point Reyes Station (Marin County OneRain 38029) were used to fill in any data gaps.

Results and Discussion

Transect RDM values <1200 lbs/acre decreased over the study period consistent with the end of the pronounced drought, with percentages <1200 lbs/acre as follows by year: 67% (2015); 45% (2016); 12% (2017); 7% (2018); and 7% (2019) (figure 3). Values in the <600 lbs/acre category also dropped, from 33% in 2015 to 10% in 2016, and to 5% in 2017. In 2018–2019, no transect values were documented below 600 lbs/acre.

Out of the 31 ranch map units, RDM visual mapping was completed on 19 and partially on 1 unit in 2015; on 24 ranch map units and partially on 3 in 2016; on 16 ranch map units in 2017; on 26 and partially on 2 ranch map units in 2018; and on all 31 ranch map units in 2019 (table 1). Results from visual mapping indicate a similar trend as compared to transect mapping across park ranches (table 3), showing a contraction of areas below the RDM standard over the monitoring period. This decrease over time was also true of the percentage soils classified by the USDA Natural Resources Conservation Service as having high erosion potential and low compaction resistance (table 3). However, due to the variation in mapping effort both across the park and at individual ranches between years, results do not provide a complete representation of observed change over time. Results from pilot mapping in 2015 indicate that large contiguous areas did not meet the 1200 lbs/acre standard on the 19 units (plus part of 1 additional ranch) surveyed (figure 4). Results were more patchy in 2016 coming out of the drought across the 24 units surveyed (plus part of 3 additional ranches; figure 5), and in 2017 the areas not meeting the standard dropped to about 14% of the 16 ranch units surveyed (figure 6). By 2018 and 2019, areas below the standard were limited to about 6% of the 26 ranch units (plus portions of 2 additional ranches) surveyed

in 2018 (figure 7), and 3% of all ranch units in 2019 (figure 8). Of the areas mapped at RDM below 1200 lbs/acre in 2018-2019, a number were known high intensity use or feeding areas, as well as areas with less productive soils.

It is also important to note that excluding onion grass in 2015-2016 surveys may have contributed to the decreased values on ranches where the species was present, particularly on the more heavily affected portions of ranches. Cover of onion grass declined to <25% on transects with higher infestations over the period 2015-2019; no transects were identified to have onion grass cover >25% in 2019 (table 2).

The effects of drought on growth of herbaceous vegetation combined with land use, particularly the location, timing, duration and intensity of grazing, is a plausible explanation for the change observed in RDM values across the park over time. However, possible interactions are complex and likely sensitive to the timing of climatic factors over the study period. For example, increased precipitation during the spring period of rapid plant growth, can lead to increased production (Pitt & Heady 1978; Suttle et al. 2007). However, Suttle et al. (2007) note that annual grasses can have limited response to extended rainfall in a given year due to their early phenology, but that they may benefit in the subsequent growing season. Additionally, across many years, individual species-specific responses to climate may be become secondary to lagged effects of altered community interactions (Suttle et al. 2007). These types of short-term responses coupled with longer-term changes to plant communities would be expected for the period of RDM monitoring described here. This is directly relevant to the observed changes in onion grass at certain locations as well, where the species was noted to have increased dramatically, but then declined in estimated visual cover post-drought.

TABLE 1: SUMMARY OF RDM VISUAL MAPPING COMPLETED BY YEAR AND BY RANCH.

Map ID	Ranch Map Unit	2015	2016	2017	2018	2019
1	A Ranch (Dairy)	yes	yes	no	yes	yes
2	B Ranch (Dairy)	yes	yes	no	yes	yes
3	C Ranch/D Ranch (Dairy)	yes	yes	no	yes	yes
4	D Ranch Pastures B & C	yes	yes	no	yes	yes
5	E Ranch	yes	partial	no	yes	yes
6	F Ranch	no	yes	no	yes	yes
7	ATT	no	yes	yes	yes	yes
8	G Ranch	no	yes	no	yes	yes
9	D. Rogers Ranch	yes	yes	yes	yes	yes
10	M Ranch	no	yes	yes	yes	yes
11	H Ranch	no	yes	no	yes	yes
12	I Ranch (Dairy)	yes	yes	no	yes	yes
13	J Ranch/K Ranch (Dairy)	yes	yes	yes	yes	yes
13	L Ranch (Dairy)	yes	yes	no	yes	yes
14	K Ranch	yes	yes	yes	yes	yes
16	N Ranch	yes	yes	no	yes	yes
18	Home Ranch	yes	yes	yes	no	yes
19	Martinelli Ranch	yes	yes	yes	no	yes
20	Genazzi Ranch	yes	yes	yes	yes	yes
21	E. Gallagher Ranch	no	yes	no	yes	yes
22	McFadden Ranch	no	yes	no	yes	yes
23	C. Rogers Ranch	no	yes	no	yes	yes
24	Zanardi Ranch	yes	no	yes	yes	yes
25	McIsaac Ranch Bolinas Ridge/West	yes	yes	no	yes	yes
25	McIsaac Ranch East	yes	no	yes	yes	yes
26	Cheda Ranch	yes	yes	yes	yes	yes
27	Percy Ranch/Percy ROP*	partial	no	yes	yes	yes
28	Stewart Ranch/Lupton/Truttman	no	no	yes	partial	yes
30	R. Giacomini Ranch	yes	yes	yes	partial	yes
31	Commonweal	no	partial	yes	no	yes
31	Niman ROP*	no	partial	yes	yes	yes

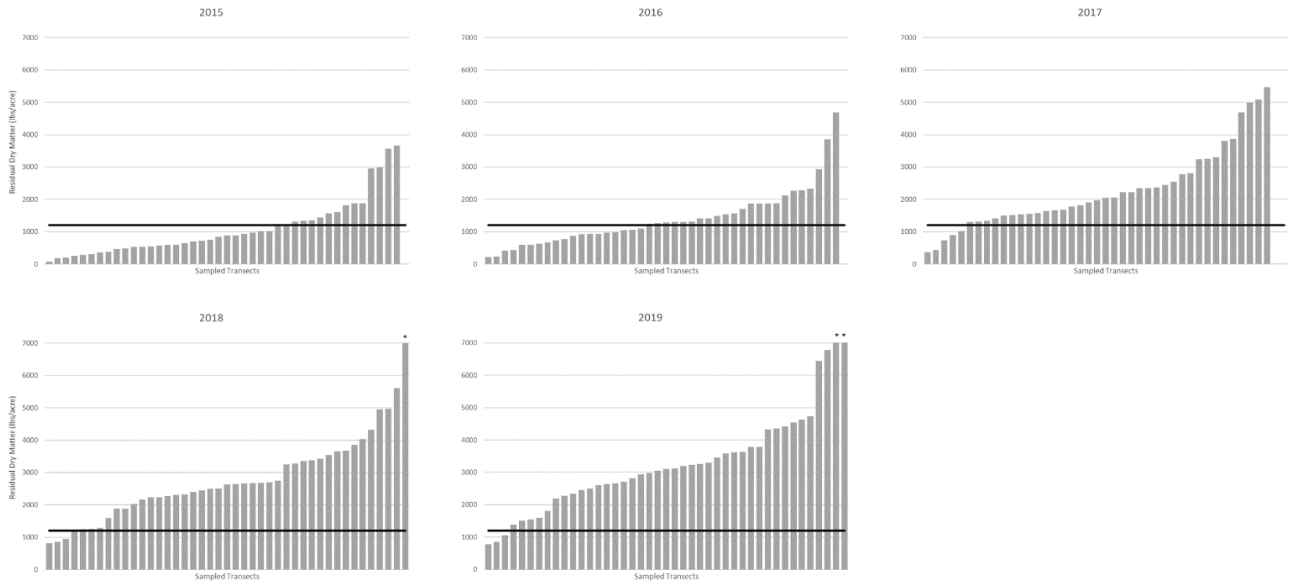

Figure 3: Boxplot of RDM results in pounds per acre for all sampled key area transects on ranches 2015-2019, with standard of 1200 lbs/acre indicated by the horizontal dashed line and individual transect results as olive points (jittered to reduce visual overlap). The horizontal line within each box represents the median, while lower and upper box hinges correspond to the first and third quartiles (the 25th and 75th percentiles). Attempts were made to exclude onion grass from clipped herbaceous material in 2015-2016 samples. From 2017-2019, onion grass was excluded from samples if cover of the species in the clipped plot was estimated at >25%.

TABLE 2: PERCENT COVER OF ONION GRASS DETECTED ON RDM KEY AREA TRANSECTS 2017-2019

Map ID	Ranch	Transect	Average % Onion Grass by Year		
			2017	2018	2019
6	F Ranch	18	16	<25	
10	M Ranch	44		<25	<25
18	Home Ranch	29	55	<25	<25
19	Martinelli Ranch	10	11	<25	<25
23	C. Rogers Ranch	33			<25
25	McIsaac Ranch Bolinas Ridge	6	3	<25	
28	Stewart Ranch/Truttman	3		<25	<25
28	Stewart Ranch/Lupton	4, 9		<25	
30	R. Giacomini Ranch	8	41	39	<25
31	Commonweal Ranch	27	54	20	<25
31	Commonweal Ranch	38	8	<25	
31	Niman ROP*	39	34	17	<25

Note: For 2015-2016 Only Presence/Absence Notes Are Available.

TABLE 3: RDM VISUAL MAPPING METRICS IN ACRES AND PERCENT BY YEAR FOR THE FOUR MAPPING CATEGORIES

Year	Total Ranch Acres Surveyed	Unit	RDM Category (lbs/acre)				High Erosion Potential	Low Compaction Resistance
			>1800	1200-1800	600-1200	<600	<1200	<1200
2015^	13,393	*Acres*	3,351		10,042		2,746	4,939
		Percent	25.0%		75.0%		20.5%	36.9%
2016*	14,399	*Acres*	4,294	4,477	4,221	1,406	980	2,686
		Percent	29.8%	31.1%	29.3%	9.8%	6.8%	18.7%
2017	9,035	*Acres*	5,946	1,855	870	364	400	890
		Percent	65.8%	20.5%	9.6%	4.0%	4.4%	9.8%
2018	13,711	*Acres*	11,296	1,587	762	65	147	511
		Percent	82.4%	11.6%	5.6%	0.5%	1.1%	3.7%
2019	18,557	*Acres*	16,303	1,678	512	64	85	311
		Percent	87.9%	9.0%	2.8%	0.3%	0.5%	1.7%

Source: USDA- NRCS (2014)

Note: Acres and percent of visually mapped RDM results below 1200 lbs/acre on soils with high erosion potential and low compaction resistance are also included.
^2015 RDM visual mapping categories were: >1200 lbs/acre and <1200 lbs/acre
*2016 RDM visual mapping categories were: <1600 or <1800; 1200-1600 or 1200-1800; 600-1200 or 800-1200; and <600 or <800 due to differences in mapping on certain ranches.

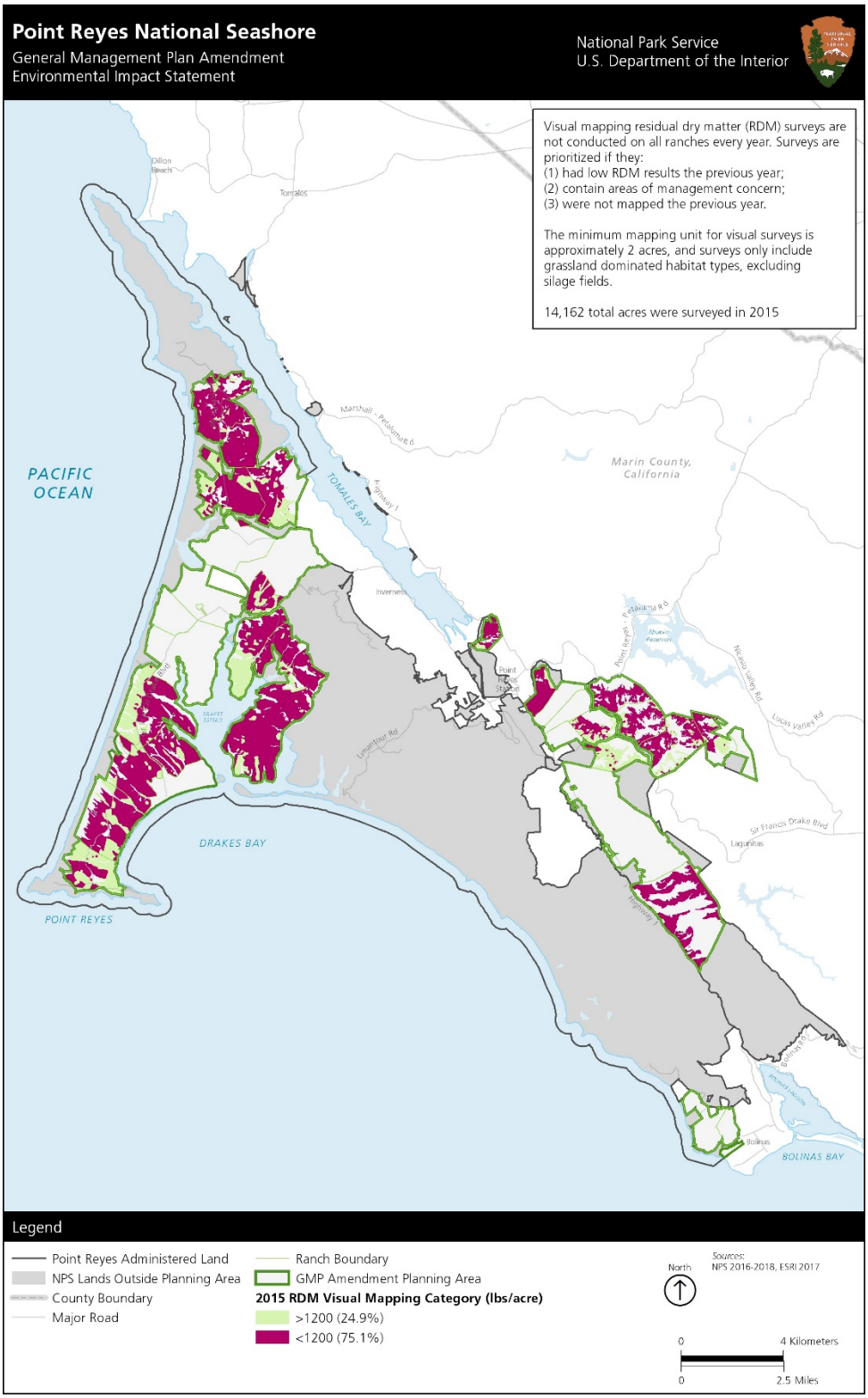

Figure 4: 2015 RDM visual mapping results.

Note: Only two mapping categories were used during this pilot year.

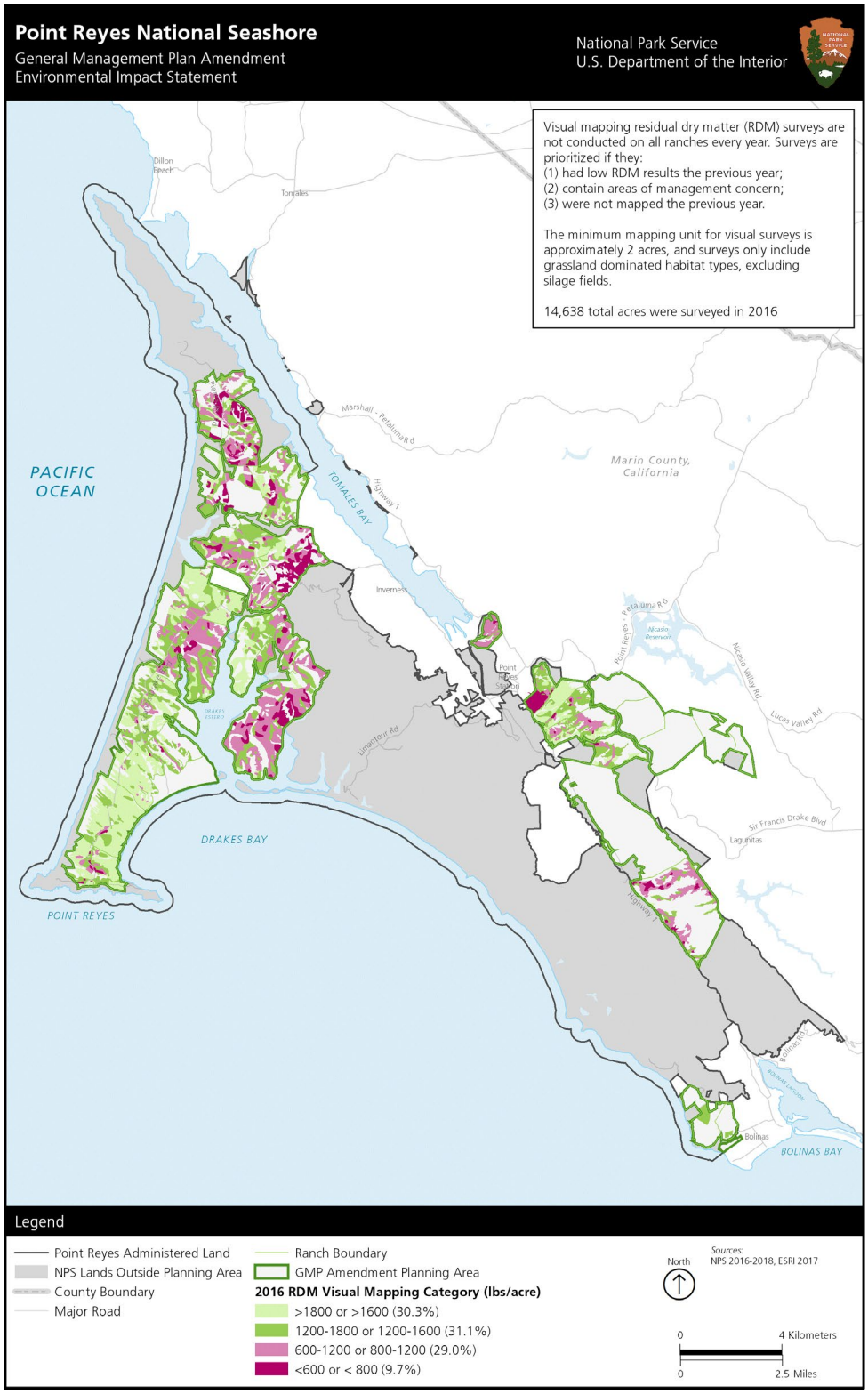

Figure 5: 2016 RDM visual mapping results.

Note: Mapping categories were: <1600 or <1800; 1200-1600 or 1200-1800; 600-1200 or 800-1200; and <600 or <800 due to differences in mapping on certain ranches.

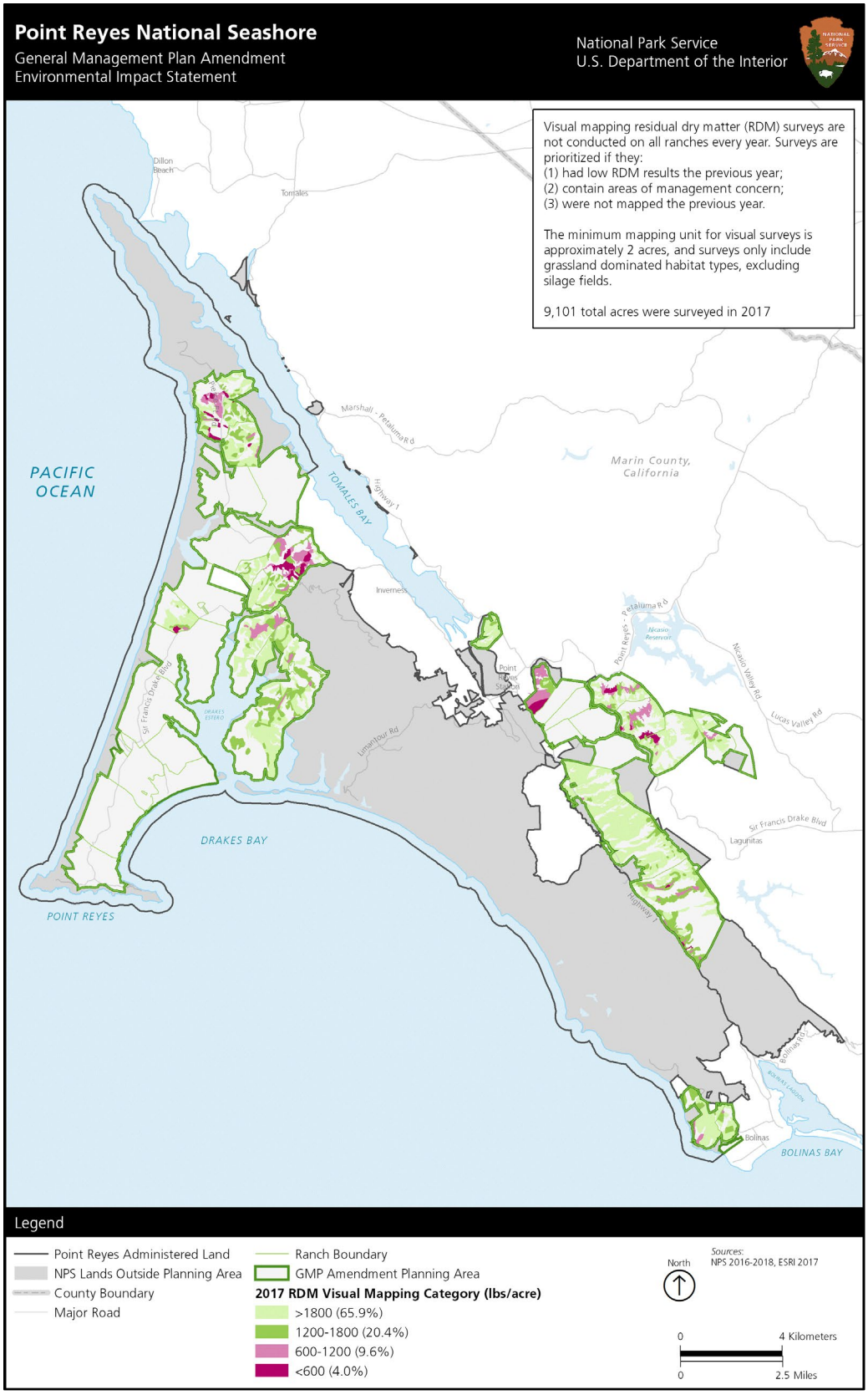

Figure 6: 2017 RDM Visual Mapping Results

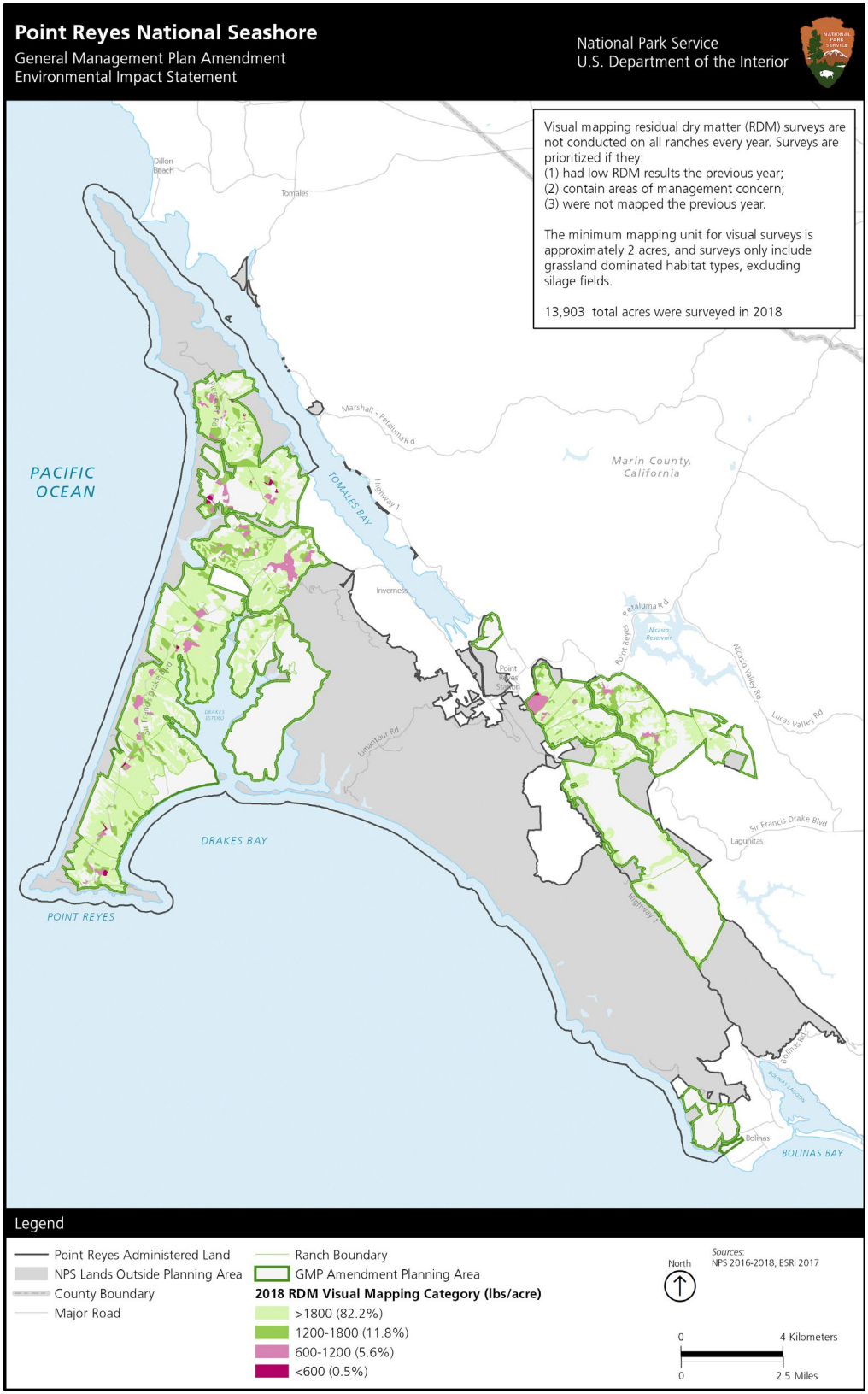

Figure 7: 2018 RDM Visual Mapping Results

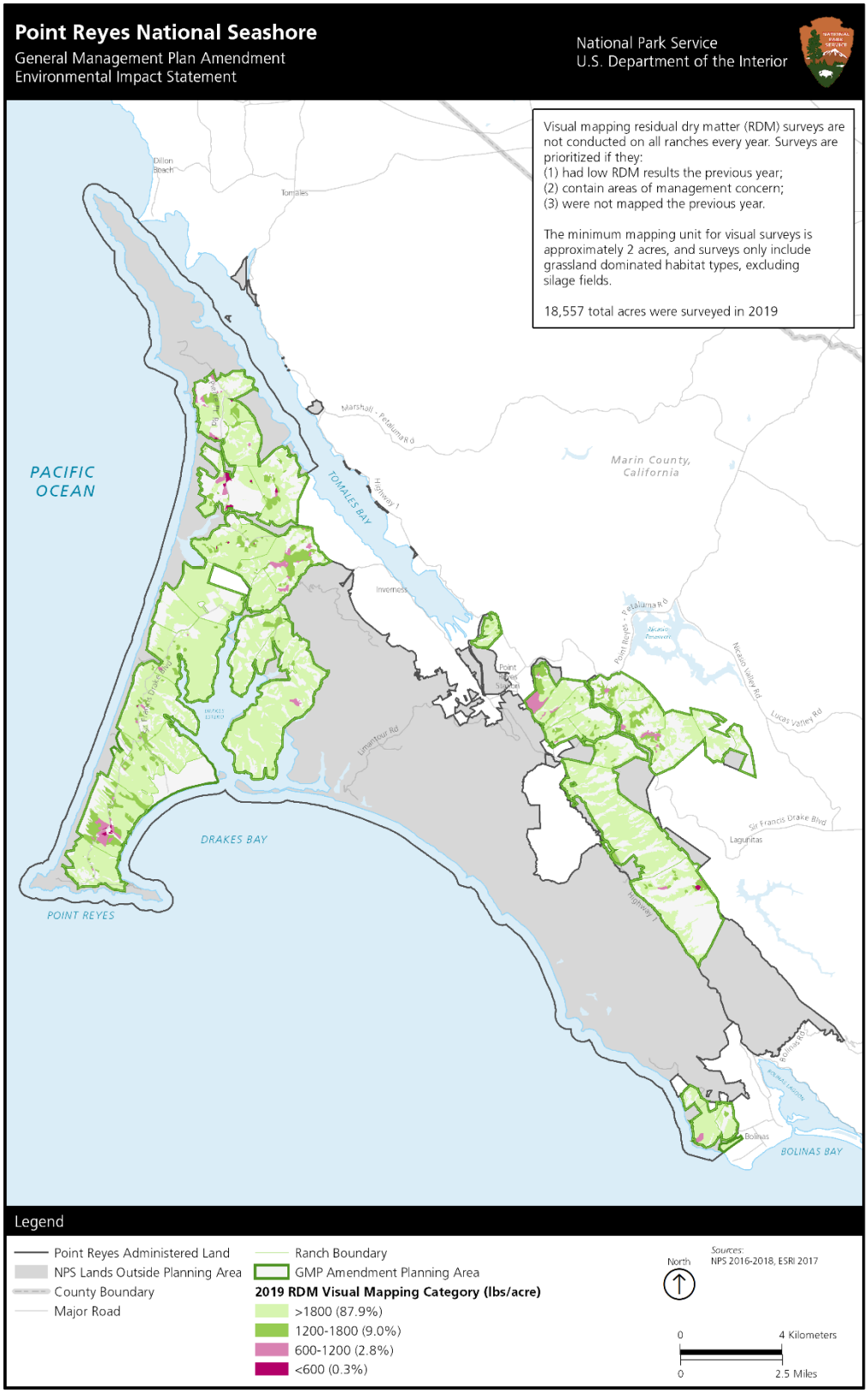

Figure 8: 2019 RDM Visual Mapping Results

References

Bartolome, J. W., W. E. Frost, N. K. McDougald, and J. M. Connor

2006 *California Guidelines for Residual Dry Matter (RDM) Management on Coastal and foothill Annual Rangelands*. University of California Division of Agricultural Natural Resources Rangeland Management Series Publication 8092 (Revised). 8p. http://anrcatalog.ucdavis.edu/Details.aspx?itemNo=8092

Bartolome, J. W., M. Hammond, P. Hopkinson, and F. Ratcliff

2015 "1987-2014 Residual Dry Matter Analysis Report and Updated Rangeland Monitoring Guidelines for Livestock Grazed Grasslands within Point Reyes National Seashore and Golden Gate National Recreation Area. Point Reyes National Seashore (PORE) Project Phase 1: CESU Task Agreement # P11AC91045." Range Ecology Lab, Department of Environmental Science, Policy, and Management, University of California, Berkeley.

Bush, L.

2006 *Grazing Handbook: A Guide for Resource Managers in Coastal California*. Santa Rosa, CA: Sotoyome Resource Conservation District. http://www.sonomarcd.org/documents/Grazing-Handbook.pdf

Jackson, R. D., and J. W. Bartolome

2002 "A State-Transition Approach to Understanding Nonequilibrium Plant Community Dynamics of California Grasslands." *Plant Ecology* 162:49–65.

NIDIS (National Integrated Drought Information System)

2020 Drought.gov U.S. Drought Portal. U.S. Drought Monitor. Accessed April 8, 2020. https://www.drought.gov/drought/data-gallery/us-drought-monitor

NPS (National Park Service)

2020 Residual Dry Matter (RDM) Monitoring Protocol for Point Reyes National Seashore and North District Golden Gate National Recreation Area v2.2. January 2020. U.S. Department of the Interior.

Pitt, M. D., and H. F. Heady

1978 "Responses of Annual Vegetation to Temperature and Rainfall Patterns in Northern California." *Ecology* 59:336–350. doi:10.2307/1936378.

Shook, W.

1990 Range Management Guidelines. Point Reyes National Seashore: National Park Service. U.S. Department of Interior.

Suttle, K. B., M. A. Thomsen, and M. E

2007 "Species Interactions Reverse Grassland Responses to Changing Climate." *Science* 315 (5812): 640–642. doi: 10.1126/science.1136401.

Sweet, L.

2020 *Romulea rosea* var. *australis* Risk Assessment. California Invasive Plant Council. Created on August 20, 2016. Accessed April 8, 2020. https://www.cal-ipc.org/plants/risk/romulea-rosea-risk/

USDA-NRCS (US Department of Agriculture-Natural Resources Conservation Service)

2014 Web Soil Survey. Marin County California – CA041. Accessed June 26, 2019. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

USGS (US Geological Survey)

2020 2012-2016 California Drought: Historical Perspective. California Water Science Center. Accessed April 8, 2020. https://ca.water.usgs.gov/california-drought/california-drought-comparisons.html.

APPENDIX F—MANAGEMENT ACTIVITIES, PRACTICE STANDARDS, AND MITIGATION MEASURES

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APPENDIX F: MANAGEMENT ACTIVITIES, PRACTICE STANDARDS AND MITIGATION MEASURES

Introduction

The environmental impact statement (EIS) contains several tiers of National Park Service (NPS) oversight to ensure natural and cultural resources are protected while allowing ranching to occur in Point Reyes National Seashore (Point Reyes) and the north district of Golden Gate National Recreation Area (collectively referred to as the park). First, the agricultural lease/special use permits (lease/permits) would constitute the overall authorization for ranch families to operate on park lands, including general terms and conditions, commitments, and standards for ranching operations. Items addressed by lease/permit general terms and conditions include tree and vegetation removal; ground disturbance; use of hazardous materials; pesticides and herbicides; the treatment of livestock; management of refuse and carcasses; and protection of wildlife, plants, and water quality. Second, the subzoning framework would ensure resource protection by identifying the most appropriate locations on each ranch for grazing and Management Activities. Third, each lease/permit would require ranchers to enter into a ranch operating agreement (ROA), identifying ranch-specific operational details and requirements associated with beef or dairy ranching (as applicable), authorized diversification activities, and maintenance requirements. The ROA would also identify Management Activities, required United States Department of Agriculture-Natural Resource Conservation Service (NRCS) Conservation Practice Standards (Practice Standards), and mitigation measures that apply to the authorized activities that are outlined in this appendix.

This appendix was adapted from numerous compliance documents, including established guidance from the NRCS, the Marin Resource Conservation District Permit Coordination Program (which was established to streamline permitting for many of the Activity Types listed herein), as well as previous NPS National Environmental Policy Act (NEPA) compliance for projects, and biological opinions from the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).

To ensure protection of natural and cultural resources, streamline the permitting process for typical ranch maintenance activities, and provide consistent guidance to ranchers, this appendix outlines standardized Management Activities, Practice Standards, and required mitigation measures that will be permitted on ranches. Consistent with the EIS process, certain Practice Standards or Management Activities may be authorized only in specific subzones. The subzoning framework that designates ranchlands as Resource Protection, Range, Pasture, and Ranch Core subzones is based on analysis of topography and existing sensitive resource information. The Resource Protection and Range subzones generally contain known sensitive resources and/or slopes greater than 20%; activities in these subzones would be the most limited.

To ensure additional protection of wildlife and livestock, the following requirements would also apply to all livestock management and would be included as conditions in the ROA or the lease/permit:

- Dead livestock shall immediately be removed from the park and disposed of in accordance with all applicable laws.
- Wildlife access to feed, organic wastes (including afterbirths and stillborn animals), and ranch-related and household trash shall be restricted using structural controls, and these items shall be promptly removed from areas where wildlife access cannot be controlled.
- Feeding livestock shall be conducted in a manner that discourages or precludes wildlife (including raven) access to feed (e.g., use of covered feed bunks).
- In the Ranch Core, use fencing that will deter wildlife from digging under or climbing over, such as multiple strand electric.
- Where appropriate, young livestock (e.g., calves, lambs, and kids) shall be confined for approximately two weeks following birth.

- Where appropriate, recently castrated/branded/docked animals shall be kept in an area close to the Ranch Core for a time to allow healing before putting them out to pasture/rangeland because wounds create odors that attract wildlife.
- All ranchers are required to provide NPS with documentation that livestock are under veterinary care. Any disease detected must be reported to NPS.

The Management Activities described in table F-1 are analyzed in the EIS for a general management plan amendment (GMP Amendment) for the park. They are intended to guide planning, implementation, and operation and maintenance for ranches. Specific mitigation measures, listed in tables F-11 through F-13 by NRCS Practice Standard (presented at the end of this appendix), would limit potential impacts on sensitive resources. The mitigation measures were developed to provide a level of impact avoidance and minimization for all Management Activities and are mandatory when implementing any of the activities. The NRCS Practice Standards are designed to address the treatment of natural resource concerns. They are technical guidelines that contain information on the intended purpose and location where the practice may be applied, specifying the minimum quality criteria that must be met during the application or installation of the practice. Specific design requirements, avoidance measures, and mitigation measures that apply to all Activity Types are listed first. In addition, all Management Activities must fit within their individual maximum size limits; individual activities or projects that exceed the maximum limits do not qualify for coverage through the EIS. A *project* entails the establishment of any new Management Activity associated with one or more Practice Standards not in effect on a given ranch. Each project may constitute implementation of one or more Management Activities listed below (see table F-1). For example, a road upgrade project to address erosion from a ranch road could require use of Practice Standards for planning and installation of (1) an Access Road with (2) a Lined Waterway that would carry excess upland surface runoff to (3) a Structure for Water Control (e.g., a culvert). One project would comprise these three practices for the Road Upgrade Management Activity. Recurring Management Activities (e.g., annual mowing) would not be counted as new individual projects once established.

Unless noted in tables F-11 through F-13, the lessee is responsible for ensuring all mitigation measures are carried out for any Management Activity, including monitoring for compliance with the conditions herein for any contracted work. In the case that a third party (e.g., Marin Resource Conservation District) or NPS is the lead manager of the project, then the designated lead project manager would be responsible for ensuring mitigation measures are carried out. NPS would monitor recurring activities on each ranch to ensure mitigations are being met as defined through the ROA for that ranch once the activities are established. NPS would provide oversight and require a pre-construction meeting to review all applicable mitigation measures prior to the start of any new construction project or Management Activity. The NPS or lead project manager would also conduct a post-construction meeting to ensure the mitigation measures were carried out.

NPS can approve Management Activities covered by the EIS and that meet the criteria identified in this appendix without the need for additional NEPA compliance. Proposals for activities not included in the ROA shall be submitted in writing to NPS at least 30 days in advance of the annual ROA meeting, as required by the lease/permit.

Proposals for new activities not analyzed in the EIS will require individual review under NEPA and shall be submitted in writing to NPS at least 30 days in advance of the annual ROA meeting. NPS will determine whether to approve new activities on a case-by-case basis. Additional review and compliance could include the National Historic Preservation Act (NHPA); agency consultation; and federal, state, and local permitting requirements, as appropriate. Project leads, at their sole cost and expense, are responsible for obtaining approval deemed necessary by any agency. NPS would work with ranchers during annual meetings to identify projects and consolidate and coordinate review of ranch projects.

When developing and implementing projects, the lead project manager (lessee, third party, or NPS) shall adhere to these general principles and applicable conditions from the lease/permit to avoid or minimize the potential for adverse impacts:

- Permanent fill of wetlands shall not be authorized without consultation and issuance of regulatory permits from the US Army Corps of Engineers and/or Regional Water Quality Control Board.
- Projects in potential California red-legged frog habitat shall be designed to minimize disturbance to vegetation near or in permanent and seasonal pools of streams, marshes, ponds, or shorelines with extensive emergent or weedy vegetation.
- Ground and vegetation disturbance shall not exceed the minimum area necessary to complete the project. Removal of native trees and shrubs shall be minimized and only occur when necessary to meet project objectives.
- Site-specific design plans shall show the maximum extent of grading and include requirements to protect sensitive natural and cultural resources during construction and maintenance activities, including erosion control measures.
- Disturbed areas shall be restored to pre-construction or better conditions.
- Construction managers shall prepare and implement a spill prevention and clean-up plan, stormwater pollution prevention plan, or similar document for all construction projects. The plan shall address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales and silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas.
- Refuse, litter, trash, unused materials, and construction and other debris shall be removed from the premises and disposed of in an environmentally sound manner in accordance with applicable laws. Fencing and storage materials shall be reused when possible.
- Activities involving the use of heavy equipment (e.g., harvesting, mowing, shrub management, and seeding) shall not occur during rainy or saturated soil conditions.
- Planning shall consider methods available to achieve objectives and use the method(s) least disruptive to the habitat of endangered or sensitive species. If sensitive habitats or species near to proposed work must be avoided, the area shall be flagged and/or an NPS-approved representative shall be present on-site to denote sensitive resources. The parties implementing the project shall avoid all NPS-delineated sensitive resources.
- The spread or introduction of invasive plant species and other noxious weeds shall be avoided to the maximum extent possible by protecting areas with established native vegetation; implementing preventative measures, such as use of certified weed-free materials and inspection and cleaning of all equipment before entering or exiting sites during construction; restoring disturbed areas with native species where appropriate; performing post-project monitoring; and controlling non-native species.
- Ranchers shall employ integrated pest management (IPM) strategies (i.e., prevention, avoidance, monitoring, and suppression) to reduce risks to the public, park resources, and the environment from pests and pest-related management strategies.
- Because the practices appropriate for a given ranch depend on project layout, topography, soil types, and other factors, technical assistance from local USDA-NRCS, Resource Conservation District, University of California (UC) Cooperative Extension, licensed professionals, or other experts may be required.
- NPS shall oversee any use of biological control agents.

- NPS or the responsible party shall monitor and maintain all erosion control systems to ensure that issues can be addressed before failure.
- Cyclic maintenance of new and existing ranch infrastructure shall be performed as per the lease/permit or project requirements.
- Operations shall be conducted in such a manner that soil erosion and air and water pollution are minimized and held within legal limits.
- The owner, operator, contractor, or other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regard for the safety of all persons and property.
- Activities shall follow all specifications associated with Practice Standards unless otherwise approved by NPS.

Proposed Management Activities and projects would require review and approval by NPS to ensure adherence to these principles.

Agencies with potential jurisdiction over these activities include USFWS, NMFS, the Regional Water Quality Control Board, and California Coastal Commission. These agencies may stipulate additional requirements for Management Activities or projects. All actions would adhere to stipulations within the biological opinions issued under the GMP Amendment, state and federal water quality laws, and the terms of any applicable permits, including San Francisco Bay RWQCB Waste Discharge Requirements and Waivers of Waste Discharge Requirements.

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

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

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

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

F-1: MANAGEMENT ACTIVITIES BY ACTIVITY TYPE

Activity Type	Description	Associated NRCS Practice Standard(s)
Ranch Infrastructure and Water Control Management		
Road Upgrade and Decommissioning	Improvements to an existing road network for the purpose of preventing erosion and protecting water quality that may include re-grading surfaces (e.g., out-sloping, crowning, in-sloping); construction of water bars, rolling dips, or critical dips; removal or addition of roadside ditches to assist with stormwater drainage; installation or repair of ditch relief culverts or critical culverts; removal of a screen or installation of a trash rack at a culvert inlet; construction of cross-road drains; and protection of ecologically sensitive, erosive, or potentially erosive sites.	Access Road (560) Trails and Walkways (575) Structure for Water Control (587) Road Closure and Treatment (654)
Infrastructure Improvement	Management Activities to protect water quality and reduce erosion, including heavy use area protection, establishment of suitable vegetation to convey surface water at a non-erosive velocity using a broad and shallow cross section to a stable outlet, strips of vegetation to filter pollutants, roof and covers, and roof runoff structures to divert clean water away from potential pollutant sources.	Heavy Use Area Protection (561) Roof and Covers (367) Roof Runoff Structure (558)
Waterway Vegetation and Planting	Used in areas where added water conveyance capacity and vegetative protection are needed to prevent erosion and improve runoff water quality through infiltration that removes sediment, other suspended solids, and dissolved contaminants in runoff (table F-4). The Waterway Vegetation and Plantings Management Activity includes two Practice Standards—Grassed Waterway and Filter Strip. Installation of waterway vegetation and plantings often requires grading and use of equipment.	Grassed Waterway (412) Filter Strip (393)
Fencing	Facilitates management goals and objectives by providing a means to control movement of animals and people, including vehicles.	Fence (382)
Livestock Water Supply	Actions to provide a dependable supply of water for livestock, including the collection system (e.g., pipeline, trench, appurtenances below ground). Implementation may require shallow digging/trenching for removal/installation of piping and associated equipment. This practice may include installation of an underground outlet to safely disperse concentrated runoff.	Spring Development (574) Livestock Pipeline (516) Underground Outlet (620) Watering Facility (614) Pumping Plant (533)
Pond Restoration	May include structural component repair, including spillways, alternative pipe outlets for water flow, and embankment repair, as well as obstruction removal and pond desiltation as necessary to maintain the pond.	Pond Restoration (378[R])

Activity Type	Description	Associated NRCS Practice Standard(s)
Waterway Stabilization	Stabilization of a gully or downcutting channel by installing a structure to control the grade and/or stabilize the slope. Implementation may require some grading and installation of brush, erosion-control fabric, rock, or timber structures that do not impound water but rather allow water to be conveyed in a stable manner. Actions may include installing a rock weir to control and slow in-channel flow; adding rock to stabilize a gully draining towards a stream channel; lining an eroding swale or diversion ditch; rock armoring an eroding ditch; armoring below an outlet; installing an energy dissipater at a spillway or pipe outlet to a channel; and stabilizing and protecting streambanks through laying back the bank, bioengineering, or vegetated rock installation.	Grade Stabilization Structure (410) Lined Waterway or Outlet (468)
Stream Crossing	Installation of a ford, bridge (channel-spanning when feasible), or culvert crossing for people, livestock, equipment, or vehicles where necessary for access over an intermittent or perennial watercourse to protect water quality, habitat, and species.	Stream Crossing (578)
Vegetation Management		
Upland and Riparian Vegetation Management and Planting	Plant establishment to stabilize a disturbed area, reduce stormwater flow velocity and surface flow erosion, encourage infiltration, and enhance or establish wildlife habitat. Actions may include planting a vegetative buffer along a field perimeter to filter runoff exiting the area; establishing native grasses, forbs, shrubs, or trees in disturbed or eroding areas; planting permanent vegetation at a pipe or underground outlet; maintenance of a dense line of vegetation to function as a wind break/habitat enhancement/barrier to noise or to increase carbon storage capacity consistent with historic landscape, alignment, and species; establishing perennial or self-sustaining vegetation across fields used as rangeland; and replacing invasive species and potential disease-host plants with native species.	Critical Area Planting (342) Range Planting (550) Riparian Herbaceous Cover (390) Riparian Forest Buffer (391) Windbreak/ Shelterbelt Establishment (380) Tree/Shrub Establishment (612) Mulching (484) Conservation Cover (327) Wildlife Habitat Planting (420)
Mowing	The timely cutting, and in some cases removal of, herbaceous vegetation for forage, control of herbaceous weeds, and woody (nonherbaceous) plants including those that are invasive and noxious.	Brush Management, Mechanical (314-A) Herbaceous Weed Treatment (315)

Activity Type	Description	Associated NRCS Practice Standard(s)
Integrated Pest Management (IPM)	Managing pest infestations (including weeds, insects, and diseases) to reduce adverse effects on environmental resources. The removal or control of herbaceous weeds, including invasive, noxious, and prohibited plants to enhance accessibility, quantity, and/or quality of forage and/or browse; restore or release native or create desired plant communities and wildlife habitats consistent with the site potential; protect soils and control erosion; reduce fine fuel loads and wildfire hazard.	IPM (595)
Targeted Grazing	Managing the harvest of vegetation with grazing and/or browsing animals with the intent to achieve specific ecological management objectives including one or more of the following: Improve or maintain desired species composition, structure, and/or vigor of plant communities Improve or maintain surface and/or subsurface water quality and/or quantity Improve or maintain riparian and/or watershed function Reduce soil erosion and maintain or improve soil health Improve or maintain the quantity, quality, or connectivity of food and/or cover available for wildlife Manage fine fuel loads to achieve desired conditions	Prescribed Grazing (528)
Other Management Activities (applicable only on ranches where currently authorized)		
Manure and Nutrient Management	Installation of practices that improve management of manure, thereby resulting in improved water and/or air quality conditions. Actions include installation of manure/liquid separators, composting pads, techniques resulting in a reduction of greenhouse gas emissions, such as conversion from dairy flush to scrape systems, and the proper transfer of liquid manure to avoid impacts on environmentally sensitive areas. Agricultural management practices to protect water quality, such as the amount (rate), orientation, collection, placement, and timing of animal manure, residue, and amendments on the soil surface year-round while limiting soil-disturbing activities to only those necessary to place nutrients and condition residue.	Nutrient Management (590) Composting Facility (317) Waste Treatment (629) Waste Separation Facility (632) Waste Transfer (634) Waste Storage Facility (313)
Forage Production	Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, silage, haylage, or hay, production, and the timely cutting and removal of forage from the field while limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface. On dairies, nutrient management may also be included as a soil amendment for forage production.	Forage and Biomass Planting (512) Forage Harvest Management (511) Residue and Tillage Management/ No-Till (329)

Authorization of diversification activities would be evaluated based on rancher proposals. The general types of diversification activities that could be authorized are discussed in the EIS, and general mitigation measures are included in table F-14 (presented at the end of this appendix). Additional mitigation measures could be required depending on the proposal and type of diversification.

NRCS Conservation Practice Standards that have been identified as having greenhouse gas mitigation and/or carbon sequestration benefits on farms and ranches are denoted with an *asterisk* below, based on NRCS Comet-Planner (http://comet-planner.com/).

Detailed Descriptions of Management Activities and Associated NRCS Conservation Practice Standards

Ranch Infrastructure and Water Control Management

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

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

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

Culverts may be installed or replaced under the road to provide or improve drainage. Although culverts would generally be sized for a 100-year, 24-hour storm event, smaller culverts may be used (minimum 10-year storm capacity but not less than 12 inches in diameter) if topography and overflow facilities are adequate to prevent damage from larger storms or site conditions preclude use of a larger culvert. Outlets would be placed in a well-vegetated area that would not be subject to erosion, or the outlet would be rocked with an energy dissipater or stabilized by other means to provide a suitable location to discharge stormwater from the roadway that prevents erosion.

Trails and Walkways (575)—This Practice Standard applies to a *trail*, a feature with a vegetated or earthen surface, or to a *walkway* that has an artificial surface. Upgrades include improvement of an existing travel lane on agricultural lands for livestock, pedestrians, and off-road vehicles used exclusively for agricultural purposes (e.g., farm all-terrain vehicles that are not designed for use on public roads) to traverse difficult, ecologically sensitive, or erosive terrain. The Trails and Walkways Practice Standard may also improve access to forage or water and to agricultural or maintenance operations and does not apply to roads constructed for movement of equipment or nonagricultural vehicles. Any required culverts

would be designed to carry, at a minimum, a 2-year, 24-hour flow, although, if watershed conditions or anticipated usage warrant, a larger storm-event design may be used.

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

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

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

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

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

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

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

Infrastructure Improvement. Infrastructure Improvement Management Activities protect heavily used areas by preventing erosion and degradation of critical infrastructure, separating clean runoff from potential pollutant sources, and preventing flooding in Ranch Core areas. These could include establishment of suitable vegetation to convey surface water at a nonerosive velocity using a broad and shallow cross section to a stable outlet, strips of vegetation to filter pollutants, roof and covers and roof runoff infrastructure and placement of materials to stabilize a ground surface. Structure for Water Control (587) is also a Practice Standard for Infrastructure Improvement; details and size limitations are provided above under Road Upgrades and Decommissioning.

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

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

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

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

TABLE F-3: SIZE LIMITATIONS PER PROJECT FOR INFRASTRUCTURE IMPROVEMENT

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

Waterway Vegetation and Planting. Waterway Vegetation and Planting Management Activities are used in areas where added water conveyance capacity and vegetative protection are needed to prevent erosion and improve runoff water quality through infiltration that removes sediment, other suspended solids, and

dissolved contaminants in runoff (table F-4). The Waterway Vegetation and Planting Management Activity includes two Practice Standards—Grassed Waterway and Filter Strip. Installation of Waterway Vegetation and Plantings would often require grading and use of equipment.

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

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

*Grassed Waterway (412)**—Installation of a vegetated, shaped or graded waterway is used to convey surface water at a nonerosive velocity using a broad and shallow cross section to a stable outlet. This Practice Standard is designed to reduce erosion in a concentrated flow area in order to reduce sediment and other substances delivered to receiving waters. Vegetation may act as a filter to remove some of the sediment, although this is not the primary function of a grassed waterway; see the Filter Strip Practice Standard below.

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

*Filter Strip (393)**—Filter Strips are permanent areas of vegetation designed to remove both suspended and dissolved sediment, organic matter, and other pollutants from runoff and wastewater. This Practice Standard would be used between high use agricultural lands and environmentally sensitive areas. When the field or high use area borders are located such that runoff occurs as sheet flow, coarser-grained sediments are filtered and deposited.

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

Fence. *Fencing (382)* is used to facilitate conservation objectives by providing a means to control the movement of animals, people, and vehicles (table F-5). This Practice Standard includes both digging/trenching for post holes and installation of aboveground fencing. It can be used for livestock management in the Ranch Core, in a rotational grazing program, to restrict access to an area being revegetated, and to restrict livestock access to sensitive resources, such as riparian areas or creeks. Based on objectives, fences may be permanent, portable, or temporary. Fencing materials, type, and design would be of a high quality and durability to meet the management objectives and site challenges. Fences would be located and installed to meet appropriate NPS wildlife and land management needs and requirements.

TABLE F-5: SIZE LIMITATIONS PER PROJECT FOR FENCING

Item	Practice Acres	Additional Criteria
Fencing	N/A	Livestock fencing must be wildlife-friendly, unless otherwise approved by NPS.

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

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

Spring Development (574)—The Spring Development Practice Standard is used to improve the distribution of water or to increase the quantity of water available for livestock and wildlife. Piping is installed from water-bearing soil and rocks to a trough or tank away from the spring. A wooden or concrete box or plastic pipe backfilled with gravel (spring box) may also be installed to hold the water before distribution. In some cases, horizontal drilling may be used to tap into the water source. The area around the spring or seep would be fenced to control livestock access and improve habitat values. The Spring Development Practice Standard is included in the EIS for circumstances where the it would have minimal effects on springs or adjacent wetland habitat or involves redevelopment of an existing spring and would provide water quality improvements to nearby waterways. Spring Development would use an excavation process that does not result in placement of fill in or around spring areas, although fencing would be installed to exclude livestock from the area.

Livestock Pipeline (516)—The Livestock Pipeline Practice Standard conveys water from a source of supply to a point of use to direct livestock away from springs, streams, and other waterbodies. Livestock Pipelines may be made of flexible conduit materials, such as plastic, steel, or ductile iron pipe. Appurtenances used with pipelines may include inlets, outlets, check valves, backflow prevention devices, booster pumps, pressure tanks, surge tanks, air chambers, and pressure or air relief valves. Livestock Pipelines would be placed only in or on soils suitable for the type of material selected. Steel pipe installed above ground would be galvanized or insulated with a suitable protective paint coating. Plastic pipe installed above ground would be resistant to ultraviolet light throughout the intended life of the pipe, or measures would be taken to protect the pipe from damage due to ultraviolet light.

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

Underground Outlet (620)—An Underground Outlet is a conduit or system of conduits installed below the ground to convey surface water to a suitable outlet where the discharge can occur without causing damage by erosion, polluted runoff, or flooding. The design capacity of an Underground Outlet Practice Standard would be based on size of the structure or feature that it serves and its intended purpose. It may be

designed to function as the only outlet or in conjunction with other types of outlets. Components of Underground Outlets, including inlet collection boxes and conduit junction boxes, would be designed with sufficient size to allow efficient maintenance and cleaning operations.

Watering Facility (614)—This Practice Standard involves the installation of water storage tanks (rainwater and groundwater supply) or water troughs and a plumbed pumping system to deliver water at a designed pressure and flow rate. This can include minor grading, shaping, and construction of a pad for the tank or troughs.

A Watering Facility is used to provide livestock and/or wildlife with drinking water to meet daily needs. Proper location of troughs would improve animal distribution and associated utilization of vegetation. They are sometimes installed to keep livestock out of streams and other surface water areas where water quality is a concern, often associated with Fencing.

This Practice Standard applies to all land uses where there is a need for a Watering Facility for livestock and/or wildlife, where there is a source of water that is adequate in quantity and quality, and where soils and topography are suitable for the structure.

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

Pumping Plant (533)—The Pumping Plant Practice Standard describes a facility that delivers water at a designed pressure and flow rate to meet a conservation need. Components of the facility include the required pump, associated power unit, plumbing, and necessary appurtenances. It also may include on-site fuel or energy sources and protective structures. The power supply for a Pumping Plant may come from line power, photovoltaic panels, or water-powered pumps (hydraulic rams) with generator backup.

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

TABLE F-6: SIZE LIMITATIONS PER PROJECT FOR LIVESTOCK WATER SUPPLY

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Spring Development	N/A	0.05 acre	75	Springs would not provide water for recreation or construction activities.
*Livestock Pipeline; see also in-stream limitations below	6,000 feet	--	1,500 cubic yards	Limited to 50 feet across per channel.
*Pipelines Located In-Stream or in the Riparian Zone	250 feet	100 square feet	15 cubic yards	Included in the totals listed above.
Underground	100 feet	0.1 acre	100 cubic	Pipelines and underground

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Outlet			yards	outlets installed in a stream would not include grouted rock, headwalls, or similar features. All outlets would have animal guards that allow passage of debris while blocking entry of animals large enough to restrict the flow in the conduit.
Watering Facility	N/A	N/A	N/A	Troughs would be constructed with wildlife ramps.
Pumping Plant	N/A	N/A	N/A	Maximum pump size is 3 horsepower; maximum pump rate is 10 gallons per minute.

Pond Restoration. *Pond Restoration (378[R])* is limited to restoration and maintenance of existing water impoundment structures (table F-7). No new in-stream ponds or restoration activities that would involve an increase in the original area or storage capacity of a pond are authorized.

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

TABLE F-7: SIZE LIMITATIONS PER PROJECT FOR POND RESTORATION

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

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

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

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

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

Grade Stabilization Structure (410)—A Grade Stabilization Structure is used to control grade or stabilize a slope or downcutting channel, manage gully erosion, and eliminate erosional headcutting and formation or advancement of gullies (table F-9). This Practice Standard refers to vegetation, erosion-control fabric, rock, or timber structures that do not impound water but rather allow water to be conveyed in a stable manner that results in reduced erosion and improved downstream water quality. Installation would involve grading and bioengineering techniques for placement of rock or geotextile fabric and revegetation to stabilize the eroding area or prevent headcuts from moving further upslope. Design considerations would include water quantity and quality, as well as the visual quality of downstream water resources.

Lined Waterway or Outlet (468)—A Lined Waterway or Outlet has an erosion-resistant lining of rock, erosion control/reinforcement fabric, or other permanent material designed to convey runoff without causing erosion or flooding (table F-8). This Practice Standard is used to provide safe conveyance from diversions, terraces, or other concentrated water sources on sites where it is not practical to establish or maintain a Grassed Waterway; it is not used for irrigation water conveyance or in a natural watercourse. Lined Waterways or Outlets would be used in areas where:

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

TABLE F-8: SIZE LIMITATIONS PER PROJECT FOR WATERWAY STABILIZATION

Item	Length	Disturbance Area	Soil Disturbance	Additional Criteria
Grade Stabilization Structure	1,000 feet	1.5 acres	1,000 cubic yards	No more than 350 cubic yards of fill per rock structure. This Practice Standard would be sized to match the dimensions of the channel or gully and would be neither larger nor smaller than required to achieve stability.
Lined Waterway or Outlet	500 feet	2 acres	2,000 cubic yards	No longer than 500 feet per project. If used, concrete must cure for a minimum of 30 days or be coated with an agency-approved sealant until it is dry before being allowed to interface water.

Stream Crossing. The purpose of the *Stream Crossing (578*) Practice Standard is to install a permanent stabilized area or structure across a perennial or intermittent watercourse to provide access for people, livestock, equipment, and vehicles and to protect water quality through reducing potential for delivery of sediment and other pollutants into the water during use of the crossing (table F-9). Stream Crossings include stabilized areas, such as fords, wet crossings, and structures (e.g., bridges and culverts). Bridges authorized under this Management Activity would fully span the watercourse from top-of-bank to top-of-bank.

Ford crossings are best suited for use in wide, shallow watercourses with firm streambeds and when use of the crossing is infrequent. However, if the Stream Crossing would be used often, as in a dairy operation, a bridge or culvert would often be required. Implementation of Stream Crossings may require grading and use of mechanized equipment.

Stream Crossings would be designed to account for site conditions and accommodate sediment transport and passage of large woody materials. Proposed sites would first be evaluated to determine whether a crossing is necessary or if other activities or management strategies can be used in lieu of the crossing. Replacement of crossings would take frequency of use into account, and former crossings could be changed to a different type or removed if other strategies are feasible.

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

threatened and endangered species) that may be affected by construction of the crossing would be assessed.

TABLE F-9: SIZE LIMITATIONS PER PROJECT FOR STREAM CROSSINGS

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

Vegetation Management

Upland and Riparian Vegetation Management and Planting. The Upland and Riparian Vegetation Management and Planting Management Activity include the following Practice Standards: Critical Area Planting, Range Planting, Riparian Herbaceous Cover, Riparian Forest Buffer, Windbreak and Shelterbelt Establishment, Tree and Shrub Establishment, Mulching, Conservation Cover, and Wildlife Habitat Planting. The purpose of Upland and Riparian Vegetation Management and Planting is to:

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

The associated Practice Standards of Critical Area Planting, Range Planting, Riparian Herbaceous Cover, Riparian Forest Buffer, Windbreak/ Shelterbelt Establishment, Tree/Shrub Establishment, Mulching, Conservation Cover, and Wildlife Habitat Planting support establishment of adapted perennial or self-sustaining vegetation, such as grasses, forbs, legumes, shrubs, and trees using species approved by NPS. Herbicides and other biological treatments (e.g., grazing) may be used to control or eliminate invasive, noxious, or toxic infestations. NPS IPM regulations and mitigation measures would be followed when herbicides are used. Biological treatment plans for Upland and Riparian Vegetation Management and Planting would provide references for containment and management or control of target species; kind of grazing animals to be used; timing, frequency, duration, and intensity of grazing or browsing; desired degree of grazing or browsing use for effective control of target species; maximum allowable degree of use on desirable nontarget species; and precautions or requirements associated with the selected

treatments. Vegetation Management activities may include minor grading or digging to remove roots and prepare the area for planting.

There are no size limitations on Upland and Riparian Vegetation Management and Planting. However, the following limitations on vegetation removal would apply to all the activities:

- No more than 0.10 acre of native riparian trees, shrubs, or woody perennials may be removed from a stream area, and only if the area would be replanted with native vegetation.
- Where the area contains a mix of native and invasive species, no more than 0.25 acre of vegetation may be treated or removed from a streambank or stream channel, and only if the area would be replanted with native vegetation where appropriate.
- Outside riparian areas and other sensitive habitats, native vegetation may be removed only if replanting with native vegetation is completed at the site.
- Where the area is exclusively nonnative species, up to 5 acres of riparian vegetation may be removed and/or treated.

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

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

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

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

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

*Windbreak and Shelterbelt Establishment (380)**—Windbreaks are documented as features within the historic landscape. Maintenance of historic Windbreaks would be encouraged under this Practice Standard. Consistent with the cultural landscape designation, alignment and species should be consistent with the historic condition.

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

*Mulching (484)**—Mulching involves applying plant residues or other suitable materials to the land surface to improve the efficiency of moisture management, prevent or reduce erosion, improve plant productivity and health, maintain or increase organic matter content, or reduce emissions of particulate matter. Materials are spread evenly over a site and could include anchoring methods, if necessary, to hold the materials in place for a specified period. Spreading of wood products or inorganic materials must be at a minimum depth of 2 inches, and inorganic materials, such as gravel, must be a minimum size of 0.75 inch. Straw or grass hay must be applied at a rate to achieve a minimum 70 percent ground cover. Plant-based mulch materials with a carbon (C) to nitrogen (N) ratio less than 20:1 must not be applied where there is potential to enter watercourses. A Plans and Specifications document must be prepared that includes purpose of the cover, type of material to be used, percent cover or thickness of application, timing of application, site preparation, methods of anchoring, and operation and maintenance requirements. Materials used, including compost, must be approved by NPS.

*Conservation Cover (327)**—Conservation Cover involves establishing and maintaining permanent vegetative cover to reduce erosion, protect water quality, reduce emissions of particulate matter and greenhouse gasses, enhance wildlife habitat, or improve soil health. This Practice Standard may be used to promote the conservation of wildlife species in general, including threatened and endangered species. It does not apply to planting for Forage Production or Critical Area Planting. Species utilized must be native, adapted, and suitable to the site as approved by NPS. Removal of products would not be permitted. The site must be protected from grazing and trampling to the extent necessary to achieve the desired purpose. Herbaceous weed management or Mulching may be required to reduce competition from

weeds or improve establishment of the cover. A Plans and Specifications document must be prepared that includes species to be used, seeding rates and dates, establishment procedures, actions needed to ensure adequate cover of desired species, and operation and maintenance requirements.

Wildlife Habitat Planting (420)—Wildlife Habitat Planting involves the planting of native herbaceous vegetation or shrubs to establish wildlife habitat that resembles the historic, desired, and reference native community or to improve degraded wildlife habitat for a target species or guild. This Practice Standard applies to all lands where inadequate wildlife habitat is identified as a primary resource concern and a plant community inventory or wildlife habitat evaluation indicates a benefit in altering the current vegetative conditions (species diversity, richness, structure, and pattern) by establishing herbaceous plants or shrubs. The use of annuals that persist over the life of the Practice Standard and annuals that serve as a nurse crop to support the establishment of the persistent vegetative species are appropriate under this Practice Standard. The Practice Standard does not apply to the planting of trees, repeated cultivation, planting primarily for erosion control or water quality purposes, restoration of abiotic conditions or rare communities, or the treatment of weeds or woody vegetation. A Plans and Specifications document must be created that identifies the target wildlife species or guild, success criteria (target conditions) for the planting, including the target conditions and timeframes, vegetative establishment measures needed to meet minimum criteria, target habitat conditions to be created (including plant species richness, diversity, pattern and structure, taking into account season of use, life history, home range, condition of adjacent habitats, and landscape context), risks from or to nontarget species, plant material composition, rates, planting depth, and proper handling, necessary vegetative establishment protocols (including site preparation, weed and pest control, planting rates, planting dates, planting methods), post-planting management actions (e.g. mowing annual weeds and inspections/control for invasive plants), and other operation and maintenance requirements. Where the area is exclusively nonnative species, up to 5 acres of riparian vegetation may be removed and/or treated. All species used must be approved by NPS.

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

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

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

may be taken off site for consumption by cattle. Pending NPS approval, Herbaceous Weed Treatment may be conducted by ranch operators within Pasture, Range and Ranch Core subzones as identified in the Ranch Operating Agreement. NPS and ranch operators may also consider actions to manage herbaceous weeds within the Resource Protection subzone as appropriate.

Integrated Pest Management. *IPM (595)* is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. It a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage by cost-effective means while posing the least possible risk to people, resources, and the environment (NPS 2006). The purpose of IPM is to: prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses; prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses; prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact; and prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans. NPS addresses pest issues on a case-by-case basis following an IPM policy, which helps determine the combination of procedures that are most effective for each pest situation. The decision to incorporate a chemical, biological, or bioengineered pesticide into a management strategy is based on a determination that a product is necessary, and other available options are either not acceptable or not feasible. Proposals for the use of a pesticide, biological control agent, or genetically modified organism (also known as pesticide use proposals), are reviewed on a case-by-case basis by the Park IPM Coordinator considering site-specific conditions. NPS must approve the pesticide use proposal before a product can be purchased or applied. Pesticide applications are only to be performed by or under the supervision of a certified or registered applicator licensed under the procedures of a federal or state certification system. All pesticide applications are reported to NPS annually.

Targeted Grazing. *Prescribed Grazing (528)** includes managing grazing and/or browsing animals with the intent to achieve specific management objectives. This Practice Standard would be conducted in coordination with NPS as a part of a conservation management system to achieve one or more of the following: improve or maintain desired species composition, structure, and/or vigor of plant communities; improve or maintain surface and/or subsurface water quality and/or quantity; improve or maintain riparian and/or watershed function; reduce soil erosion and maintain or improve soil health; improve or maintain the quantity, quality, or connectivity of food and/or cover available for wildlife; and manage fine fuel loads to achieve desired conditions.

Other Management Activities (Applicable only on Ranches Where Currently Authorized)

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

*Nutrient Management (590)**—Nutrient Management involves development of a plan to manage the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments to all lands where plant nutrients and soil amendments are applied. The purpose of Nutrient Management is to minimize nonpoint-source pollution to surface and groundwater, to properly use compost as a soil amendment, to protect air quality, and to maintain or improve soil and crop conditions.

The type, amount, and timing of nutrients and soil amendments would be based on soil testing, planned crop yield, growing season of target plants, and carbon sequestration goals and potentials.

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

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

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

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

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

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

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

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

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

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

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

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

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

TABLE F-10: SIZE LIMITATIONS PER PROJECT FOR MANURE AND NUTRIENT MANAGEMENT

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

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

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

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

*Forage and Biomass Planting (512)**—This Practice Standard involves establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, silage, haylage, or hay production to improve or maintain livestock nutrition and/or health, provide or increase forage supply during periods of low Forage Production, reduce soil erosion, or improve soil and water quality. Planted species would be approved by NPS and not contain species considered noxious weeds. Planting would occur in the fall using a no-till seed drill, which may be conducted in combination with Nutrient Management under a plan approved by NPS. The seeding/planting component of the required plan would

address the following elements: site/seedbed preparation, nutrient management (if applicable), methods of seeding/planting, timing of seeding/planting, selection of species, seed/plant source, seed analysis, and rate of seeding/planting.

Forage Harvest Management (511)—This Practice Standard involves the timely cutting and removal of forages from the field as hay, green-chop, or ensilage. Forage would be harvested based on stage of maturity, moisture content, length of cut, stubble height, harvest interval to achieve optimal use (i.e., silage, haylage, hay), plant community, and stand life. Approaches to minimize harvest impacts on wildlife should be considered when using this Practice Standard (e.g., harvest timing, cutting procedures, and cover patterns). Storage of harvested forage would use an associated runoff management system and/or Waste Storage Facility to avoid seepage. The Forage Harvest Management component of the required NPS approved plan would address the following elements: goals, objectives, and specific purpose, method of harvest, stage of maturity, optimal harvest moisture content, length of cut, stubble height to be left, harvest interval, and contaminant avoidance recommendations.

*Residue and Tillage Management/ No-Till (329)**—This Practice Standard limits soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface to reduce sheet, rill and wind erosion, reduce tillage-induced particulate emissions, maintain or increase soil health and organic matter content, increase plant-available moisture, and reduce energy use. Soil disturbance is limited to the methods of planting/seeding under the Forage and Biomass Planting Practice Standard. Residues would be distributed evenly over the entire field and maintain a minimum of 60% residue cover on the soil surface throughout the year. Approaches to minimize harvest impacts to wildlife should be considered (e.g., leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover for one or more years). Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10% of the field may be tilled for this purpose.

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TABLE F-11: RANCH INFRASTRUCTURE, INCLUDING WATER CONTROL MANAGEMENT PRACTICE STANDARDS AND MITIGATION MEASURES

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
Mitigations **NOTE: If sensitive resources are not in the project area that mitigations are intended to protect, the NPS may waive that mitigation requirement. Further, if the proposed practice does not require the level of disturbance or equipment addresses, additional mitigation measures may be required. Additional mitigation measure may be added to this list over the 20-year lease/permit term, as necessary.**																						
Use of heavy machinery shall be performed by experienced operators and heavy machinery shall: ▪ avoid steep slopes (>20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ be kept at least 10 feet from any cliffs or steep banks ▪ only be allowed based on daily fire danger rating ▪ avoid woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ avoid significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoid waterbodies and riparian zones unless specifically required and approved by NPS as critical to the project objective (e.g. Pond Restoration, Waterway Stabilization, Stream Crossing) ▪ avoid lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Soils Vegetation Wildlife	All	University of California 2006 NPS Pitt, Burgy, and Heady 1978

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
To control the spread of plant diseases, insects, and weeds, equipment and vehicles shall be free of soil and debris accumulations on tires, wheel wells, vehicle undercarriages, and other surfaces before arrival at the park, when being moved between sites within the park, and before storing within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. All vehicles will be pressure-washed before their first entry into the park or when being moved for use in a different job site within the park. Hand tools, shovels, loaders, and other equipment must be clean and free of soil and plant debris before initial use at the park and before being moved between work sites within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. No soil or plant debris from the interior of vehicles or equipment (cabs, etc.) shall be deposited at the work site. If drivers/operators will be entering or exiting vehicles at the job site, the cab must be free of mud, soil, plant parts, and organic debris before arriving at the job site. Interior floors, floor mats, and seats must be free of potentially contaminated material. Equipment and vehicles shall be inspected by NPS to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; be removed from NPS property if deficient and properly clean it at the expense of the project manager before returning to NPS property.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Soils Vegetation	All	

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
A spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document shall be prepared and implemented for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas. Petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life are prohibited from passing into, or being placed where they can pass into the waters of the state. Equipment operators shall have emergency spill clean-up gear (spill containment and absorption materials), dry cleanup methods (i.e., absorbent materials, and/or rags), and fire equipment available on site at all times. Petroleum-powered equipment shall be stored and operated in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: ▪ All vehicles and equipment on the site shall not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel; inspect vehicles each day for leaks and repair immediately. ▪ Equipment storage, short-term maintenance, and refueling shall be conducted in a contained area located at least 100 feet from a watercourse or riparian area as approved by NPS; these activities will be prohibited from taking place on the project site unless deemed necessary for project completion by NPS. ▪ Immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence. ▪ All spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries must be collected, stored, and recycled as hazardous waste off site. All major vehicle maintenance and washing shall be conducted off site.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) NPS

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
Revegetation must be completed as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain. Temporary erosion control measures shall be used on disturbed soils until permanent vegetation is established. Disturbed and uncompacted soils shall be covered with straw mulch and/or biodegradable netting or matting. For slopes exceeding 20% staked biodegradable erosion logs or wattles are required for decelerating runoff. Silt fences or filter bags shall be used if working in areas known to flood or experience heavy flow. Temporary seeding using non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) or hydromulching may be utilized if approved by NPS. To avoid scouring, erosion control materials shall be placed to allow water to sheet as opposed to channel. Areas that may be accessed by cattle or other livestock shall be enclosed by fencing to exclude livestock until restoration goals have been met.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Air Vegetation Water	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)
Vehicles and equipment shall be restricted to one principal access route, preferably one that has been used for past activities. All vehicles and equipment shall be staged on roads, in NPS-specified staging areas, or on existing disturbed ranch operation sites.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Air Soils Vegetation Visitor Use and Exp. Water Wildlife	All	Marin PCP 2018 (BIO-3, Protect Wetlands) NPS
If access through a wetland is necessary, low ground pressure, rubber-tired equipment is required. NPS will determine the necessity and timing of access to minimize disturbance (typically later summer).	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Vegetation Water	All	Marin PCP 2018 (BIO-3, Protect Wetlands)
Erosion control and sediment detention measures must be available on site at all times and in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water. Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway. When required by NPS or project regulators, NPS staff or a qualified designee shall inspect in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits. If rain is forecast to occur while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind, and install silt fencing or wattles on contour around all stockpile locations.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Air Water	Pasture and Ranch Core	Marin PCP 2018 (HYD-2, Protect Water Quality, Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities (other than native vegetation planting or erosion control activities on disturbed sites without mechanized equipment) during the dry season, generally June 1 through October 31; exceptions may be made by the NPS in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by the NPS and project regulators.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Soils Water Vegetation Water Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
Perform work in and around areas, including structures, that may support bird nesting before March 15 or after July 31, unless vegetation height is less than 8 inches, or otherwise authorized by the NPS.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (Birds)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)
Conduct preconstruction breeding bird surveys for projects with construction activities occurring from March 15 through July 31 for special-status birds, migratory birds, and raptors (surveys for raptors would be required for work beginning as early as February 1). Conduct these preconstruction surveys in all locations identified by a qualified biologist. Conduct the surveys within three days two weeks prior to initiation of vegetation clearing, tree removal and trimming, or other construction activities. Note: the results of surveys will be reviewed by NPS prior to any work authorization. If nests are identified by the biologist, NPS will work with the project manager to identify appropriate avoidance measures and buffers. Determinations of the appropriate measures are be based on the nesting species, sensitivity, and listing status. If the biologist finds no active nesting or breeding activity, NPS may authorize work to begin.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (Birds)	All	Marin PCP 2018 (BIO-1j, Protect Nesting Birds during Construction)
The following American badger protection measures must be implemented for all projects requiring disturbance to open grasslands or low-growing vegetation habitats: Conduct a preconstruction survey for the American badger prior to beginning work. If any badgers are documented in the project area or within 500 feet of it, establish and maintain buffer zones until the badgers have vacated the area. Do not begin working in the buffer zone until the area is cleared by the project biologist. In consultation with NPS, develop and implement additional protection measures, which may include larger buffer zones or relocations, as required.	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (American Badger)	All	Marin PCP 2018 (BIO-1n, Protect American Badger)

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter. Exclusion fencing must be highly visible and installation overseen by the project biologist. Openings shall be restricted to areas of construction site access. Note: the purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife	All	Marin PCP 2018 (BIO-1c Avoid Listed Special-status Wildlife Species)
If suitable CRLF breeding habitat is present, only conduct project activities between July 1 and October 15 to avoid impacts on breeding CRLF or egg masses. If a project site occurs in potential CRLF habitat, an NPS approved biologist must conduct a preconstruction survey of potential CRLF habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for the CRLF no more than 48 hours before the start of construction activities. The biologist shall look for individual frogs, evaluate the likelihood of usage, and determine whether additional biological monitoring is needed during construction to ensure that individuals present are be removed or avoided. The biologist shall monitor initial ground-disturbing activities within 300 feet of CRLF habitat and halt work activities that may adversely affect the CRLF until it no longer occupies the project area. Note: relocation of CRLF can performed only by individuals, who are approved in advance by CDFW and USFWS.	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (CRLF)	All	Marin PCP 2018 (BIO-1g, Protect California Red-legged Frog)
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until August 1 and complete work by October 15. Note: work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from the NPS and project regulators. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (CA freshwater shrimp, Salmonids)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
Reconnaissance-level surveys must be performed by a designated project biologist to determine whether suitable habitat for listed butterflies, including Myrtle's silverspot butterfly, is present in the project area. If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, project work must be conducted with minimum soil compaction and disturbance, and with hand tools wherever possible.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)
Protect host plants for listed butterflies identified by the designated project biologist, including Sedum spathulifolium and Viola adunca, with a clearly demarcated 20-foot buffer zone.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)
Areas must be closely monitored for pest plant invasion after construction, mechanical and burn treatments, aeration, and seeding; a monitoring plan must be established by the project manager to detect and eradicate any weeds. Monitoring shall employ an early detection, rapid response approach to any previously undetected aggressive weedy species observed, once the plant's species identification and non-native status have been confirmed following best available weed-specific technical guidance current at the time of implementation.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Vegetation	All	NPS
Replace all native plants removed during project activities with species similar to that of the removed vegetation or with species that are appropriate to the site conditions and are native to the project watershed, as approved by the NPS Plants shall be sourced from Marin County or southern Sonoma County unless otherwise approved by NPS. Plants sourced from nursery require NPS approval of the nursery, which shall include documentation of pathogen avoidance protocols and source of plant materials. Use of native plant species with high wildlife and/or pollinator values will be prioritized by NPS during approval.	X	X	X	X	X						X	X	X				X	X	X	Vegetation	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance),

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
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Any import of soils must be pre-approved by the NPS. Soils shall not be imported directly adjacent to sites known to be infested with pathogens, areas of heavy use, or sites with high risk for contamination such as landscaped areas, old nursery stock, or parking lots. Soils shall not be imported to sites or upslope of sites with habitat for plants that are species of concern or listed species. NPS shall approve any Import of soil to sites that host plants susceptible to Phytophthora (Fagaceae, Ericaeae). Soils with copious organic matter and water-logged soils shall not be imported as these are ideal candidates for Phytophthora contamination. Only weed-free certified soils and aggregates shall be used unless approved by NPS. Imported soils shall be evenly heat treated to 300°F or solarized for 15 hours under black plastic, reaching a minimum temperature of 113°F.	X	X	X		X						X	X			X	X	X	X	X	Soils	All	NPS
Avoid conducting work in the RPZ (Root Protect Zone) of trees wherever possible and do not work in the RPZ when soils are wet. Note: the RPZ is defined as 1.5 times the dripline radius measured from the tree trunk and extending approximately three feet below the soil surface. The project manager shall ensure that the outer extent of the RPZ is clearly demarcated with exclusionary fencing to keep construction vehicles and activities away from tree roots. If work must occur in the RPZ: ▪ All tree trunks shall be wrapped up to 8 feet high or the height of the equipment working in the area. ▪ Use protection materials that may include wood boards or heavy-duty rubber matting. ▪ Install trench plates or heavy mulch for heavy equipment working in the RPZ. ▪ Cut all roots larger than 1 inch with a clean, sharp saw. ▪ Prune no more than 20% of live foliage in one year.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Vegetation	All	Marin PCP 2018 (BIO-2b, Avoid Work in or Compensate for Impacts on Native Tree Root Protection Zone)
Remove no more than 0.25 acre of vegetation from a streambank or stream channel where the area contains a mix of native and invasive species and no more than 0.10 acre of native riparian trees, shrubs, or woody perennials for a single project.	X		X	X							X	X	X	X	X	X	X	X	X	Vegetation Water	All	Marin PCP 2018 (BMP VM-1 Project areal limitations on vegetation management)
Fence construction shall adhere to the wildlife friendly USDA, NRCS, specifications (382D) for fence construction, unless otherwise approved by NPS. Minimize the number of internal wire strands to the extent practicable.										X										Wildlife	All	Karhu 2008; Paige 2012; Weigand 2008

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
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Design culverts to minimize habitat fragmentation and barriers to aquatic movement. Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible. Culverts that require Section 401/404 permits shall be designed and stamped by a licensed engineer, geologist, landscape architect or a qualified NRCS engineer.	X	X	X		X		X												X	Wildlife (Salmonids, Fish)	All	Marin PCP 2018 (BMP DC-3 Required design considerations for roads, culverts, and stream crossings to protect sensitive biological resources and water quality).
Livestock Water Supply activities shall include: ▪ installing buried pipe at minimum sufficient depth (typically 18” or less) below the ground surface to provide protection from hazards imposed by traffic loads, farming operations, freezing temperatures, or soil cracking, as applicable ▪ using pipelines of sufficient strength to withstand all external loads on the pipe for the given installation conditions. ▪ installing a trench (if the action include such), placing the top 6 inches of excavated soil to one side and the remaining soil to the other side of the trench; when refilling the trench, placing the top 6 inches of soil back on top of the final fill to retain the existing native seed bank and to return the surface to existing condition and grade ▪ keeping trench width to the minimum necessary to allow for pipeline installation ▪ equipping the pipe leading from the spring to a tank or trough with a valve or overflow to allow water to return to the spring when the tank or trough is full ▪ conducting work during driest time of the year (August to first fall rains) ▪ placing any material excavated from springs or ponds during development on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less ▪ conducting spring maintenance activities with hand tools whenever possible ▪ requiring wildlife escape ramps in all troughs ▪ placing new water troughs a minimum distance of 150 feet from riparian areas											X	X	X	X	X					All	All	NPS

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
All pond restoration activities shall adhere to the following conditions: ▪ No new or enlarged ponds are authorized. ▪ No more than 3,000 cubic yards of fill shall be removed from a pond under any single project. ▪ Ensure that maintenance activities are conducted either when a pond has dried out completely, or during the driest period of the year in September or October (late August is an option if necessary, but not preferred). ▪ Ensure that no mowing occurs around ponds unless pre-approved by NPS. ▪ Avoid excavating below original pond depth. ▪ Provide sloping or benched sides with shallow areas and keeping deep areas at least a yard deep. ▪ Use spoils from the ponds to buttress the berm; otherwise, place excess soils in an NPS-identified area for stockpiling or spreading. ▪ Place excavated material on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less. ▪ Install a staff gage in the pond before construction begins to monitor water level. ▪ Maintain 10% to 35% cover if the pond has existing emergent vegetation.															**X**				Soils Water Wildlife (CRLF)	All	NPS
Unless otherwise stated on the Practice Requirement sheet or seeding plan, the timing of seeding must occur in the fall before October 15. Only use local (collected in Marin County or southern Sonoma County) genotypes of native species seed or species on the park's approved seed species list (based on information provided by the USDA, NRCS Plant Materials Program), unless otherwise approved by NPS. Only seed certified to be free of noxious weed seeds and fungicides shall be used. Adjust seeding rates for soil textural differences and the pure live seed rating. Only conduct seeding using no-till drill or broadcast methods and using only broadcast methods on sites with a high risk of soil erosion.							**X**	**X**											Air Soils Vegetation	Pasture	NPS 1990 DEFRA 2009 USDA-NRCS 2010 University of California 2006

Management Activities	Road Upgrade and Decommissioning				Infrastructure Improvement			Waterway Vegetation and Planting		Fence	Livestock Water Supply					Pond Restoration	Waterway Stabilization		Stream Crossing			
Practice Standards	Access Road (560)	Trails and Walkways (575)	Structure for Water Control (587)	Road Closure and Treatment (654)	Heavy Use Area Protection (561)	Roof and Covers (367)	Roof Runoff Structure (558)	Grassed Waterway (412)	Filter Strip (393)	Fence (382)	Spring Development (574)	Livestock Pipeline (516)	Underground Outlet (620)	Watering Facility (614)	Pumping Plant (533)	Pond Restoration (378[R])	Grade Stabilization Structure (410)	Lined Waterway or Outlet (468)	Stream Crossing (578)	**Resources**	**Subzone**	**Reference**
In-stream crossings shall not be designed for placement within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 1,500 meters (4,921 feet) apart. Crossings in a non-fish bearing stream must be at least 100 feet apart.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Wildlife (T&E)	All	Marin PCP 2018 (BMP DC-3 Required design considerations for roads, culverts, and stream crossings to protect sensitive biological resources and water quality). NOAA Fisheries 2016
Crossings shall be designed to require the minimum amount of dewatering, not to exceed 500 feet of channel unless otherwise approved by NPS. Bridges shall be designed and stamped by a licensed California engineer or a qualified NRCS engineer.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	All	All	NPS
All precipitation and clean surface drainage outside of manured areas, including that from roofed areas, shall be diverted away from confined and/or manured areas, unless such drainage is fully contained in a retention pond.	X	X	X		X	X	X	X	X									X		Water	Ranch Core	Cal. Code Regs., tit. 27, §22562(b)
General seeding mitigations: ▪ A Plans and Specifications document must be prepared that includes species to be used, seeding rates and dates, establishment procedures, actions needed to ensure adequate cover of desired species, and operation, monitoring, and maintenance requirements. ▪ All purchased seed shall be tagged and labeled in accordance with the California Agricultural Code and Seed Law, and acceptable to the County Agricultural Commissioner. Bag tags shall include evidence of purity and germination. Seed shall be of a quality that weed seed shall not exceed 0.5% of the aggregate of pure live seed (PLS) (% germination x % purity) and other material. Time since date of seed test shall not exceed 9 months.							X	X											All	All	NPS

TABLE F-12: VEGETATION MANAGEMENT PRACTICE STANDARDS AND MITIGATION MEASURES

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
NOTE: If sensitive resources are not in the project area that mitigations are intended to protect, the NPS may waive that mitigation requirement. Further, if the proposed practice does not require the level of disturbance or equipment addresses, additional mitigation measures may be required. Additional mitigation measure may be added to this list over the 20-year lease/permit term, as necessary.															
Use of heavy machinery shall be performed by experienced operators and heavy machinery shall: ▪ avoid steep slopes (>20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ be kept at least 10 feet from any cliffs or steep banks ▪ only be allowed based on daily fire danger rating ▪ avoid woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ avoid significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoid waterbodies and riparian zones unless specifically required and approved by NPS as critical to the project objective (e.g. Pond Restoration, Waterway Stabilization, Stream Crossing) ▪ avoid lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Soils Vegetation Wildlife	All
To control the spread of plant diseases, insects, and weeds, equipment and vehicles shall be free of soil and debris accumulations on tires, wheel wells, vehicle undercarriages, and other surfaces before arrival at the park, when being moved between sites within the park, and before storing within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. All vehicles will be pressure-washed before their first entry into the park or when being moved for use in a different job site within the park. Hand tools, shovels, loaders, and other equipment must be clean and free of soil and plant debris before initial use at the park and before being moved between work sites within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. No soil or plant debris from the interior of vehicles or equipment (cabs, etc.) shall be deposited at the work site. If drivers/operators will be entering or exiting vehicles at the job site, the cab must be free of mud, soil, plant parts, and organic debris before arriving at the job site. Interior floors, floor mats, and seats must be free of potentially contaminated material. Equipment and vehicles shall be inspected by NPS to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; be removed from NPS property if deficient and properly clean it at the expense of the project manager before returning to NPS property.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Soils Vegetation	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
A spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document shall be prepared and implemented for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas. Petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life are prohibited from passing into, or being placed where they can pass into the waters of the state. Equipment operators shall have emergency spill clean-up gear (spill containment and absorption materials), dry cleanup methods (i.e., absorbent materials, and/or rags), and fire equipment available on site at all times. Petroleum-powered equipment shall be stored and operated in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: ▪ All vehicles and equipment on the site shall not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel; inspect vehicles each day for leaks and repair immediately. ▪ Equipment storage, short-term maintenance, and refueling shall be conducted in a contained area located at least 100 feet from a watercourse or riparian area as approved by NPS; these activities will be prohibited from taking place on the project site unless deemed necessary for project completion by NPS. ▪ Immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence. ▪ All spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries must be collected, stored, and recycled as hazardous waste off site. All major vehicle maintenance and washing shall be conducted off site.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Water Wildlife	All
Revegetation must be completed as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain. Temporary erosion control measures shall be used on disturbed soils until permanent vegetation is established. Disturbed and uncompacted soils shall be covered with straw mulch and/or biodegradable netting or matting. For slopes exceeding 20% staked biodegradable erosion logs or wattles are required for decelerating runoff. Silt fences or filter bags shall be used if working in areas known to flood or experience heavy flow. Temporary seeding using non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) or hydromulching may be utilized if approved by NPS. To avoid scouring, erosion control materials shall be placed to allow water to sheet as opposed to channel. Areas that may be accessed by cattle or other livestock shall be enclosed by fencing to exclude livestock until restoration goals have been met.	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**		Air Vegetation Water	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Vehicles and equipment shall be restricted to one principal access route, preferably one that has been used for past activities. All vehicles and equipment shall be staged on roads, in NPS-specified staging areas, or on existing disturbed ranch operation sites.	X	X	X	X	X	X	X	X	X	X	X	X	X	Air Soils Vegetation Visitor Use and Experience Water Wildlife	All
If access through a wetland is necessary, low ground pressure, rubber-tired equipment is required. NPS will determine the necessity and timing of access to minimize disturbance (typically later summer).	X	X	X	X	X	X	X	X	X	X	X	X	X	Vegetation Water	All
Erosion control and sediment detention measures must be available on site at all times and in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water. Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway. When required by NPS or project regulators, NPS staff or a qualified designee shall inspect in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly.	X	X	X	X	X	X	X	X	X					Water Wildlife	All
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits. If rain is forecast to occur while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind, and install silt fencing or wattles on contour around all stockpile locations.							X					X		Air Water	Pasture and Ranch Core
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities (other than native vegetation planting or erosion control activities on disturbed sites without mechanized equipment) during the dry season, generally June 1 through October 31; exceptions may be made by the NPS in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by the NPS and project regulators.		X								X	X	X		Soils Water Vegetation Water Wildlife	All
Perform work in and around areas, including structures, that may support bird nesting before March 15 or after July 31, unless vegetation height is less than 8 inches, or otherwise authorized by the NPS.	X	X								X	X	X		Wildlife (Birds)	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Conduct preconstruction breeding bird surveys for projects with construction activities occurring from March 15 through July 31 for special-status birds, migratory birds, and raptors (surveys for raptors would be required for work beginning as early as February 1). Conduct these preconstruction surveys in all locations identified by a qualified biologist. Conduct the surveys within three days two weeks prior to initiation of vegetation clearing, tree removal and trimming, or other construction activities. Note: the results of surveys will be reviewed by NPS prior to any work authorization. If nests are identified by the biologist, NPS will work with the project manager to identify appropriate avoidance measures and buffers. Determinations of the appropriate measures are be based on the nesting species, sensitivity, and listing status. If the biologist finds no active nesting or breeding activity, NPS may authorize work to begin.	**X**	**X**								**X**	**X**	**X**		Wildlife (Birds)	All
The following American badger protection measures must be implemented for all projects requiring disturbance to open grasslands or low-growing vegetation habitats: ▪ Conduct a preconstruction survey for the American badger prior to beginning work. ▪ If any badgers are documented in the project area or within 500 feet of it, establish and maintain buffer zones until the badgers have vacated the area. ▪ Do not begin working in the buffer zone until the area is cleared by the project biologist. ▪ In consultation with NPS, develop and implement additional protection measures, which may include larger buffer zones or relocations, as required.	**X**	**X**								**X**	**X**	**X**		Wildlife (American Badger)	All
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter Exclusion fencing must be highly visible, and installation overseen by the project biologist. Openings shall be restricted to areas of construction site access. Note: The purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats.	**X**										**X**	**X**		Wildlife	All
If suitable CRLF breeding habitat is present, only conduct project activities between July 1 and October 15 to avoid impacts on breeding CRLF or egg masses. If a project site occurs in potential CRLF habitat, an NPS approved biologist must conduct a preconstruction survey of potential CRLF habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for the CRLF no more than 48 hours before the start of construction activities. The biologist shall look for individual frogs, evaluate the likelihood of usage, and determine whether additional biological monitoring is needed during construction to ensure that individuals present are be removed or avoided. The biologist shall monitor initial ground-disturbing activities within 300 feet of CRLF habitat and halt work activities that may adversely affect the CRLF until it no longer occupies the project area. Note: Relocation of CRLF can performed only by individuals, who are approved in advance by CDFW and USFWS.	**X**									**X**	**X**	**X**		Wildlife (CRLF)	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until August 1 and complete work by October 15. Note: Work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from the NPS and project regulators. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams.										**X**	**X**	**X**		Wildlife (CA freshwater shrimp, Salmonids)	All
Reconnaissance-level surveys must be performed by a designated project biologist to determine whether suitable habitat for listed butterflies, including Myrtle's silverspot butterfly, is present in the project area. If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, project work must be conducted with minimum soil compaction and disturbance, and with hand tools wherever possible.	**X**	**X**								**X**	**X**	**X**		Wildlife (Myrtle's Silverspot)	All
Protect host plants for listed butterflies identified by the designated project biologist, including Sedum spathulifolium and Viola adunca, with a clearly demarcated 20-foot buffer zone.	**X**	**X**								**X**	**X**	**X**		Wildlife (Myrtle's Silverspot)	All
Areas must be closely monitored for pest plant invasion after construction, mechanical and burn treatments, aeration, and seeding: a monitoring plan must be established by the project manager to detect and eradicate any weeds. Monitoring shall employ an early detection, rapid response approach to any previously undetected aggressive weedy species observed, once the plant's species identification and non-native status have been confirmed following best available weed-specific technical guidance current at the time of implementation.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Vegetation	All
Replace all native plants removed during project activities with species similar to that of the removed vegetation or with species that are appropriate to the site conditions and are native to the project watershed, as approved by the NPS. Plants shall be sourced from Marin County or southern Sonoma County unless otherwise approved by NPS. Plants sourced from nursery require NPS approval of the nursery, which shall include documentation of pathogen avoidance protocols and source of plant materials. Use of native plant species with high wildlife and/or pollinator values will be prioritized by NPS during approval.												**X**		Vegetation	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Any import of soils must be pre-approved by the NPS. Soils shall not be imported directly adjacent to sites known to be infested with pathogens, areas of heavy use, or sites with high risk for contamination such as landscaped areas, old nursery stock, or parking lots. Soils shall not be imported to sites or upslope of sites with habitat for plants that are species of concern or listed species. NPS shall approve any Import of soil to sites that host plants susceptible to Phytophthora (Fagaceae, Ericaeae). Soils with copious organic matter and waterlogged soils shall not be imported as these are ideal candidates for Phytophthora contamination. Only weed-free certified soils and aggregates shall be used unless approved by NPS. Imported soils shall be evenly heat treated to 300F or solarized for 15 hours under black plastic, reaching a minimum temperature of 113°F.	**X**					**X**								Soils	All
Avoid conducting work in the RPZ (Root Protect Zone) of trees wherever possible and do not work in the RPZ when soils are wet. Note: The RPZ is defined as 1.5 times the dripline radius measured from the tree trunk and extending approximately three feet below the soil surface. The project manager shall ensure that the outer extent of the RPZ is clearly demarcated with exclusionary fencing to keep construction vehicles and activities away from tree roots. If work must occur in the RPZ: ▪ All tree trunks shall be wrapped up to 8 feet high or the height of the equipment working in the area. ▪ Use protection materials that may include wood boards or heavy-duty rubber matting. ▪ Install trench plates or heavy mulch for heavy equipment working in the RPZ. ▪ Cut all roots larger than 1 inch with a clean, sharp saw. ▪ Prune no more than 20% of live foliage in one year.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		Vegetation	All
Remove no more than 0.25 acre of vegetation from a streambank or stream channel where the area contains a mix of native and invasive species and no more than 0.10 acre of native riparian trees, shrubs, or woody perennials for a single project.			**X**	**X**							**X**	**X**		Vegetation Water	All
Design culverts to minimize habitat fragmentation and barriers to aquatic movement. Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible. Culverts that require Section 401/404 permits shall be designed and stamped by a licensed engineer, geologist, landscape architect or a qualified NRCS engineer.														Wildlife (Salmonids, Fish)	All

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Unless otherwise stated on the Practice Requirement sheet or seeding plan, the timing of seeding must occur in the fall before October 15. Only use local (collected in Marin County or southern Sonoma County) genotypes of native species seed or species on the park's approved seed species list (based on information provided by the USDA, NRCS Plant Materials Program), unless otherwise approved by NPS. Only seed certified to be free of noxious weed seeds and fungicides shall be used. Adjust seeding rates for soil textural differences and the pure live seed rating. Only conduct seeding using no-till drill or broadcast methods and using only broadcast methods on sites with a high risk of soil erosion.	**X**	**X**	**X**					**X**	**X**					Air Soils Vegetation	Pasture
Inspect seeding area the year prior to seeding to identify potential weed problems and to control weeds during planting and throughout the first growing season.	**X**	**X**						**X**	**X**					Vegetation	Pasture
Restrict or reduce grazing in the two years of establishment at least until the seedlings have completed their growth for the first growing season.	**X**	**X**						**X**	**X**					Vegetation	Resource Protection
Selection of seed species and their cultivars must be based on: climatic conditions, such as annual precipitation, distribution, growing season length, tolerance of temperature extremes, and the USDA, NRCS, plant hardiness zone, soil condition and landscape position attributes, such as pH, available water holding capacity, aspect, slope, drainage class, fertility level, salinity, depth, flooding and ponding, and levels of phytotoxic elements that may be present	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**					Vegetation	All
With the exception of silage harvest and management of certain weed species as approved by NPS, mowing shall be timed to minimize resource impacts: ▪ August 1–October 15 (or first autumn rains, whichever comes first) is preferred to avoid impacts to ground nesting birds and California red-legged frog (CRLF). ▪ March 15–July 31 (bird nesting season) is limited to removal of vegetation less than 8 inches in height or can take place only if bird nesting surveys are completed.										**X**	**X**	**X**		Vegetation Wildlife (Birds, CRLF)	All
Maintain a 35-foot buffer between wetlands and mowed areas. Note: Depending on site specific conditions, NPS may require leaving in place scattered islands of brush to service as a corridor for wildlife species that inhabit brushy habitat.										**X**				Vegetation Water	Range
Rotational mowing practices (i.e., early, late, or rested) must be followed to maintain grassland communities in various stages of growth and vegetative diversity, promoting nesting habitat for grassland birds. Do not mow at night due to the risk of higher wildlife mortality.										**X**				Wildlife (Birds)	Pasture
For shrub management, generally apply one or more initial treatments to remove existing shrubs, followed by periodic or ongoing management to prevent subsequent re-establishment, as defined in the ROA. Apply follow-up spot treatment methods when woody vegetation is recovering or small and is the most vulnerable to treatment.										**X**				Vegetation	Pasture and Range upon site specific approval

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Shrub management efforts shall be limited to areas previously occupied by grassland, as shown by historical photographs, or to soil types appropriate to support grassland, according to the USDA, NRCS, soil survey and associated ecological site descriptions. Shrub treatment shall be limited areas to those identified by NPS biologists as acceptable based on: ▪ the absence of endangered species and significant wildlife and plant communities, including areas with high concentrations of nesting birds ▪ appropriate ratio and spatial arrangement of grassland and woody vegetation at the site and landscape scale to provide food, shelter, and cover to shrub-dependent wildlife and appropriate structure for wildlife that benefit from edge habitat or structural diversity ▪ appropriate size and shape of treated acreage and of any shrubland acreage left untreated ▪ desired age or successional status of remaining shrubland									**X**				Vegetation	Pasture, Range upon site specific approval
Use the following grazing methods to control weeds, especially as a follow-up method that minimizes the need for repeated mechanical or chemical applications: ▪ use targeted grazing to impact weedy species when they are vulnerable, using species-specific technical guidance available from sources such as NPS; University of California, Cooperative Extension and Weed Research and Information Center; USDA, NRCS; and DiTomaso et al. (2013) ▪ avoid heavy grazing of infested areas at stages of the weedy species' phenology when herbivory favors increased tillering ▪ encourage vigorous growth of desirable grass species in infested or recently treated areas by maintaining sufficient residual dry matter in fall and winter and by allowing thick grass growth throughout winter									**X**		**X**	**X**	Air Vegetation	All
Use multiple methods for weed management as a means of reducing the amount of herbicide needed and increasing the overall speed and effectiveness of treatment										**X**	**X**	**X**	**X**	Air Vegetation Water	
Ensure that any use of herbicides conforms to relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates. Consult with a PCA and/or NPS, and: address measures to minimize the use of high-persistence herbicides and the potential for leaching to surface and groundwater, especially in soil types with high leaching potential consider the use of herbicides specifically formulated and approved for use in water for application of herbicides to uplands that may have CRLFs or other rare amphibians present consider the use of pollinator-protective strategies as described in NOAA Fisheries (2014), especially when considering broadcast applications and applications when pollinator host plants are flowering minimize the use herbicides or fertilizers in habitat that supports special-status butterflies and do not use herbicides in this habitat during Myrtle's silverspot butterfly flight season (June 15-early September)										**X**	**X**		Water Wildlife (CRLF, Fish, Amphibians, Invertebrates Myrtle's Silverspot Butterfly)	

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
In-stream crossings shall not be designed for placement within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 1,500 meters (4,921 feet) apart. Crossings in a non-fish bearing stream must be at least 100 feet apart.	X	X	X	X	X	X				X	X	X	X	Wildlife (T&E)	All
Crossings shall be designed to require the minimum amount of dewatering, not to exceed 500 feet of channel unless otherwise approved by NPS. Bridges shall be designed and stamped by a licensed California engineer or a qualified NRCS engineer.	X	X	X	X	X	X				X	X	X	X	All	NPS
Pasture and crop fertilization shall comply with Nutrient Management Plans and USDA, NRCS, guidelines for nutrient management, including but not limited to: ▪ Develop a nutrient budget that considers all sources of nutrients. ▪ Evaluate the risks of nitrogen and phosphorus transport using methods cited by USDA, NRCS. ▪ Conduct pertinent soil analyses to determine the appropriate (and maximum) level of nutrient addition, such as nutrient and pH levels and electrical conductivity, and ensure that the total nutrient loading does not exceed the amount needed to meet crop demand. ▪ Cropland applications shall maintain soil pH in a range that favors nutrient uptake by crops. ▪ Application rates of nitrogen, phosphorus, and potassium shall not exceed the University of California guidelines (or industry practice when recognized by the university). Lower rates are acceptable. ▪ Application timing shall correspond as closely as practicable with the timing of plant uptake by crops or pasture grasses. ▪ Application of solid or liquid waste discharges to land shall be at rates that are reasonable for crop, soil, climate, special local situations, management system, and type of manure. ▪ Application of manure and wastewater discharges shall only be done during non-rainy or non-saturated conditions, ensuring that discharges do not result in runoff to surface waters and that discharges infiltrate completely within 72 hours after application. ▪ Spreading of compost, manure, or fertilizer shall not occur when the top 2 inches of soil are saturated or when enough precipitation to cause runoff is forecast. ▪ Sufficient setbacks (filter strips or otherwise well-vegetated areas) shall be maintained from drainages and waterbodies to prevent pollution and comply with state and federal water quality regulations; setback distance should be greater for steeper slopes, higher levels of nutrients applied, and lower levels of setback ground cover. ▪ Best practices shall be employed (e.g., USDA-NRCS 2011) to minimize the risk of nutrient runoff in application of liquids, slurry and solids, such as adjusting the thickness of the applied layer of manure and compost relative to slope and setback distance to minimize the chance that material will be washed downhill to waterbodies.	X	X												Air Soils Vegetation Water	Pasture

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
Records must be maintained for at least five years documenting the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event. Keep these records with the Nutrient Management Plan.	**X**	**X**													Pasture
Excessive fly populations associated with manure storage shall be controlled, in consultation with NPS, using an Integrated Pest Management approach and avoiding wet areas around manure storage where flies may breed												**X**		Health and Safety Visitor Use and Experience	Ranch Core
Avoid tilling or if necessary and with prior NPS approval use shallow tillage operations (1 to 2 inches) or operations that do not invert the soil. Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10% of the field may be tilled for this purpose.								**X**						Air Cultural Resources Soil Water	Pasture
Do not aerate soils, unless soil compaction is demonstrated, which can be predicted using USDA, NRCS, soil maps and measured using a soil cone penetrometer, when soils are saturated and ideally are at field capacity.	**X**	**X**												Soils	Pasture
Materials used must be approved by NPS. No synthetic materials shall be used for mulching. ▪ Apply mulch material evenly. Use tackifiers, emulsions, pinning, netting, crimping or other methods of anchoring, to hold the mulch in place for specified periods ▪ Spreading of wood products or inorganic materials must be at a minimum depth of two inches, and inorganic materials, such as gravel, must be a minimum size of 0.75 inches. Straw or grass hay must be applied at a rate to achieve a minimum 70-percent ground cover. ▪ Avoid excessively thick or tightly packed mulches; fine-textured mulches that allow less oxygen penetration than coarser materials shall not be thicker than 2 inches. ▪ Plant-based mulch materials with a carbon (C) to nitrogen (N) ratio less than 20:1 must not be applied where there is potential to enter watercourses. ▪ A Plans And Specifications document must be prepared that includes purpose of the cover, type of material to be used, percent cover or thickness of application, timing of application, site preparation, methods of anchoring, and operation and maintenance requirements.							**X**							All	NPS

Management Activities	Upland and Riparian Vegetation Management and Planting									Mowing		IPM	Targeted Grazing		
Practice Standards	Critical Area Planting (342)	Range Planting (550)	Riparian Herbaceous Cover (390)	Riparian Forest Buffer (391)	Windbreak/ Shelterbelt Establishment (380)	Tree/Shrub Establishment (612)	Mulching (484)	Conservation Cover (327)	Wildlife Habitat Planting (420)	Brush Management, Mechanical (314-A)	Herbaceous Weed Treatment (315)	IPM (595)	Targeted Grazing (528)	**Resources**	**Subzone**
A Plans And Specifications document must be created that identifies: ▪ the target wildlife species or guild ▪ success criteria (target conditions) for the planting, including the target conditions and timeframes ▪ vegetative establishment measures needed to meet minimum criteria ▪ target habitat conditions to be created (including plant species richness, diversity, pattern and structure, taking into account season of use, life history, home range, condition of adjacent habitats, and landscape context) ▪ risks from or to nontarget species ▪ plant material composition, rates, planting depth, and proper handling ▪ necessary vegetative establishment protocols (including site preparation, weed and pest control, planting rates, planting dates, planting methods) ▪ post-planting management actions (e.g. mowing annual weeds and inspections/control for invasive plants), and ▪ other operation and maintenance requirements									**X**				All	NPS
General seeding mitigations: ▪ A Plans and Specifications document must be prepared that includes species to be used, seeding rates and dates, establishment procedures, actions needed to ensure adequate cover of desired species, and operation, monitoring, and maintenance requirements. ▪ All purchased seed shall be tagged and labeled in accordance with the California Agricultural Code and Seed Law, and acceptable to the County Agricultural Commissioner. Bag tags shall include evidence of purity and germination. Seed shall be of a quality that weed seed shall not exceed 0.5% of the aggregate of pure live seed (PLS) (% germination x % purity) and other material. Time since date of seed test shall not exceed 9 months.	**X**	**X**	**X**					**X**	**X**					All	NPS

TABLE F-13: OTHER ACTIVITIES PRACTICE STANDARDS AND MITIGATION MEASURES

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Mitigations **NOTE: If sensitive resources are not in the project area that mitigations are intended to protect, the NPS may waive that mitigation requirement. Further, if the proposed practice does not require the level of disturbance or equipment addresses, additional mitigation measures may be required. Additional mitigation measure may be added to this list over the 20-year lease/permit term, as necessary.**												
Use of heavy machinery shall be performed by experienced operators and heavy machinery shall: ▪ avoid steep slopes (>20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ be kept at least 10 feet from any cliffs or steep banks ▪ only be allowed based on daily fire danger rating ▪ avoid woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ avoid significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoid waterbodies and riparian zones unless specifically required and approved by NPS as critical to the project objective (e.g. Pond Restoration, Waterway Stabilization, Stream Crossing) ▪ avoid lands designated by USDA, NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Soils, Vegetation, Wildlife	All	University of California 2006 NPS Pitt, Burgy, and Heady 1978
To control the spread of plant diseases, insects, and weeds, equipment and vehicles shall be free of soil and debris accumulations on tires, wheel wells, vehicle undercarriages, and other surfaces before arrival at the park, when being moved between sites within the park, and before storing within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. All vehicles will be pressure-washed before their first entry into the park or when being moved for use in a different job site within the park. Hand tools, shovels, loaders, and other equipment must be clean and free of soil and plant debris before initial use at the park and before being moved between work sites within the park. A high-pressure washer, compressed air, brushes, or other means shall be used to ensure that soil and debris are completely removed. No soil or plant debris from the interior of vehicles or equipment (cabs, etc.) shall be deposited at the work site. If drivers/operators will be entering or exiting vehicles at the job site, the cab must be free of mud, soil, plant parts, and organic debris before arriving at the job site. Interior floors, floor mats, and seats must be free of potentially contaminated material. Equipment and vehicles shall be inspected by NPS to ensure the undercarriage is clean and to allow the vehicle to proceed to the job site; be removed from NPS property if deficient and properly clean it at the expense of the project manager before returning to NPS property.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Soils, Vegetation	All	NPS

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
A spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document shall be prepared and implemented for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas. Petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life are prohibited from passing into, or being placed where they can pass into the waters of the state. Equipment operators shall have emergency spill clean-up gear (spill containment and absorption materials), dry cleanup methods (i.e., absorbent materials, and/or rags), and fire equipment available on site at all times. Petroleum-powered equipment shall be stored and operated in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary measures: ▪ All vehicles and equipment on the site shall not leak any type of hazardous materials, such as oil, hydraulic fluid, or fuel; inspect vehicles each day for leaks and repair immediately ▪ Equipment storage, short-term maintenance, and refueling shall be conducted in a contained area located at least 100 feet from a watercourse or riparian area as approved by NPS; these activities will be prohibited from taking place on the project site unless deemed necessary for project completion by NPS ▪ Immediately clean up leaks, drips, and other spills to avoid soil or groundwater contamination and notify NPS staff of any such occurrence ▪ All spent fluids, including motor oil, radiator coolant, or other fluids, and used vehicle batteries must be collected, stored, and recycled as hazardous waste off site All major vehicle maintenance and washing shall be conducted off site.	X	X	X	X	X	X	X	X	X	Water, Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) NPS
Revegetation must be completed as soon as possible after disturbance using live native plantings, native seed casting, or hydroseeding, preferably prior to the onset of rain. Temporary erosion control measures shall be used on disturbed soils until permanent vegetation is established. Disturbed and uncompacted soils shall be covered with straw mulch and/or biodegradable netting or matting. For slopes exceeding 20% staked biodegradable erosion logs or wattles are required for decelerating runoff. Silt fences or filter bags shall be used if working in areas known to flood or experience heavy flow. Temporary seeding using non-invasive, non-persistent grass species (e.g., barley grass, sterile wheat) or hydromulching may be utilized if approved by NPS. To avoid scouring, erosion control materials shall be placed to allow water to sheet as opposed to channel. Areas that may be accessed by cattle or other livestock shall be enclosed by fencing to exclude livestock until restoration goals have been met.	X	X	X	X	X	X	X			Air, Vegetation, Water	All	Marin PCP 2018 (HYD-1, Protect Water Quality – Planting and Revegetation after Soil Disturbance)
Vehicles and equipment shall be restricted to one principal access route, preferably one that has been used for past activities. All vehicles and equipment shall be staged on roads, in NPS-specified staging areas, or on existing disturbed ranch operation sites.	X	X	X	X	X	X	X	X	X	Air, Soils, Vegetation, Visitor Use and Experience, Water, Wildlife	All	Marin PCP 2018 (BIO-3, Protect Wetlands) NPS

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
If access through a wetland is necessary, low ground pressure, rubber-tired equipment is required. NPS will determine the necessity and timing of access to minimize disturbance (typically later summer).	X	X	X	X	X	X	X	X	X	Vegetation, Water	All	Marin PCP 2018 (BIO-3, Protect Wetlands)
Erosion control and sediment detention measures must be available on site at all times and in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water. Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway. When required by NPS or project regulators, NPS staff or a qualified designee shall inspect in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly.	X	X	X	X	X	X	X	X	X	Water, Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)
Prohibit discharge of water from any onsite temporary sediment stockpile or storage areas or any other discharge of construction dewatering flows to surface waters, unless specific mitigations are approved in permits. If rain is forecast to occur while materials are temporarily stockpiled, cover with plastic that is secured in place to ensure the piles are protected from rain and wind, and install silt fencing or wattles on contour around all stockpile locations.	X	X	X	X	X	X	X	X		Air, Water	Pasture and Ranch Core	Marin PCP 2018 (HYD-2, Protect Water Quality, Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat)
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities (other than native vegetation planting or erosion control activities on disturbed sites without mechanized equipment) during the dry season, generally June 1 through October 31; exceptions may be made by the NPS in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by the NPS and project regulators.		X	X	X	X	X	X	X	X	Soils, Vegetation, Water, Wildlife	All	Marin PCP 2018 (HYD-2, Protect Water Quality – Erosion Control and Stormwater Detention during Grading and Other Disturbance in a Stream, Waterway, or Other Sensitive Habitat) Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Perform work in and around areas, including structures, that may support bird nesting before March 15 or after July 31, unless vegetation height is less than 8 inches, or otherwise authorized by the NPS.	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	Wildlife (Birds)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)
Conduct preconstruction breeding bird surveys for projects with construction activities occurring from March 15 through July 31 for special-status birds, migratory birds, and raptors (surveys for raptors would be required for work beginning as early as February 1) Conduct these preconstruction surveys in all locations identified by a qualified biologist. Conduct the surveys within three days two weeks prior to initiation of vegetation clearing, tree removal and trimming, or other construction activities Note: The results of surveys will be reviewed by NPS prior to any work authorization. If nests are identified by the biologist, NPS will work with the project manager to identify appropriate avoidance measures and buffers. Determinations of the appropriate measures are be based on the nesting species, sensitivity, and listing status. If the biologist finds no active nesting or breeding activity, NPS may authorize work to begin.	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	Wildlife (Birds)	All	Marin PCP 2018 (BIO-1j, Protect Nesting Birds during Construction)
The following American badger protection measures must be implemented for all projects requiring disturbance to open grasslands or low-growing vegetation habitats: ▪ Conduct a preconstruction survey for the American badger prior to beginning work. ▪ If any badgers are documented in the project area or within 500 feet of it, establish and maintain buffer zones until the badgers have vacated the area. ▪ Do not begin working in the buffer zone until the area is cleared by the project biologist. ▪ In consultation with NPS, develop and implement additional protection measures, which may include larger buffer zones or relocations, as required.	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	Wildlife (American Badger)	All	Marin PCP 2018 (BIO-1n, Protect American Badger)
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until August 1 and complete work by October 15. Note: Work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from the NPS and project regulators. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams.	**X**	**X**	**X**	**X**	**X**	**X**				Wildlife (CA freshwater shrimp, Salmonids)	All	Marin PCP 2018 (BMP BR-3 Temporal limitations and requirements to protect special-species during construction, vegetation management and other maintenance activities)
Reconnaissance-level surveys must be performed by a designated project biologist to determine whether suitable habitat for listed butterflies, including Myrtle's silverspot butterfly, is present in the project area. If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, project work must be conducted with minimum soil compaction and disturbance, and with hand tools wherever possible.		**X**	**X**	**X**	**X**	**X**				Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Protect host plants for listed butterflies identified by the designated project biologist, including Sedum spathulifolium and Viola adunca, with a clearly demarcated 20-foot buffer zone.		X	X	X	X	X				Wildlife (Myrtle's Silverspot)	All	Marin PCP 2018 (BIO-1m, Protect Special-status Butterflies)
Areas must be closely monitored for pest plant invasion after construction, mechanical and burn treatments, aeration, and seeding. A monitoring plan must be established by the project manager to detect and eradicate any weeds. Monitoring shall employ an early detection, rapid response approach to any previously undetected aggressive weedy species observed, once the plant's species identification and non-native status have been confirmed following best available weed-specific technical guidance current at the time of implementation.	X	X	X	X	X	X	X	X	X	Vegetation	All	
Avoid conducting work in the RPZ (Root Protect Zone) of trees wherever possible and do not work in the RPZ when soils are wet. Note: The RPZ is defined as 1.5 times the dripline radius measured from the tree trunk and extending approximately three feet below the soil surface. The project manager shall ensure that the outer extent of the RPZ is clearly demarcated with exclusionary fencing to keep construction vehicles and activities away from tree roots. If work must occur in the RPZ: ▪ All tree trunks shall be wrapped up to 8 feet high or the height of the equipment working in the area. ▪ Use protection materials that may include wood boards or heavy-duty rubber matting. ▪ Install trench plates or heavy mulch for heavy equipment working in the RPZ. ▪ Cut all roots larger than 1 inch with a clean, sharp saw. ▪ Prune no more than 20% of live foliage in one year.	X	X	X	X	X	X				Vegetation	All	Marin PCP 2018 (BIO-2b, Avoid Work in or Compensate for Impacts on Native Tree Root Protection Zone)
Unless otherwise stated on the Practice Requirement sheet or seeding plan, the timing of seeding must occur in the fall before October 15 Only use local (collected in Marin County or southern Sonoma County) genotypes of native species seed or species on the park's approved seed species list (based on information provided by the USDA, NRCS Plant Materials Program), unless otherwise approved by NPS. Only seed certified to be free of noxious weed seeds and fungicides shall be used. Adjust seeding rates for soil textural differences and the pure live seed rating. Only conduct seeding using no-till drill or broadcast methods and using only broadcast methods on sites with a high risk of soil erosion.							X		X	Air, Soils, Vegetation	Pasture	NPS 1990 DEFRA 2009 USDA-NRCS 2010 University of California 2006
Inspect seeding area the year prior to seeding to identify potential weed problems and to control weeds during planting and throughout the first growing season							X			Vegetation	Pasture	University of California 2006
With the exception of silage harvest and management of certain weed species as approved by NPS, mowing shall be timed to minimize resource impacts: ▪ August 1–October 15 (or first autumn rains, whichever comes first) is preferred to avoid impacts to ground nesting birds and California red-legged frog (CRLF). ▪ March 15–July 31 (bird nesting season) is limited to removal of vegetation less than 8 inches in height or can take place only if bird nesting surveys are completed.								X	X	Vegetation, Wildlife (Birds, CRLF)	All	USDA-NRCS 2003

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Maintain a 35-foot buffer between wetlands and mowed areas. Note: Depending on site-specific conditions, NPS may require leaving in place scattered islands of brush to service as a corridor for wildlife species that inhabit brushy habitat.								**X**		Vegetation, Water	Range	NPS
As appropriate, attach flushing bars to the mower to help to flush birds and mammals (especially deer and rabbit) before the mower reaches them. Mow from the middle to the outside to minimize impacts. Avoid mowing until after the peak of the nesting season which typically falls in the middle of April. Explore ways to reduce the amount of wild radish (*Raphanus raphanistrum*) and mustards (*Brassica sp.*) in silage fields that may attract certain nesting birds. Maintain awareness for the presence of nesting Tricolored Blackbird (*Agelaius tricolor*), a state listed threatened species.								**X**		Wildlife (Birds and Mammals)	Pasture	Green n.d.; Hyde and Cambell 2012; Ochterski 2006; USDA-NRCS 2009
Rotational mowing practices (i.e., early, late, or rested) must be followed to maintain grassland communities in various stages of growth and vegetative diversity, promoting nesting habitat for grassland birds. Do not mow at night due to the risk of higher wildlife mortality.								**X**		Wildlife (Birds)	Pasture	Hyde and Cambell 2012; USDA-NRCS 2009; Ochterski 2006
In-stream crossings shall not be designed for placement within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 1,500 meters (4,921 feet) apart. Crossings in a non-fish bearing stream must be at least 100 feet apart.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Wildlife (T&E)	All	Marin PCP 2018 (BMP DC-3 Required design considerations for roads, culverts, and stream crossings to protect sensitive biological resources and water quality). NOAA Fisheries 2016
Crossings shall be designed to require the minimum amount of dewatering, not to exceed 500 feet of channel unless otherwise approved by NPS. Bridges shall be designed and stamped by a licensed California engineer or a qualified NRCS engineer.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	All	All	NPS

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Pasture and crop fertilization shall comply with Nutrient Management Plans and USDA, NRCS, guidelines for nutrient management, including but not limited to: ▪ Develop a nutrient budget that considers all sources of nutrients. ▪ Evaluate the risks of nitrogen and phosphorus transport using methods cited by USDA, NRCS. ▪ Conduct pertinent soil analyses to determine the appropriate (and maximum) level of nutrient addition, such as nutrient and pH levels and electrical conductivity, and ensure that the total nutrient loading does not exceed the amount needed to meet crop demand. ▪ Cropland applications shall maintain soil pH in a range that favors nutrient uptake by crops. ▪ Application rates of nitrogen, phosphorus, and potassium shall not exceed the University of California guidelines (or industry practice when recognized by the university). Lower rates are acceptable. ▪ Application timing shall correspond as closely as practicable with the timing of plant uptake by crops or pasture grasses. ▪ Application of solid or liquid waste discharges to land shall be at rates that are reasonable for crop, soil, climate, special local situations, management system, and type of manure. ▪ Application of manure and wastewater discharges shall only be done during non-rainy or non-saturated conditions, ensuring that discharges do not result in runoff to surface waters and that discharges infiltrate completely within 72 hours after application. ▪ Spreading of compost, manure, or fertilizer shall not occur when the top 2 inches of soil are saturated or when enough precipitation to cause runoff is forecast. ▪ Sufficient setbacks (filter strips or otherwise well-vegetated areas) shall be maintained from drainages and waterbodies to prevent pollution and comply with state and federal water quality regulations; setback distance should be greater for steeper slopes, higher levels of nutrients applied, and lower levels of setback ground cover. ▪ Best practices shall be employed (e.g., USDA-NRCS 2011) to minimize the risk of nutrient runoff in application of liquids, slurry and solids, such as adjusting the thickness of the applied layer of manure and compost relative to slope and setback distance to minimize the chance that material will be washed downhill to waterbodies.	**X**						**X**	**X**		Air, Soils, Vegetation, Water	Pasture	Marin PCP 2018 (BIO-1b) Sonoma County 2013 USDA-NRCS 2016 USDA-NRCS 2011 CBARCD 2003
Records must be maintained for at least five years documenting the types and rates of nutrients applied, soil analyses, weather conditions at time of application, and elapsed time between application and the next rainfall or irrigation event. Keep these records with the Nutrient Management Plan.	**X**						**X**	**X**		All	Pasture	NPS
Do not spread manure or compost when winds are in excess of 20 miles per hour.	**X**									Air, Soils, Visitor Use and Experience, Water	Pasture	NPS
Liquid (irrigated) manure application shall avoid saturating the soil. Pipes, hoses, and other irrigation equipment must be checked daily for leaks.	**X**									Air, Soils, Water	Pasture	NHDAMF 2011
Compost of manure before spreading is recommended to reduce the volume of material, and potential for spread of weeds and pathogens.	**X**									Air, Soils, Water	Pasture	NHDAMF 2011
Store organic waste in well-ventilated areas and take extra safety precautions if handling these materials when stored in ventilated containers.	**X**	**X**	**X**	**X**	**X**	**X**				Health and Safety	Ranch Core	NPS

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Excessive fly populations associated with manure storage shall be controlled, in consultation with NPS, using an Integrated Pest Management approach and avoiding wet areas around manure storage where flies may breed.	**X**	**X**	**X**	**X**	**X**	**X**				Health and Safety, Visitor Use and Experience	Ranch Core	NHDAMF 2011
Do not store or apply manure, manured bedding, compost, and process water within a 100-foot setback to any down-gradient surface water, open tile line intake structure, sinkhole, agricultural or domestic well head, or other conduit to surface water unless a 35-foot-wide vegetated buffer or physical barrier (i.e., a berm) is substituted for the 100-foot setback or an alternative conservation practice or field-specific condition is installed that provides pollutant reductions equivalent to or better than achieved by the 100-foot setback. Place manure and contaminated bedding materials in contained storage or composting locations for later disposal or composting; ensure such locations have roofs, tarps, or other cover sufficient to keep rainfall out during the rainy season and two to four walls or sides sufficient to keep contents in place.	**X**	**X**	**X**	**X**	**X**	**X**				Water	Ranch Core	Marin PCP 2018 (BIO-1b)
Composting and waste separation facilities shall be set back at least 100 feet from the nearest surface waterbody and/or the nearest water supply well. Note A lesser setback distance may be allowed by the San Francisco Bay Regional Water Quality Control Board if it can be demonstrated that the groundwater, geologic, topographic, and well construction conditions at the site are adequate to protect water quality as described in the State Water Resources Control Board Compost General Order, 2015 or as revised.		**X**	**X**	**X**	**X**	**X**				Water	Ranch Core	Marin PCP 2018 (BIO-1b); Marin PCP 2018 (BMP DC-6 Setback from Water Supply Wells at Waste Storage Facilities)
All precipitation and clean surface drainage outside of manured areas, including that from roofed areas, shall be diverted away from confined and/or manured areas, unless such drainage is fully contained in a retention pond.	**X**	**X**	**X**	**X**	**X**	**X**				Water	Ranch Core	Cal. Code Regs., tit. 27, §22562(b)
Existing retention ponds must, at a minimum, be lined with, or underlain by, soils which contain at least ten (10) percent clay and not more than ten (10) percent gravel or artificial materials or materials with equivalent impermeability or include additional lining materials necessary to comply with the San Francisco Bay Regional Water Quality Control Board Conditional Waiver's Discharge Prohibitions. New retention ponds (or expansion of ponds) must comply with Natural Resources Conservation Service (NRCS) Waste Storage Facility Code 313 including a maximum specific discharge (unit seepage rate) of 1 x 10-6 cm/sec. Such ponds may not be used until the Discharger submits a report verifying that the pond liner meets this requirement. Waste shall not be placed into the retention pond until after the Water Board notifies the operator in writing that the report is acceptable. Following a storm event, the operator shall restore the wastewater holding capacity of retention ponds, if necessary, in a timely manner and in a manner consistent with the required Waste Management Plan and Nutrient Management Plan.						**X**				Water	Ranch Core	Cal. Code Regs., tit. 27, §22562(d), Waste Storage Facility (313), RWQCB 2016 Waste Discharge Requirements for Confined Animal Facilities Order No. R2-2016-0031
Soil disturbance is limited to the methods of planting/seeding under the Forage and Biomass Planting Practice Standard. Residues shall be distributed evenly over the entire field and a minimum of 60% residue cover on the soil surface shall be maintained throughout the year. Approaches to minimize harvest impacts to wildlife shall be considered (e.g., leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover for one or more years).							**X**		**X**	Soils	Pasture	Residue and Tillage Management/ No-Till (329)
For all lease/permits that allow Forage Production, a conservation plan must be obtained from USDA, NRCS, or NPS which identifies requirements such as silage crop residue cover, cut stubble height, row spacing, disc passes, disc depth, and number of animal days grazed							**X**	**X**	**X**	Air, Soils, Vegetation, Water	Pasture	NPS 1990 USDA-NRCS 2013

Management Activities	Manure and Nutrient Management						Forage Production, including Silage, Haylage and Hay					
Practice Standards	Nutrient Management (590)	Composting Facility (317)	Waste Treatment (629)	Waste Separation Facility (632)	Waste Transfer (634)	Waste Storage Facility (313)	Forage and Biomass Planting (512)	Forage Harvest Management (511)	Residue and Tillage Management/ No-Till (329)	**Resources**	**Subzone**	**Reference**
Avoid tilling or if necessary and with prior NPS approval use shallow tillage operations (1 to 2 inches) or operations that do not invert the soil. Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10% of the field may be tilled for this purpose.							X		X	Air, Cultural Resources, Soil, Water	Pasture	USDA-NRCS 2007, 2013
Do not aerate soils, unless soil compaction is demonstrated, which can be predicted using USDA, NRCS, soil maps and measured using a soil cone penetrometer, when soils are saturated and ideally are at field capacity.	X						X			Soils	Pasture	Wynne and Hancock 2008
Efforts must be made to control silage leachate. Install an impermeable cover to minimize the entry of clean rain water from the top of the cover into the bunker, and ensure that water is not running along the sides of the bunker and coming into contact with the feed. Note: A leachate collection system or vegetated filters strip may be required. Use a minimum cubic foot of leachate storage capacity for each ton of material placed in storage if and when containment becomes necessary.								X		Air, Water	Ranch Core	Kammel 1995
General seeding mitigations: ▪ A Plans and Specifications document must be prepared that includes species to be used, seeding rates and dates, establishment procedures, actions needed to ensure adequate cover of desired species, and operation, monitoring, and maintenance requirements. ▪ All purchased seed shall be tagged and labeled in accordance with the California Agricultural Code and Seed Law, and acceptable to the County Agricultural Commissioner. Bag tags shall include evidence of purity and germination. Seed shall be of a quality that weed seed shall not exceed 0.5% of the aggregate of pure live seed (PLS) (% germination x % purity) and other material. Time since date of seed test shall not exceed 9 months.							X			All	All	NPS

F-14: MITIGATIONS ASSOCIATED WITH OTHER LIVESTOCK, HORSE BOARDING, AND CROP DIVERSIFICATION

Diversification Mitigations
Adhere to the following Livestock Diversification practices specific to the Pasture subzone (if applicable): ▪ Avoid heavy or prolonged grazing by sheep and goats in pastures on areas with steep slopes or sparse vegetation. ▪ Control grazing practices, including pasture rotation, for goats and sheep in pastures to avoid overgrazing. ▪ Locate watering facilities in pastures on areas that promote even grazing distribution by sheep and goats and reduce grazing pressure on specific areas. ▪ Locate watering facilities in pastures away from well heads and install wellhead protection (i.e., fencing). ▪ Place watering facilities, new feed rack, and salt and mineral feeders in pastures a minimum of 300 feet from any riparian or aquatic habitat. ▪ Regularly move portable/moveable structures located in pastures for the production of fowl with to avoid or minimize contamination, disease occurrence, and overgrazing. ▪ Place portable/moveable structures located in pastures for the production of fowl a minimum of 300 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September. ▪ Place floorless broiler chicken huts located within the Pasture subzone a minimum of 150 feet from any drainages, riparian areas, wetlands, or ponds from mid-June through mid-September.
Ensure livestock receive preventative veterinary care as needed. As appropriate and consistent with organic standards, vaccinate livestock and fowl if regional disease issues have been identified and administer vaccinations according to manufacturer recommendations. Inform NPS of livestock disease testing results, and contact USDA and CDFA for required, reportable diseases.
Ensure the design, construction, and maintenance of enclosures, buildings, and equipment used for livestock diversification located in the Ranch Core subzone or Pasture subzone: ▪ Allow for easy maintenance to allow for good hygiene and air quality ▪ Provide shelter from predators and from adverse weather conditions. ▪ Limit the risk of disease, contamination, and injuries. ▪ Include the use of fire-resistant materials and properly installed electrical equipment and wiring.
Conduct daily inspections and quickly pick up livestock (i.e., sheep, goat, and hog) and fowl (i.e., chicken) carcasses and dispose of them outside the park. Document disposal methods and instances using the USDA-approved methods and emergency action plans if necessary.
Adhere to the following key points for use of all livestock guardian animals: ▪ Post signs to alert the public of the presence of livestock guardian animals. ▪ Ensure health and safety by providing adequate food and water, routine veterinary care and vaccinations, de-worming, hoof trimming for donkeys and llamas (ATTRA 2002; BCAC 2011a, 2011b; CDFA n.d.) Report all livestock guardian animal interactions with wildlife and visitors to the NPS. Adhere to the following key points for use of guard dogs (ATTRA 2002; BCAC 2011a, 2011b; CDFA n.d.; Green and Woodruff 1999; MDC 1996; Van Bommel 2010; USDA-APHIS 2002): ▪ Select a suitable breed for guard dogs, such as the Maremma-Abbruzzi, Akbash, Kuvasz, Anatolian Shepherd, Great Pyrenees, or Kommondor and purchase from a reputable breeder registered with the American Kennel Club. ▪ Properly train the dog to understand commands made by owner(s). ▪ Rear singly, from 8 weeks of age, with the animals the dog is guarding and minimize human contact ▪ Ensure some (limited) human contact to adequately socialize the dog and avoid aggressive behavior toward humans—10 minutes twice day for a puppy and once a day for an adult on pasture is typically enough contact. ▪ Spay or neuter guard dogs at appropriate age.

Diversification Mitigations
▪ Monitor and correct any undesirable behavior. ▪ Do not feed any raw food. ▪ When feasible, contain livestock and guard dogs within temporary exclosures bordered by electrified netting. Adhere to the following key points for use of llamas (ATTRA 2002; BCAC 2011b; CDFA n.d.; Iowa State University 1994; MDC 1996): ▪ Use gelded adult male llamas, nonbreeding females, or females with young. ▪ Use only one llama per pasture. ▪ Monitor for aggressive behavior toward humans. ▪ Feed with the animals they are guarding. Adhere to the following key points for use of donkeys (ATTRA 2002; BCAC 2011b; CDFA n.d.; MDC 1996): ▪ Select donkeys from medium- to large-size stock. ▪ Use jennies and geldings (Jacks are usually too aggressive). ▪ Feed with the animals they are guarding. ▪ Use only one donkey per pasture.
Report to NPS all observed or suspected interactions between livestock and native predators, including coyotes, bobcats, and mountain lions. Lethal control of wildlife is explicitly prohibited.
Adhere to the Livestock Diversification practices specific to the Ranch Core subzone: ▪ Place watering facilities, new feed rack, salt and mineral feeders, corrals, and feed storage facilities based on operational needs. ▪ Regularly clean and disinfect livestock and fowl housing, processing areas, and equipment as needed to reduce or prevent the spread of disease and pathogens by removing debris, cleaning and disinfecting surfaces.
Structural measures to prevent predation of poultry include: ▪ Build wildlife-proof structures for poultry using strong wire metal mesh that is firmly secured. ▪ Enclose poultry in night houses or shelters for species on pasture.
Implement dust control measures, such as wetting down paddocks and riding arenas, especially on dry, windy days and use low-dust or no-dust footing materials to control dust while reducing water use.
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains. Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season.
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands. Minimize the amount of water used by using sponges or hoses equipped with shut-off or low-flow nozzles; and the amount of soap used, especially soap with surfactants.
As part of any crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate. Use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late

Diversification Mitigations
fall and use certified weed-free straw if purchased from outside the park or from a different ranch. Incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin). Store harvested crops in enclosed structures (i.e., buildings, barrels, crates). If wildlife control is needed, only non-lethal management methods are permitted (i.e., scarecrows or decoys and control garden debris). Lethal control of wildlife is explicitly prohibited.
Plant cover crop or cover soils with mulch and use at least 30% cover in fallow crop areas throughout the rainy season.
For crop diversification, conclude tilling activities row crop areas, such as ripping, disking, or harrowing, before the first rains or November 1, whichever comes later

References

ATTRA (Appropriate Technology Transfer for Rural Areas)

2002 "Predator Control for Sustainable & Organic Livestock Production." Livestock Technical Note. October.

BCAC (BC Agriculture Council)

2011a "Wildlife Predator Loss Prevention. Best Management Practices for Cattle. A Guide for Cattle Producers on How to Minimize Predation of Cattle".

2011b "Wildlife Predator Loss Prevention. Best Management Practices for Sheep. A Guide for Sheep Producers on How to Minimize Predation of Sheep."

CBARCD (Council of Bay Area Resource Conservation Districts)

2003 Fact Sheet: Land Application of Horse Manure. Petaluma, California. June.

CDFA (California Department of Food and Agriculture)

n.d. "Livestock Guardians; Choosing a Guard Animal." Accessed January 27, 2016. http://www.predatorfriendly.org/how-to/how-to-pdf docs/Choosing%20%20a%20Guard%20Animal.PDF

DEFRA (Department of Environment Food and Rural Affairs)

2009 "Protecting our Water, Soil, and Air. A Code of Good Agricultural Practice for Farmers, Growers, and Land Managers."

DiTomaso, J. M. and D. W. Johnson (eds.)

2006 *The Use of Fire as a Tool for Controlling Invasive Plants*. Cal-IPC Publication 2006-01. Berkeley, CA: California Invasive Plant Council. 56 pp.

DiTomaso, J. M., G. B. Kyser, S. R. Oneto, R. G. Wilson, S. B. Orloff, L. W. Anderson, S. D. Wright, J. A. Roncoroni, T. L. Miller, T. S. Prather, C. Ransom, K. G. Beck, C. Duncan, K. A. Wilson, and J. J. Mann

2013 *Weed Control in Natural Areas in the Western United States*. Davis, CA: University of California Weed Research and Information Center.

Green, C.

n.d. *Reducing Mortality of Grassland Wildlife during Haying and Wheat-Harvesting Operations*. NREM-5006. Oklahoma Cooperative Extension Fact Sheets. Oklahoma Cooperative Extension Service.

Green, J. S. and R. A. Woodruff

1999 *Livestock Guarding Dogs. Protecting Sheep from Predators*. U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS). Agriculture Information Bulletin Number 588. July.

Hyde, D., and S. Cambell

2012 *Agricultural Practices that Conserve Grassland Birds*. Michigan State University Extension. Publication No. E3190. 22 pp. http://www.canr.msu.edu/uploads/resources/pdfs/agricultural_practices_that_conserve_grasslands_birds_(e3190).pdf

Iowa State University.

1994 "Guard Llamas. A Part of Integrated Sheep Protection." University Extension, Ames, Iowa. July.

Karhu R.

2008 "Fence Designs Accommodate Wildlife but Keep Livestock In." *Barnyard and Backyards*. Wyoming Natural Resources Conservation Service. http://www.uwyo.edu/barnbackyard/_files/documents/magazine/2008/summer/wildlife-friendly-fence-summer-2008-web.pdf

Kammel, D. W.

1995 "Reducing the Risk of Groundwater Contamination by Improving Silage Storage. New Jersey Farm-A-Syst." The New Jersey Farmstead Assessment System.

Marin Resource Conservation District

2018 "Marin Permit Coordination Program."

MDC (Missouri Department of Conservation)

1996 Using Guard Animals to Protect Livestock.

NHDAMF (New Hampshire Department of Agriculture, Markets, and Food)

2011 "Manual for Best Management Practices (BMPs) for Agriculture in New Hampshire: Best Management Practices for the Handling of Agricultural Compost, Fertilizer, and Manure." Concord, New Hampshire.

NPS (National Park Service)

1990 *Range Management Guidelines*. Point Reyes National Seashore. 37 pp.

2006 Management Policies. US Department of the Interior, National Park Service, Washington, DC. https://www.nps.gov/policy/MP_2006.pdf

National Oceanic and Atmospheric Administration (NOAA Fisheries)

2014 *Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices. Agronomy Technical Note No. 9*. February 2014. https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=34828.wba

2016 Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation Management Act Essential Fish Habitat Response for the Program for restoration projects within the NOAA Restoration Center's Central Coast California Office jurisdictional area in California. Southwest Region. June 14, 2016.

Ochterski, J.

2006 *Hayfield Management and Grassland Bird Conservation*. Cornell University Cooperative Extension. 8 pp. https://www.nyfoa.org/application/files/6314/7948/6092/HayfieldsGrassland_Birds_3MB.pdf

Paige, C.

2012 *A Landowner's Guide to Wildlife Friendly Fences: How to Build Fence with Wildlife in Mind*. Second Edition, updated 2012. Montana Fish, Wildlife and Parks. Helena, MT. 56 pp. http://fwp.mt.gov/fwpDoc.html?id=34461

Pitt, M. D., R. H. Burgy, and H. F. Heady

1978 "Influences of Brush Conversion and Weather Patterns on Runoff from a Northern California Watershed." J*ournal of Range Management*. Volume 31, No. 1. January 1978.

San Francisco RWQCB (San Francisco Regional Water Quality Control Board)

2016 Pathogens in Tomales Bay Tributaries Water Quality Report Card. Released October 2016. https://www.waterboards.ca.gov/about_us/performance_report_1617/plan_assess/tmdl_outcomes/r2_tomales_bay_pathogens.pdf

Sonoma County (Sonoma County Sonoma County Agricultural Commissioner's Office)

2013 Best Management Practices for Agricultural Erosion and Sediment Control. Version 4. December.

SWRCB (State Water Resources Control Board)

2015 San Francisco Bay Region. Renewal of Conditional Waiver of Waste Discharge Requirements for Existing Dairies Within the San Francisco Bay Region. Resolution No. R2-2015-0031. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/agriculture/CAF/Resolution%20R2-2015-0031.pdf

USDA-APHIS (U.S. Department of Agriculture, Animal and Plant Health Inspection Service)

2002 *Livestock Guarding Dogs*. Wildlife Services Factsheet. April.

USDA-NRCS (US Department of the Interior, Natural Resource Conservation Services.

2003 *National Range and Pasture Handbook*. Grazing Lands Technology Institute. December 2003. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043055.pdf

2007 "Conservation Practice Standard. Residue and Tillage Management, No-till/Strip Till/Direct Seed." Code 329.

2009 *Grassland Birds: Fish and Wildlife Habitat Management, Leaflet No. 8*. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_054067.pdf

2010 "Conservation Practice Standard Overview. Forage and Biomass Planting." Code 512. January.

2011 "NRCS Conservation Practice Standard for Herbaceous Weed Management." Code 315. California Field Office Technical Guide.

2013 "Conservation Practice Standard. Residue and Tillage Management, No Till." Code 329. December.

2016 "Conservation Practice Standard. Nutrient Management." Code 590. NRCS Field Office Technical Guide, California. https://efotg.sc.egov.usda.gov/references/public/CA/590-std-ca-9-16.pdf

Van Bommel, L.

2010 Guardian Dogs. Best Practice Manual for the Use of Livestock Guardian Dogs. Invasive Animals Cooperative Research Centre.

Weigand J.

2008 "Wilderness in Mind: Wildlife Friendly Fencing." Montana Fish, Wildlife and Parks.

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

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

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

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

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

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

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

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

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APPENDIX H—PUBLIC USE AND ENJOYMENT DETAIL

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APPENDIX H: PUBLIC USE AND ENJOYMENT DETAIL

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

Development of Trails and Trail-Based Recreation Additional Detail

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

On the Point Reyes Peninsula:

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

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

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

Potential trailhead improvements could include:

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

APPENDIX I—INDICATORS, THRESHOLDS, AND VISITOR CAPACITY DETAILS

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APPENDIX I: INDICATORS, THRESHOLDS, AND VISITOR CAPACITY DETAILS

Introduction

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

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

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

Desired Conditions

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

Visitor-Caused Issues

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

Crowding and Congestion

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

Parking

The availability of formal parking and the existence of visitor-created parking sites are concerns in several sites in the planning area. Social media sharing has encouraged use at the Cypress Tree Tunnel and has led to increased visitor parking along the tree roots and at the pullout past the tunnel, resulting in damage to the tree tunnel. Parking lots at Pierce Point Ranch, Marshall Beach Trailhead, and the Estero Trail often fill up, especially during good weather and on weekends. Informal parking has been observed at those locations, as well as at Kehoe Beach Trailhead, and to a lesser extent around trailheads in the north district of Golden Gate, including Bolinas Ridge Trailhead. Informal roadside parking results in an

increased threat to visitor safety, especially during times of peak congestion and when motorists do not practice safe traveling speeds.

Ranches

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

Trails

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

Trash/Waste

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

Indicators and Thresholds

Indicators

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

Thresholds

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

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

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

Informal Parking

Indicator

Number of incidents of informal parking.

Threshold

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

Rationale for Indicator and Threshold

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

Monitoring Method

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

Management Strategies and Actions: The following adaptive management strategies represent the suite of actions that NPS could implement if the informal parking threshold is approached or exceeded.

- Increase education about the potential impacts of parking along the sides of the road
- Encourage visitor use during non-peak times
- Redirect visitors to other, less crowded areas
- Evaluate alternative modes of transportation access
- Redesign or increase the number of formal parking areas
- Formalize informal parking areas

Incidents and Visitor Complaints

Indicator

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

Threshold

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

Rationale for Indicator and Threshold

Unendorsed behaviors have become a primary safety concern for visitors and NPS staff and pose noteworthy risks to park resources and visitor safety. Inappropriate use can also diminish the quality of the visitor experience from the effects of disruptive or destructive behavior that interferes with others' enjoyment of park resources. Curtailing unendorsed behaviors would reduce the need for enforcement, allowing park staff to be reallocated to handle higher-priority safety situations, such as search and rescue. Monitoring use-related complaints allows the park to proactively and preemptively investigate possible related changes in the condition of natural and cultural resources that may not only compromise those resources, but also the visitor experience.

Monitoring Method

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

Management Strategies and Actions

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

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

Waste

Indicator

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

Threshold

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

Rationale for Indicator and Threshold

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

Monitoring Method

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

Management Strategies and Actions

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

- Increase targeted enforcement
- Increase education and information distribution
- Manage site with placement of physical barriers and improved boundary marking
- Develop partnerships and community involvement
- Change visitor use hours
- Increase ongoing cleanup response

Cultural Resource Impacts

Indicator

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

Threshold

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

Rationale for Indicator and Threshold

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

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

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

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

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

Monitoring Method

The planning area contains more than 200 documented historic buildings, structures, and archeological sites that are documented and tracked in NPS cultural resource databases, such as ASMIS, CLI, and LCS. For each of these resources, NPS conducts condition assessments, which are typically scheduled at a regular interval between one and ten years. Condition is determined based on a rating system of *good*, *fair*, *poor*, and *destroyed*. The monitoring is intensive and includes photo documentation to measure change over time resulting from various natural and use-related causes such as vandalism, erosion, and others. Ideally, the park would update the monitoring schedule to a shorter period, such as every five years. The park would continue to explore photogrammetry and other technologies as a monitoring technique and would continue to explore the change in condition over time for Facility Management Software System (FMSS)-maintained assets or change in deferred maintenance as a monitoring mechanism. As a part of monitoring for this indicator, the park will record events of disturbance. Cultural Landscapes Inventory and the US Geological Survey Land Change Science National Land Cover dataset will also aid in the monitoring method.

Management Strategies and Actions

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

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

Visitation

Indicator

Number of visits per year.

Threshold

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

TABLE I-1: MONITORING ANNUAL PARK-WIDE VISITATION

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

Rationale for Indicator and Threshold

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

Monitoring Method

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

Management Strategies and Actions

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

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

Visitor Capacity

Overview

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

Visitor Capacity Analysis Areas

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

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

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

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

Review of Existing Direction and Knowledge

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

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

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

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

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

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

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

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

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

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

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

Strategies to Implement Visitor Capacity.

- Increase park-wide wayfinding
- Increase education by providing more information about Pierce Point Road, Pierce Point Historic Ranch, and additional lesser known visitor opportunities
- Explore vehicle shuttles and other mechanisms of transporting bikes to trailheads and other starting locations
- Provide trip planning tools to diversify the intensity of visitation in some of the primary areas
- Identify measures to formalize and more efficiently utilize and manage existing parking
- Explore a pilot program that evaluates implementation of a reservation system, parking fees, or expanded amenity fee areas during peak times
- Explore use of vehicle shuttles during peak times

- Expand recreation opportunities, evaluate trail connections that can create loops from L Ranch Road to Pierce Point Ranch, and evaluate Marshall Beach Trail loop connection
- Work with ranchers to provide new opportunities that connect trail-based recreation with ranch interpretation and education

Analysis Area 2: North District of Golden Gate

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

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

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

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

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

Strategies to Implement Visitor Capacity.

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

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

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

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

maintains their integrity and historic and prehistoric archaeological sites, and ethnographic resources related to historic land uses and Coast Miwok traditional associations would be preserved and maintained.

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

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

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

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

Strategies to Implement Visitor Capacity.

- Expand use of intelligent transportation systems such as distributing information about crowded and/or closed areas
- Expand wayfinding to include alternative locations for visitor activities
- Develop a beach viewing area adjacent to the Naval Compass Station
- Expand the range of visitor opportunities to facilitate new and unique places to see and experience at Point Reyes
    - Consider the use of commercial use authorizations to distribute visitor use
    - Develop loop trails and opportunities to connect the Cypress Tree Tunnel to H Ranch
    - Explore trail potentials near Creamery Bay and Drake's east; if the park develops additional trails/trailheads, visitor use could be distributed better along the road corridor (with new trailheads/parking)
    - Complete Estero Trail with a loop through Home Ranch and connect to other sites
    - Develop and assess the appropriateness of additional parking locations
- Partner with the county to expand bus service
- Partner with the county to improve multi-use road to provide enhanced safety for bicycles
- Consider temporary road closures when visitor safety is compromised

- Explore a pilot permit/reservation system for key destinations during peak times or on peak weekends
- Increase the shuttle season but include the development of a new staging area before the Y at Sir Francis Drake and Pierce Point Road in the expansive flat area
- Cypress Tree Tunnel
  - Develop strategies to increase pedestrian use at the Cypress Tree Tunnel
  - Develop and assess the appropriateness of new facilities
  - Expand/improve parking at the pullout
  - Consider restrooms
  - Lock gate at the Cypress Tree Tunnel entrance
  - Leverage the radio site at the end of the road to be an attraction that is open most Saturdays and staffed by a volunteer group

References

Manning, R., S. Lawson, P. Newman, J. Hallo, and C. Monz

2014 *Sustainable Transportation in the National Parks: From Acadia to Zion*. White River Junction, VT: University Press of New England.

Lawson, S., and B. Kiser

2013a *Transportation & Visitor Use Data Collection, Analysis, & Modeling: Mount Rainier National Park*. Natural Resource Technical Report NPS/NRTR—2013/10, NPS D-105/117351 & PMIS 88348.

Lawson, S., and B. Kiser

2013b *Visitor Survey Report to Support Development of Visitor Facilities Zone Indicators & Standards: Mount Rainier National Park. Natural Resource*.

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APPENDIX J—GENERAL MANAGEMENT PLAN AMENDMENT SUBZONE DEFINITIONS AND SELECTION CRITERIA

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APPENDIX J: GENERAL MANAGEMENT PLAN AMENDMENT SUBZONE DEFINITIONS AND SELECTION CRITERIA

Range Subzone

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

The extent of the Range subzone was determined by combining existing geographic information system (GIS) coverages of known sensitive resources and buffering them by 35 feet (coverages from NPS, the US Geological Survey, US Fish and Wildlife Service, National Marine Fisheries Service, and the US Department of Agriculture [USDA]). These resources include threatened and endangered species or critical components of their life cycles (e.g., California red-legged frog; mountain beaver; and occurrences of *Viola adunca*, the host plant for Myrtle's silverspot butterfly), rare plants, native grasslands (including data derived from Schirokauer et al. [2003] and NPS field mapping), forests, ponds, streams and wetlands, and archeological sites. Slopes greater than 20% were also generally included in this subzone, based on a digital elevation model derived from USDA LIDAR surveys.

Data sources used to establish the Range subzone areas are based on best available information; however, some data layers are not comprehensive for the entire planning area. As noted in the environmental impact statement, the Range subzone would be updated based on monitoring and surveys for the above sensitive resources. NPS would make on-the-ground field verification and determinations to confirm or further delineate the Range subzone.

Metrics for native grassland and inclusion in the Range subzone would be informed by a native grassland mapping protocol developed by UC Berkeley for Point Reyes (Aoyama et al. 2017). Grassland plots that return native species as dominant or subdominant, obligate wetland species, or rare or sensitive species would be included in the Range subzone. If the plots contain one or more native species (a native component), consideration would be given to the type and number of native species present or a minimum percent cover would be established for inclusion in the Range subzone. Based on pilot data, the UC Berkeley report indicated that minimum percent cover for indicator species was generally lower than in the *Manual of California Vegetation* (Sawyer, Keeler-Wolf, and Evens 2009) or the most recent park *Vegetation Community Key* (Keeler-Wolf, van der Leeden, and Schirokauer 2003). In cases where minimum percent cover is used, the lowest cover criteria between the grassland mapping protocol report, the *Manual of California Vegetation* or the park *Vegetation Community Key* would be used to ensure protection of coastal grasslands with a native component.

Future data collection under this protocol could be used to update the inclusion criteria. A Marin Countywide Fine Scale Vegetation Map is also under development that could inform criteria for inclusion.

Resource Protection Subzone

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

Existing Grazing Exclusion

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

Proposed Grazing Exclusion

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

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

Pasture Subzone

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

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

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

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

- A known wetland or other sensitive resource not in the existing GIS coverage
- An area with a history of disturbance or heavy land use
- Feasibility of equipment access to perform management activities

- Ability to influence areas outside the proposed activity (e.g., is the slope adjacent sensitive areas?)
- Consideration of existing infrastructure (e.g., fence lines and roads)
- Stand-alone ponds with a 35-foot buffer not adjacent to other sensitive resources were "punched out" of the Pasture subzone

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

Ranch Core Subzone

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

Draft Criteria for NPS Field Surveys to Use to Refine Subzones

- Resource survey required if one has not been conducted in the last five years.
- Vegetation surveys would follow 0.25-hectare plot grassland methodology developed with University of California, Berkeley, and note that it is Range subzone if plots return:
  - Rare or sensitive species
  - Obligate wetland indicator species
  - Native species as dominant or subdominant
  - Native species at the lowest cover criteria established using methodology in the UC Berkeley native grassland mapping protocol, Manual of California Vegetation, park Vegetation Community Key, or other established document or resource used for vegetation classification. Number and type of native species could be considered in lieu of, or in addition to, cover.
- NPS would evaluate the location of a proposed activity to determine the activity's ability to influence areas outside the proposed footprint (e.g., % slope and seed dispersal).
- NPS would consider restoration suitability to determine the most appropriate subzone designation:
  - Adjacent to high quality resource area?
  - Same soil?
  - Similar slope?
  - If yes, do not include in Pasture subzone.

References

Aoyama, L., J. Bartolome, P. Hopkinson, F. Ratcliff, and L. Waks

2017 *Native Grassland Mapping Protocol*. University of California, Berkeley, Range Ecology Laboratory Department of Environmental Science, Policy, and Management. Final version – October 11, 2017. 53 pp.

Keeler-Wolf, T., P. van der Leeden, and D. Schirokauer

2003 *Field Key to the Plant Communities. Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks. Appendix A. Point Reyes National Seashore, Golden Gate National Recreation Area, and Surrounding Wildlands Plant Community and Mapping Project Final Report*. Point Reyes National Seashore, National Park Service.

Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens

2009 *A Manual of California Vegetation, Second Edition*. California Native Plant Society, Sacramento, CA.

Schirokauer, D., T. Keeler-Wolf, J. Menke, and P. van der Leeden

2003 *Plant Community Classification and Mapping Project Final Report. Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks*. National Park Service, Point Reyes Station, CA.

APPENDIX K—FORAGE MODEL

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

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

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Introduction

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

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

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

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

At the most basic level, the simulations calculate:

$$(RemainingRDMfrompreviousyear(lbs) - MonthlyDecompositionRate) +$$
$$(USDARanchForageProduction(lbs) * ControlPlotCorrection * SeasonalCorrection) -$$
$$(MonthlyForageDecayRate - SummerMonthlyDecompositionRate) -$$
$$(CattleIntakeperDay * DaysonRanch * ProportionNonsupplementalFeed) -$$
$$(ElkIntakeperDay(lbs/lbs) * ElkDaysonRanch)$$

with random variation around each variable that is detailed below.

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

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

Data for the Simulations

- A forage production estimate at the ranch scale. We generated forage production using a soils map for ranches using data available from the USDA NRCS (http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).
- The number of acres of each soil type on a ranch was calculated in GIS.
- Acres not suitable for grazing (e.g., dune habitats, forest, and dense coastal scrub) were excluded from the forage production estimate. The data set is currently based on the 1994 NPS vegetation map with known updates to shrub and weed areas. However, this may be updated in the future to more realistically reflect current conditions and identify and misclassifications.
- The available forage (lbs.) for each ranch was determined by multiplying the USDA NRCS estimates of forage production (lbs./acre, normal year) for each soil type by the total numbers of acres of each soil type found within the grazeable acres of the ranch.
- The total forage production on a ranch was then scaled by a single correction factor derived from the ratio of dry matter produced on ungrazed (i.e., control) plots (N = 59 samples from 6 different plots between 1987 and 2018) to the USDA soil prediction for forage under a normal year. These samples represent a wide range of rainfall and production and ratios ranged from about 0.5 to 3.0 (one outlier of 4.5 was removed) (Figure 1). The distribution of corrections (actual production - predicted production) best fit a gamma distribution (shape = 6.13, rate = 4.01) determined using the fitdistrplus R package (Delignette-Muller and Dutang 2015).

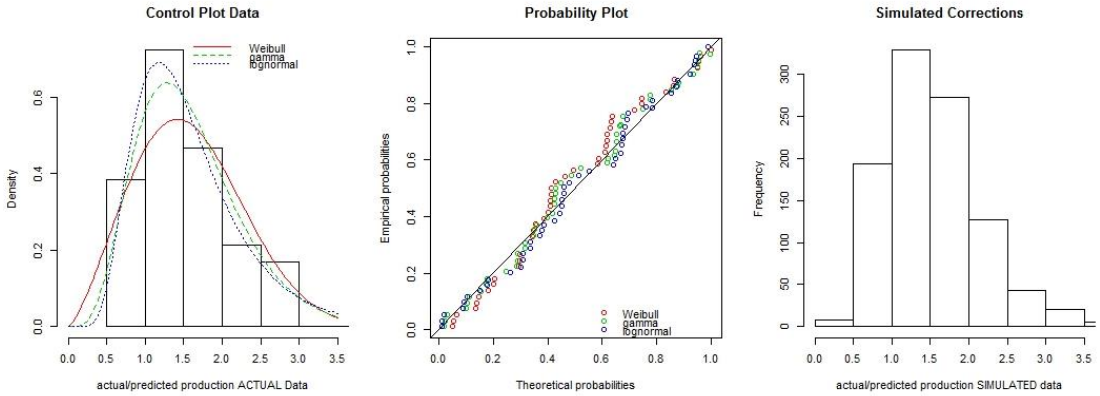


Figure 1. Distribution fitting for ratio of ungrazed control plots to NRCS soil production predictions. The best fit (by AIC) gamma distribution is used to scale soil production in ranch.forage() *and other functions. Left plot shows empirical ratio of end of year forage to NRCS predicted forage with best fits of Weibull, Gamma, and Lognormal distributions (all non-negative distributions). Center plot shows fits to theoretical probabilities, and right plot shows simulated values based on the best fit gamma distribution.*

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

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

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

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

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

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

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

## Heifer daily USDA Organic Dry Matter Demand Table 1-9 & 1-10
heifer.mean.lb <- mean(c(9.2, 11.4, 13.5, 15.5, 17.3, 19.1, 23, 25, 26.8, 28.
6, 30.3))
heifer.sd.lb <- sd(c(9.2, 11.4, 13.5, 15.5, 17.3, 19.1, 23, 25, 26.8, 28.6, 3
0.3))

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

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

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

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

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

Function Overviews

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

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

Examples

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

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

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

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

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

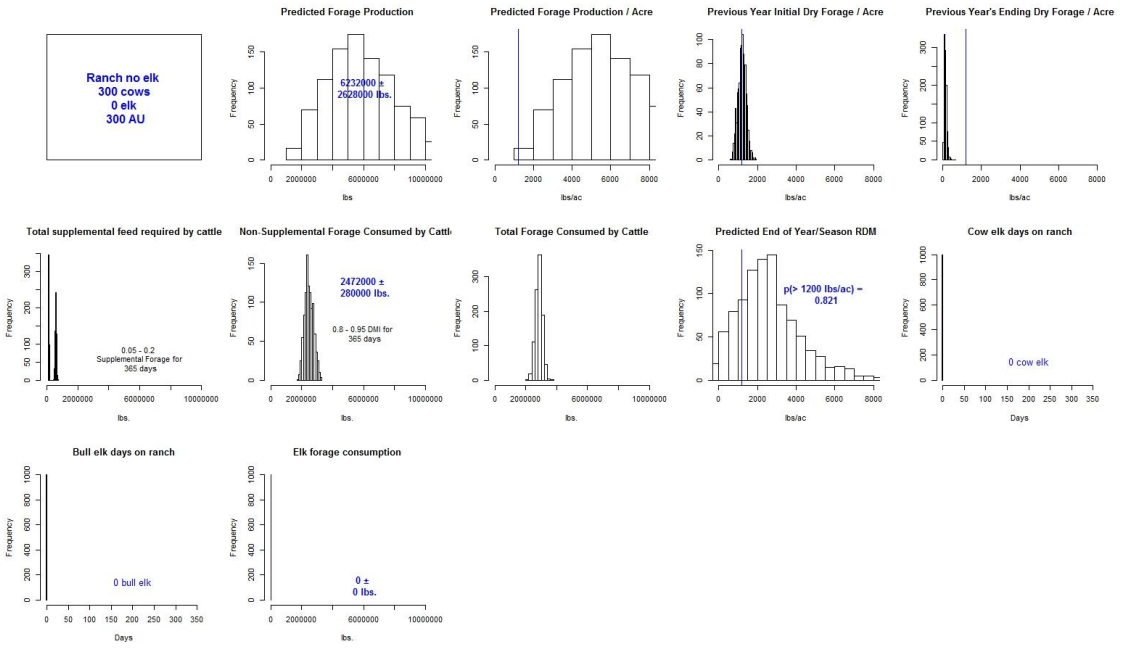


Figure 2. Output from Example 1. A ranch.forage() simulation for a fictitious ranch with 300 cattle (The 100 AU are simply a potential authorized lease number not included in calculations). Histograms represent realizations of each of 1000 simulations. Moving from left to right and down these are: total forage produced on ranch; forage produced per acre; forage remaining from previous season; previous season forage remaining at end of current season; supplemental forage required by cattle; forage from range required by cattle; total forage required by cattle; end of season RDM per acre; days (and number) of female elk; days (and number) of male elk.

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

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

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

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

```
Ranch_Elk_Winter_Spring.mc <-
  ranch.forage.mc(
    number.bovines.x <- seq(250, 450, by = 10), ## loop through 250 - 450 cat
tle in steps of 10
    pasture.name = "Ranch with Elk Full Year",
    pasture.acres = 2110,
    pasture.prod.lb.x = 4500000,
    rdm_start_dry_decay_mos = 7,                ## last years RDM decays for
7 months
    current.au = 300,                         ## this authorized # cattle and i
s used only for plotting
    elk.cows.x = 5,
    elk.bulls.x = 25,
    elk.cow.days.on.pasture.x = 75,
    elk.bull.days.on.pasture.x = 75,
    seasonal_correction = 0.16 + 0.81,          ## 0.16 for winter growth and
0.81 for spring
    DMI.req.wet = 0.95,
    DMI.req.norm = 0.85,
    DMI.req.dry = 0.80,
    loss_mean = 0.07,                           ## 7 % loss per month per Fro
st et al 2005
    loss_sd = 0.02,                             ## Not much data for this est
imate
    loss_mos = 0,                               ## set to zero if not includi
ng summer-fall
    rdm.ac.req = 1200,                          ## target RDM at end of seaso
n
    bovine.daily.dry.matter.lb.x = 26,          ## lbs of daily intake for a
beef cow/calf
    bovine.daily.dry.matter.lb.sd = 2,
    bovine.days.on.pasture = 91 + 121           ## Days cattle on pasture (wi
nter + spring = 7 mos)
  )
Ranch_Elk_Winter_Spring.mc                      ## show the plot
```

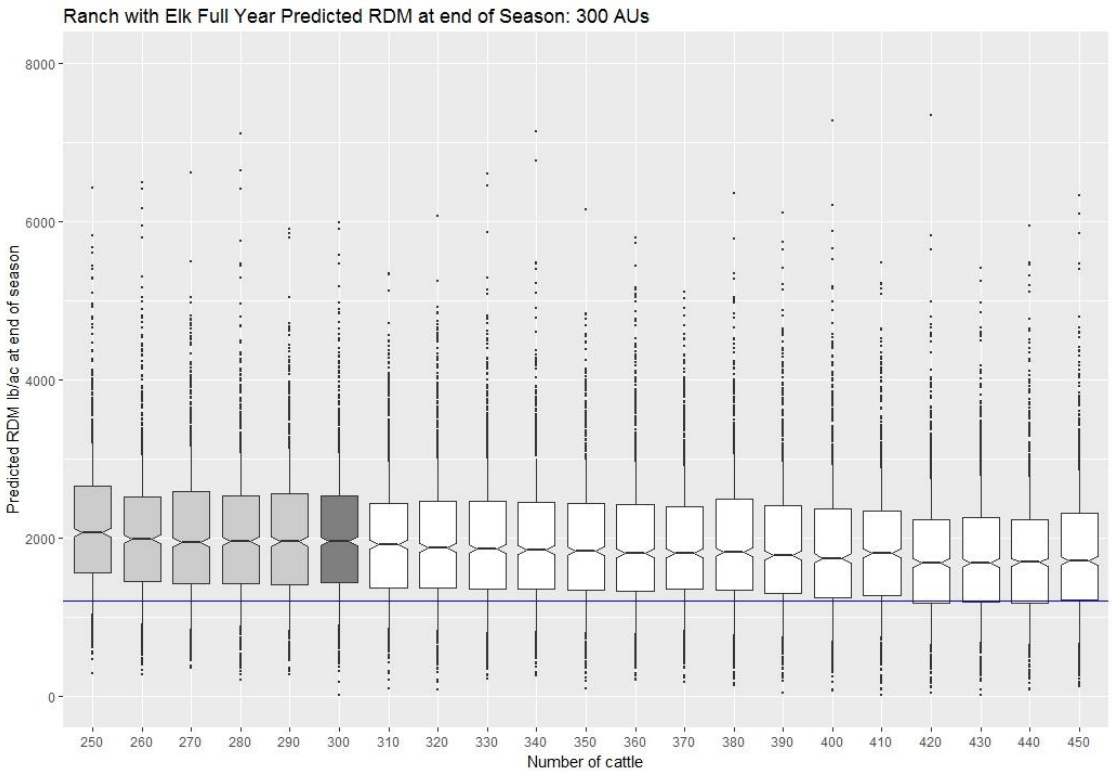


Figure 3. Boxplot output from Example 2. `ranch.forage.mc()` will automatically include a series of panels like Fig. 3 for each stocking rate. Calling the object after running the model will produce this plot showing simulated RDM at the end of the season for the range of stocking rates. The horizontal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

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

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

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

Dairy ranches have milk cows, dry cows and heifers which all may have different numbers of days on pasture and daily forage requirements. Bulls are assumed to have similar energy requirements as milk cows. Results are presented in Figure 4.

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

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

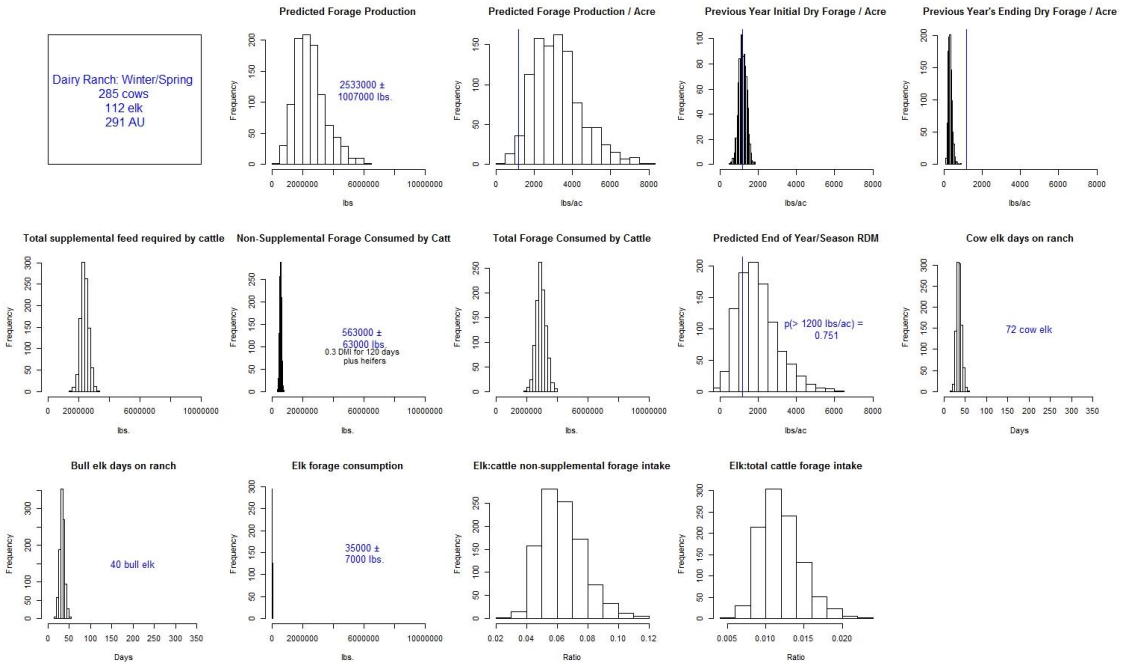


Figure 4. Output from Example 3. Summary of simulations for November - May on a dairy ranch with 285 cattle and 112 elk (and an AU of 291). This output is identical to Figure 2, however, because there were elk in this model, two additional panels are included: ratio of elk/cattle total non-supplemental forage consumption; and ratio of elk/cattle total consumption.

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

In our last example, we vary the number of elk on a ranch while holding the number of cattle steady. The simulation encompasses the full year (Nov - October). Results are presented in Figure 5.

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

```
  seasonal_correction = 0.16 + 0.81 + 0.03,  ## make cumulative for full year
  rdm_start_dry_decay_mos = 3,
  loss_mean = 0.07,                          ## 7 % loss per month per Frost et
al 2005
  loss_sd = 0.02,                            ## need better SD
  loss_mos = 3                               ## set to zero if not including su
mmer-fall
)

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

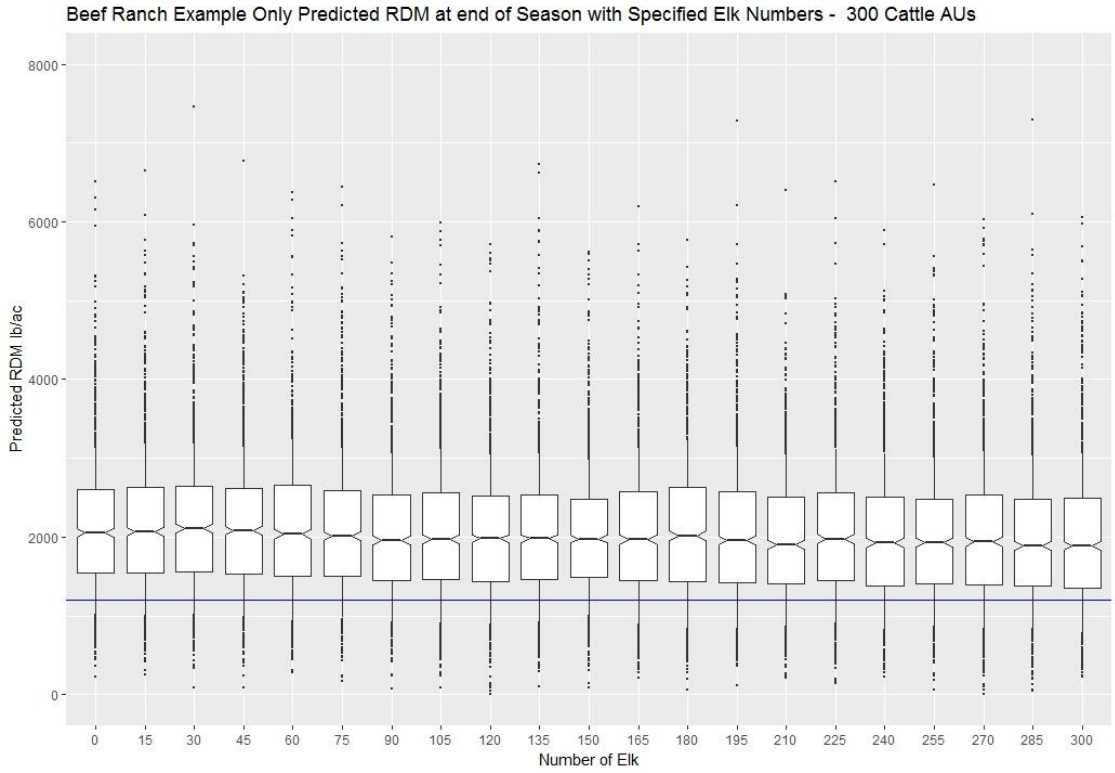


Figure 5. Output from Example 4. This plot can be read similarly to Figure 4, except that cattle numbers are kept constant and elk numbers vary. This simulation shows minimal RDM decline with increases in elk in part because it is a large ranch with mostly female elk that are only present for 100 days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

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

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

C Ranch Case Study

Introduction

Here, we perform preliminary simulations of expected residual dry matter (RDM) on C Ranch (including D West Pasture) at Point Reyes National Seashore with current information on numbers of elk, sex of elk, and time spent on C Ranch derived from observational and telemetry studies over the past several years.

We use the dairy.forage() function in the Forage() package (Becker et al., 2019) which simulates the probability of meeting a specific RDM value (in this case 1200 lbs/ac) being satisfied at the end of the season under specific numbers of dairy cattle (including dry cows, bulls, heifers) and elk. Computationally, the simulations are similar to traditional methods developed by USDA to estimate stocking rates for cattle (CITE) based on forage requirements and soil productivity. However, to assist managers with assessing the probability of meeting a specific RDM threshold, we have incorporated random annual variation around all parameters (forage growth, cattle intake, elk intake, etc.) and empirical correction factors derived from ungrazed field plots (Becker et al., 2019). Documentation and help files for the Forage() package includes details for all models, calculations, code, assumptions, and inputs (Becker et al., 2019).

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

C Ranch Methods and Results

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

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

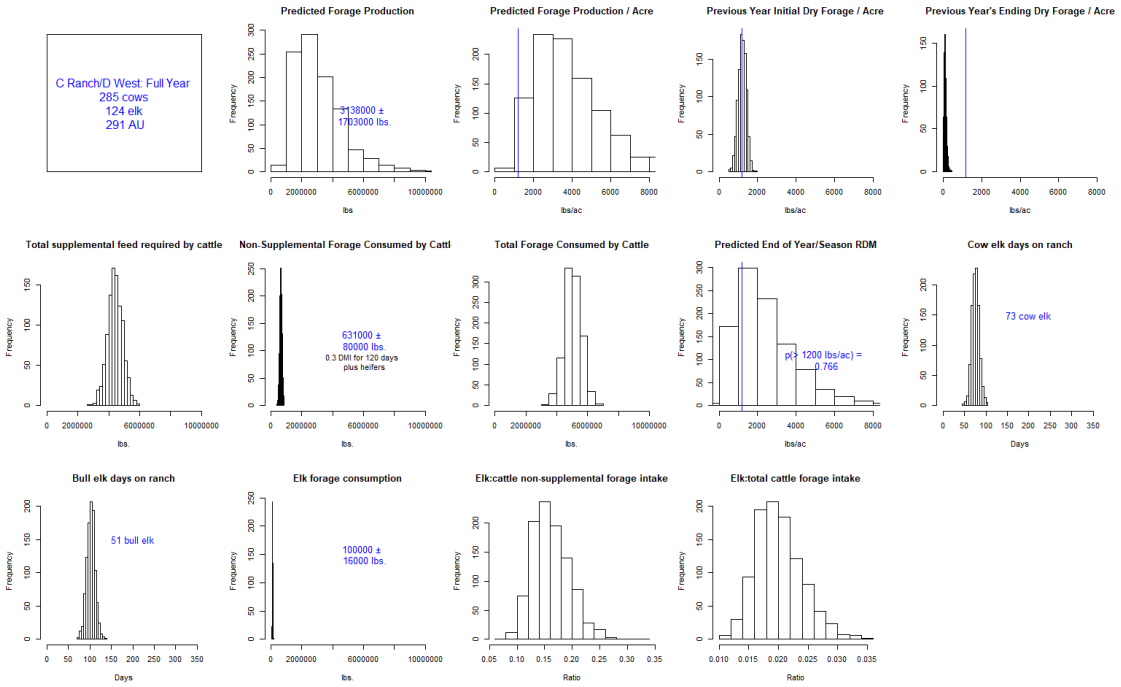
Any of these parameters can be modified as more detailed information becomes available.

Perform C Ranch Simulations and View Results

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

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

```
  elk.bull.days.on.pasture.x = 103,          # per 2019 data
  current.au = 291,                          # per lease
  bovine.days.on.pasture = 120,              # USDA Organic Req
  DMI.req = 0.30,                            # USDA Organic Req
  heifer.days.on.pasture = 90 + 120 + 155,   # assume year round
  heifer.DMI.req = 0.50                      # Assume 50% from pasture
)
```



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

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

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

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

Table 1. Probability of achieving RDM >1200 lbs/ac and forage consumed by elk with varying numbers of elk and 2019 use patterns on C Ranch.

Males	Females	p(RDM>1200)	Forage consumed (lbs)	Mean percent of available forage consumed
1	2	0.81	2,000	0
18	25	0.78	35,000	1
35	50	0.77	69,000	2
51	73	0.77	100,000	3
70	100	0.75	138,000	4
140	200	0.71	275,000	9
210	300	0.67	413,000	14
280	400	0.63	551,000	18
350	500	0.58	688,000	22

Due to the amount of time that elk currently are present on the ranch, elk numbers must nearly triple from the 2019 elk numbers to reduce probability of meeting RDM by ~10% (from 0.80 to 0.71). We also see that the differences between 3 and 124 elk have a negligible effect on the probability of meeting RDM requirements. Doubling the number of days elk spend on the ranch at varying elk numbers has a predictable decrease in meeting RDM targets (Table 2, Figure 6).

Table 2. Probability of achieving RDM >1200 lbs/ac and forage consumed by elk with varying numbers of elk using C Ranch and double the current residence time on the ranch (males: 206 days, females: 152 days).

Males	Females	p(RDM>1200)	Forage consumed (lbs)	Mean percent of available forage consumed
1	2	0.79	5,000	0
18	25	0.78	70,000	2
35	50	0.76	138,000	4
51	73	0.74	201,000	6
70	100	0.72	276,000	9
140	200	0.63	551,000	18
210	300	0.53	827,000	27
280	400	0.45	1,102,000	36
350	500	0.39	1,378,000	45

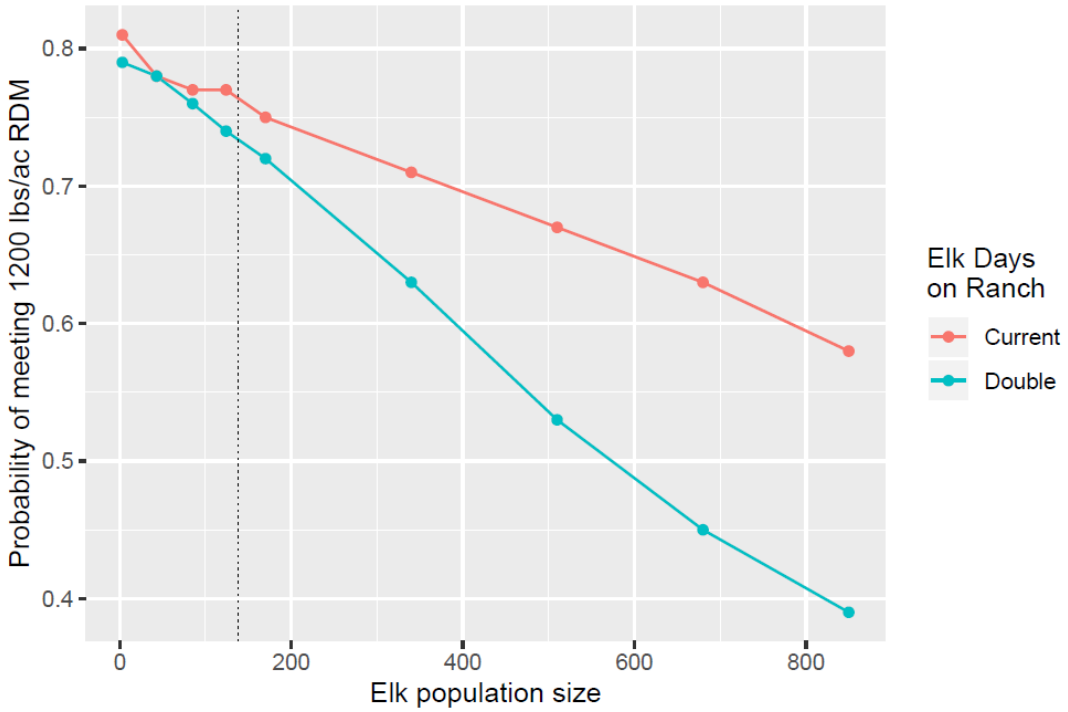


Figure 6. Probability of meeting 1200 lbs/ac at C Ranch with variation in elk population size at current (M:103 d; F:76 d) and doubled (M:206 d; F:152 d) use level. Current population size is shown with a vertical dashed line. Data from Tables 1 and 2.

C Ranch Case Study Discussion

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

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

Discussion

This group of functions should be viewed as general simulations to approximate on the ground conditions for planning cattle stocking rates. The outputs can be used in conjunction with on the ground observations and data to provide a foundation to predict long term patterns of RDM under various cattle (and elk) stocking rates. Additional information from expanded control plots and comparing the model to on the

ground conditions should be used to improve, calibrate, and validate the simulations. Additional areas that could be improved and may yield more realistic estimates include incorporating information on:

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

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

Acknowledgements

Felix Ratcliff and James Bartolome (Range Ecology Lab, UC Berkeley) provided helpful comments, code review, and important improvements on an earlier version of Forage(). Jeremy James (University of California Cooperative Extension) performed an independent peer review of the Forage() package and documentation. Gordon White and Brannon Ketcham (NPS) provided feedback to improve model details and presentation. Larry Ford (LD Ford Rangeland Conservation Science) provided insights on the use and limitations of NRCS soil production values.

References

Becchetti, T. et al.

2016 *Rangeland Management Series: Annual Range Forage Production*. University of California Agriculture and Natural Resources, ANR Publication 8018. January 2016.

Becker, B., D. Press, S. Kraft, R. Foss and D. Voeller

2019 “Rationale, Workflow, and Examples for the Forage() Package.” Unpublished NPS Report.

Becker, B. and D. Voeller.

2019 “Assessment of RDM Model Predictions on Beef Ranches using the Forage() Package.” Unpublished NPS Report.

Delignette-Muller, M. L. and C. Dutang

2015 “fitdistrplus: An R Package for Fitting Distributions.” *Journal of Statistical Software* 64:1–34.

Frost, W.E., J.W. Bartolome, and K.R. Churches

2005 "Disappearance of Residual Dry Matter on Annual Grassland in the Absence of Grazing." In *2005 XX International Grassland Congress*: *Offered Papers*. The Netherlands Wageningen Academic Publishers. Wagenhingen.

Holechek, J.

1988 "An approach for setting the stocking rate." *Rangelands* 10(1):10–14.

R Core Team

2018 "R: A Language and Environment for Statistical Computing." R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/.

RStudio Team

2016 "RStudio: Integrated Development for R." RStudio, Inc. Boston, MA. http://www.rstudio.com/.

Thomas, J. W. and D. E. Toweill

1982 *Elk of North America*. Stackpole Books, Harrisburg, PA

USDA (US Department of Agriculture)

2010a "Dry Matter Demand Tables for Classes of Beef Cattle." USDA, National Organic Program. https://www.ams.usda.gov/sites/default/files/media/NOP-5017-3-DryMatterDemandTablesforClassesofBeefCattle.pdf.

2010b "Dry Matter Demand Tables for Classes of Dairy Cattle." National Organic Program https://www.ams.usda.gov.

2019 "Web Soil Survey." http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

Wickham, H.

2017 "Tidyverse: Easily Install and Load the 'Tidyverse'." R package version 1.2.1.

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APPENDIX L—COASTAL WATERSHED WATER QUALITY ANALYSIS

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Improved water quality in coastal watersheds at Point Reyes National Seashore associated with rangeland best management practices, 2000 - 2013

Dylan Voeller Brannon Ketcham Ben Becker*

2020-07-14

Contents

*U.S. National Park Service, Point Reyes National Seashore, Point Reyes Station, California.

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Abstract

Livestock grazing and dairy operations can introduce pollutants to surface waters through runoff or direct access by animals to stream corridors. Pollutants include sediment and fecal coliform bacteria that may pose risk to human health and cause ecological degradation. However, many best management practices can control runoff and animal access to waterways and reduce deposition of microbial pollution and sediment into streams. Between 2000 and 2013, the U.S. National Park Service (US NPS) monitored water quality [fecal indicator bacteria (FIB) - (fecal coliform ("FC") and *E. coli* ("EC")), and turbidity] in three coastal watersheds at Point Reyes National Seashore in Marin County, California. Concurrently, best management practices (BMPs) such as fencing, ranch infrastructure management, infrastructure for manure management, off-stream drinking water systems for cattle, and pond restoration were implemented on dairy and beef ranch operations to improve water quality. We combined FC data from 2000-2006 with EC data from 2007-2013 using previously published EC/FC ratios and data from this study to create a continuous time series of FIB data. We used competing Bayesian generalized linear mixed-models representing several hypotheses for examining whether FIB was best explained by year, 24-hr rainfall, season, or annual rainfall. We then compared results to numeric regulatory objectives for surface waters. FIB from 2000-2013 declined (after accounting for variation in rainfall) at all 13 water quality stations that were downstream of BMPs implemented during the study. A six-fold increase resulted in the number of samples meeting regulatory criteria. Moreover, the one station without BMPs or direct livestock influence had a small but positive temporal trend. Turbidity was only monitored consistently from 2010-2013, was generally below selected ecological thresholds at most stations, and did not show a trend over time. While livestock grazing on public lands introduces fecal coliform bacteria into surface waters, our results further support previous studies showing that BMPs can dramatically, effectively, and rapidly reduce FIB and increase the probability of meeting water quality objectives.

Introduction

The main cause of stream impairments in the United States is pathogens entering these surface waters from agricultural lands (Chin 2010, U.S. EPA 2012a, Pandey *et al.* 2014, O'Callaghan *et al.* 2019). Grazing by cattle and other livestock is a major land use authorized on ~314 m ha of United States public lands (Nickerson *et al.* 2011). Ensuring that impacts from cattle ranching operations on vegetation and surface waters do not negatively impact public health, recreation, or ecosystems is a policy, legal and public interest concern (Wolf *et al.* 2017).

Surface waters may become contaminated by health-threatening fecal coliform bacteria (Wilkes *et al.* 2013, Pandey *et al.* 2014), excess nutrients (nitrogen and phosphorous) from animal waste leading to eutrophication and reduced oxygen available to aquatic ecosystems (Conley *et al.* 2009), and excess sediment due to runoff from high use areas (Dillaha *et al.* 1988) or associated with erosion from cattle using stream beds or reducing vegetation (Belsky *et al.* 1999). Roche *et al.* (2013) found that cattle grazing on US Forest Service lands in Northern California was generally compatible with federal and state clean water requirements, with most fecal indicator bacteria (FIB) samples meeting recommended criteria. However, cattle grazing consistently introduces coliform bacteria to natural areas (Derlet and Carlson 2006, National Research Council 2010) at a much higher rate than human use alone, resulting in a negative effect on water quality (Derlet *et al.* 2012). Regulations and guidelines at federal, state, county, and city levels generally dictate targets for pathogenic fecal bacteria, sediment, and nutrients in surface waters to minimize impacts to human health and ecosystems. Best management practices (BMPs) such as fencing, waste containment and storage, off-stream water sources and other means of separating cattle and their waste from surface waters have been very successful in reducing FIB and therefore risks to public health and the environment in many systems (Ellison and Skinner 2009, George *et al.* 2011, Wilkes *et al.* 2013), including coastal California (Lewis *et al.* 2019).

Cattle grazing in U.S. National Parks is generally within the context of sustaining cultural values for public benefit as well as economic and occasionally ecological benefits (Pinto 2014). Point Reyes National Seashore (PRNS) in Marin County in coastal Northern California was established in 1962. The park supports a variety of dynamic resources and uses including federally designated wilderness, recreation, and maintenance of historic ranching districts through continuance of multi-generational dairy and beef ranch operations (US NPS 2019). There are currently six dairy and eighteen beef ranch operations supporting approximately 5,500-5,700 cattle on 28,000 acres of federal lands managed by PRNS (US NPS 2019). Many of the ranches are adjacent to or upstream from federally designated Wilderness (US NPS 2019), state marine protected areas (Mach *et al.* 2017), state marine areas of special biological significance[1] and other areas in or adjacent to the park that support natural areas, endangered species, and recreational opportunities for over 2 million annual visitors. NPS and several partners monitor water quality conditions (fecal indicator bacteria (FIB) and turbidity) downstream from ranches and, when appropriate, work with ranch operators to implement the BMPs targeted to reduce potential for inputs that degrade water quality (US NPS 2019; Lewis *et al.* 2019).

Importantly, the findings of Roche *et al.* (2013) were from relatively low cattle stocking rates of 0.2 - 5.7 animal units (AU) / 100 ha (1 km^2) when compared to many other areas in the US (Brown and Fromke 2012). The highly productive coastal grasslands on the Point Reyes peninsula support markedly higher stocking rates and NPS works with ranch operators to adjust stocking rates and implement other management controls to ensure grazing is occurring at a moderate level (US NPS 2019). Beef ranches at Point Reyes National Seashore range from ~19-31 AU per km^2. Dairy ranches operate at higher densities (up to 200-300 animals per km^2) using supplemental feed and are still required to meet pasture Residual Dry Matter standards consistent with beef operators. While Roche *et al.* (2013) sampled at known cattle aggregation areas, their results may not apply to the order of magnitude higher density AUs on some other public lands, as other California coastal watershed studies on dairies have measured high concentrations of FIB associated with heavy use areas (Lewis *et al.* 2005). Furthermore, previous studies have shown that elevated FIB levels are associated with storm events (*e.g.*, Simon and Makarewicz 2009), so results must be considered in the context of both short and long-term rainfall patterns.

Several indicators have been used to estimate fecal coliform risks to human health (Rasmussen and Ziegler 2013). Many monitoring programs have historically relied on the long-dominant fecal coliform count (Jin *et al.* 2004). However, *Escherichia coli* (EC) is a better measure of coliform bacteria risks to human health than total or fecal coliform (FC) (Edberg *et al.* 2000). Consequently, many microbial water quality monitoring programs have shifted their FIB measurements from FC to EC over the past few decades (Cude 2005, Garcia-Armisen *et al.* 2007, Rasmussen and Ziegler 2013). Thus, legacy FC data must be compared and integrated with more recent EC data to assess long-term status in FIB, which requires a robust understanding of the quantitative relationship between EC and FC. Both laboratory and field studies have found that EC, as a

[1] https://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_map.shtml

component of FC, is generally about 77-80% of FC in freshwater stream and surface water monitoring samples (Cude 2005, Garcia-Armisen 2007, Hachich *et al.* 2012, Rasmussen and Ziegler 2013), This correlation may allow a robust adjustment of existing FC data to EC equivalents for long-term analyses (Cude 2005, Rasmussen and Ziegler 2013).

Here, we investigate the relationships between BMPs, rainfall, and results from long-term FIB (FC:2000-2006, EC:2007-2013) and turbidity monitoring at 14 water quality stations representing three dairy and three beef cattle operations in three coastal watersheds from 2000 - 2013. During this time 30 targeted BMP practices were implemented to manage livestock, manure, and ranch infrastructure, with the goal of reducing impacts to surface water quality. Our objectives were to: (1) determine relationship between concurrent FC and EC values, compare to previous findings, and apply a correction to FC to create a long-term set of FIB values, and (2) examine any trends or patterns in FIB and turbidity with respect to numeric water quality objectives.

Methods

Study Area

Coastal Northern California is a Mediterranean ecosystem with nearly all annual precipitation falling as rain between October and April of each year. This report analyzes data for two areas within PRNS that were monitored for FIB and turbidity: (1) the Kehoe and Abbotts Lagoon watersheds encompassing H, I, J, K, and L ranches (Fig. 1) and (2) two drainages in the Drakes Estero watershed, encompassing Home Ranch Creek (on Home Ranch) and East Schooner Creek along Sir Francis Drake Boulevard (Fig. 2).

The Kehoe and Abbotts Lagoon watersheds consist primarily of mixed coastal grassland and scrub, areas of active agriculture such as silage fields, and a small percentage of development associated with the ranch complexes, roadways and park trail heads. Dunes and coastal bluffs border the Pacific Ocean to the west. Inland of dunes, the most abundant soil types are Sirdrak sand, Kehoe loam, and Pablo-Bayview complex, with Rodeo clay loam predominating along drainages (USDA NRCS 2020). Most of the sampling stations are located on soils classified[2] as Rodeo clay loam, 2-15% slopes, which have a "slight" erosion potential rating for "off-road off-trail", and are "poorly drained". ABB3 is on Sirdrak Sand with 2-15% slopes and PAC2D is on Kehoe loam 15-50% slopes but drains downstream into the Rodeo clay loam. The lagoon stations (ABB4 and PAC3) are classified as "water". In general, the North Kehoe drainages are steeper, so higher erosion potential could be a factor in relatively high sediment volume overall, but land management, characterisitics of the stations themselves, and the timing of the sampling could also affect sediment loads.

Portions of the Kehoe and Abbotts drainages contain willow (*Salix* sp.) and California wax myrtle (*Morella californica*) riparian forest but are otherwise non-forested. Both watersheds empty to the Pacific Ocean but form lagoons at their outlets, with Abbotts Lagoon breaching more infrequently than Kehoe. Sustained flow occurs during winter, but drainages are subject to very low flow and ponding in certain areas during the summer months. The Abbotts drainages flow across gently sloping terrain, while the upper Kehoe drainages are somewhat steeper, with areas of gullying. Ranching activity in the watersheds consists of the J Ranch, I Ranch and L Ranch dairies, as well as the K Ranch and H Ranch beef operations. Use around the dairy ranch complexes is heavy, including holding corrals for various classes of animals, milking cows twice daily, washing and scraping manure within buildings, stalls, feeding areas and travel lanes, and waste storage in retention ponds. Manure is emptied from storage ponds and distributed on pastures via trucks or pipelines during dry conditions. Rotational grazing of heifers occurs in the outer pastures on dairies and for beef cattle on H and K ranches. The total authorized number of dairy animals in the two watersheds is 2,012, with 357 AU of beef cattle. Forage production involving the planting and harvesting of grass crop for consumption by cattle also occurs on the H, I and J ranches across approximately 811 acres. Previous studies in the Abbotts Lagoon watershed found that although the 188-acre area draining to ABB2 and ABB3 is approximately 6% of the watershed (Ketcham 2001), it was a primary source of nutrient loading during WY1999-2000 (Kratzer *et al.* 2006).

[2]USDA Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

The Drakes Estero watershed includes the Home Ranch Creek and Schooner Creek sub-watersheds with steep bishop pine (*Pinus muricata*) forest and dense scrub in the upper portions, dominated by loamy soils or Pablo-Bayview complex, which drain to flatter willow and red alder (*Alnus rubra*) riparian forest on Rodeo clay loam and Tomales fine sandy loam (USDA NRCS 2020) surrounded by coastal grassland and open to dense scrub. The two streams are perennial and support federally threatened steelhead trout (*Oncorhynchus mykiss*). Stocking on the Home Ranch consists of 300 AU, but only a subset of these animals utilize the pastures surrounding Home Ranch Creek, including small paddocks adjacent to the creek associated with the ranch complex.

FIB and turbidity data were collected in the three park watersheds grazed by cattle (Abbotts, Kehoe, and Home Ranch Creek). Most monitoring stations (DES2, DES3, PAC1S, PAC2, PAC2A, ABB1, ABB2) were initially established by the park in 1999-2001 to: document water quality conditions; develop management recommendations addressing impacts specific to agricultural, recreational and operational use; and develop a long-term monitoring strategy to track trends, allowing NPS to identify and address future problems (Ketcham 2001). Monitoring frequency included quarterly base flow (fall, winter, spring, summer), first flush, and winter runoff events on dairies and "degraded subwatersheds". As assessment to identify potential sources continued, stations were added further upstream, at confluences of certain tributaries, and downstream of grazing operations: PAC1A and PAC1B were established in 2002 on South Kehoe Creek; PAC2B and PAC2D were established in 2003 on North Kehoe Creek; and PAC3 and ABB4 were added in 2004 to assess the lagoons (Table 1). FC data collected from 1999–2005 exceeded criteria in >50% of samples over all 3 watersheds, particularly near dairies (Pawley and Lay 2013), but subsequent data collected from 2006-2013 has not been analyzed until now.

Prior to 2007, water samples were analyzed for FC, which was then replaced with EC for 2007-2013. Additionally, monitoring frequency was increased in 2007, with the pre-2007 protocol collecting quarterly and the latter monthly. Both protocols collected samples during storm events (Ketcham 2001, Cooprider and Carson 2006). In 2003 and 2007, some samples were analyzed for both EC and FC, allowing a comparison of results. Turbidity data was collected from 2010 - 2013 and are reported in Nephelometric Turbidity Units (NTU) (West and Scott 2016).

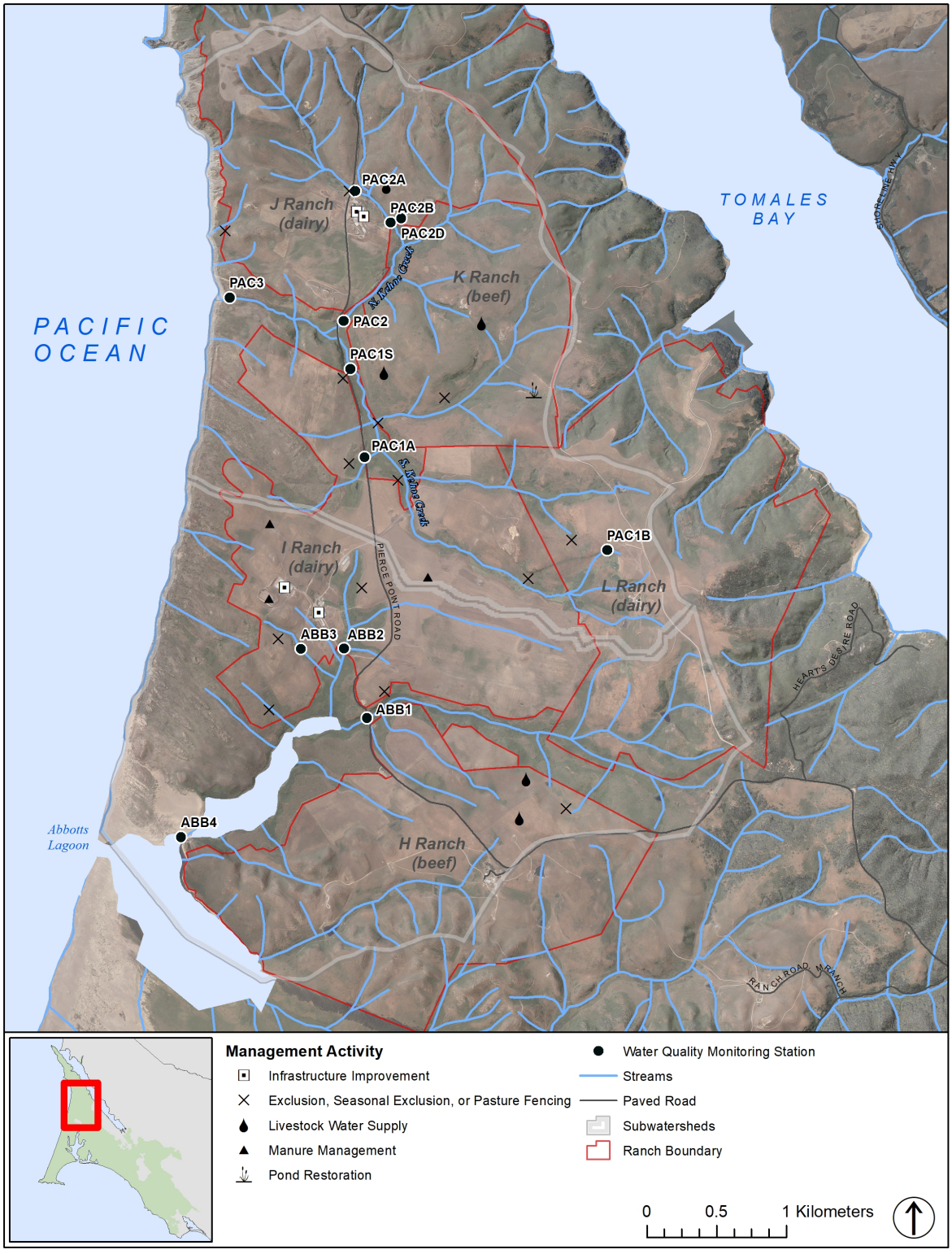

Figure 1: Kehoe and Abbotts watershed area with ranch operation boundaries and water quality monitoring Station ID codes (Table 1).

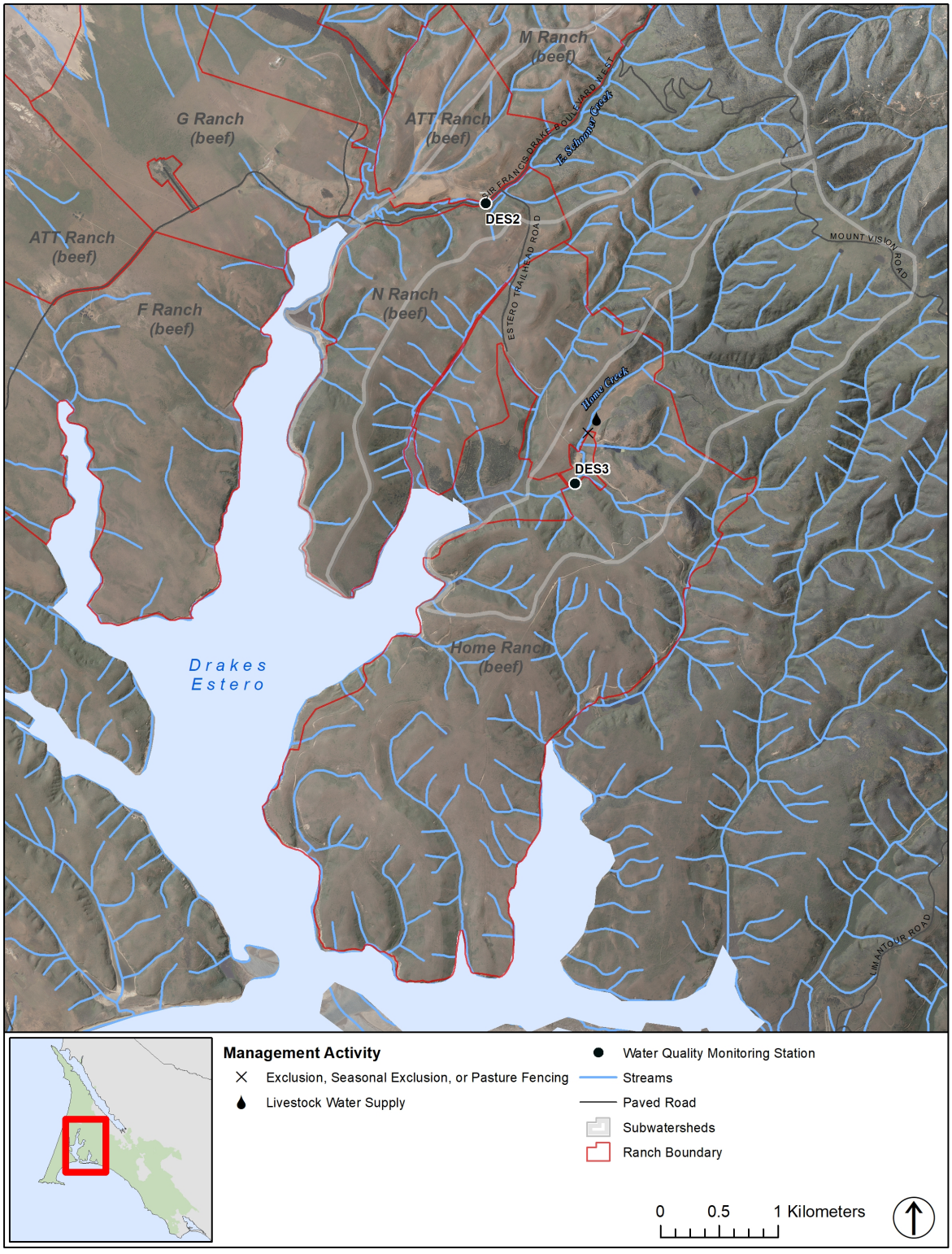

Figure 2: Drakes Estero watershed area with ranch operational boundaries and water quality monitoring Station ID codes (Table 1).

Table 1: Descriptions and summary of fecal indicator bacteria (FIB) and turbidity (NTU) values recorded at 14 stations in Point Reyes National Seashore from 2000 - 2013. FIB values prior to 2007 are fecal coliform data corrected to E. coli (see methods).

			FIB			NTU		
Watershed	Station	Description	Years	Samples	Median (range)	Years	Samples	Median (range)
Abbotts	ABB1	Perennial stream mainstem just below tributaries on H Ranch, flows through ungrazed area from L Ranch at top of watershed	2000 - 2013	51	710 (32 - 40,000)	2010 - 2013	15	12.2 (2.9 - 26.4)
Abbotts	ABB2	Tributary on I Ranch downstream of dairy corrals and ungrazed upstream wetlands and pond	2001 - 2013	45	1,900 (100 - 192,000)	2010 - 2013	15	12.7 (5.8 - 25.3)
Abbotts	ABB3	Tributary on I Ranch west just below former feeding corral prior to installation of the loafing barn in the mid-2000s	2002 - 2009	16	48,000 (310 - 1,600,000)	NA	NA	NA
Abbotts	ABB4	Abbotts lagoon at trail crossing bridge between lagoon chambers	2004 - 2013	32	13 (0.8 - 12,800)	2010 - 2013	14	5.2 (2.0 - 14.8)
Drakes Estero	DES2	E. Schooner Creek mainstem at Estero Rd. crossing, flows parallel to Sir Francis Drake Blvd for its entire length. Limited grazed lands drained by small tributaries upstream to the north	1999 - 2013	120	415 (8 - 24,190)	2010 - 2013	45	10.4 (5.1 - 58.8)
Drakes Estero	DES3	Home Creek mainstem below Home Ranch buildings, small grazed pastures and corrals	1999 - 2013	123	480 (5 - 12,800)	2010 - 2013	46	5.1 (1.8 - 361.0)
Kehoe	PAC1A	Tributary to S. Kehoe Creek on I Ranch west, flows north through mostly ungrazed area	2002 - 2013	95	350 (5 - 240,000)	2010 - 2013	45	20.8 (4.5 - 174.0)
Kehoe	PAC1B	Small tributary at headwaters of S. Kehoe Creek just below main L Ranch feeding corral	2002 - 2013	43	13,600 (220 - 1,280,000)	2010 - 2013	14	14.2 (4.1 - 51.1)
Kehoe	PAC1S	S. Kehoe Creek mainstem downstream of L and I ranches, flows north through ungrazed area	1999 - 2013	111	630 (10 - 1,280,000)	2010 - 2013	42	14.2 (2.4 - 78.5)
Kehoe	PAC2	N. Kehoe Creek mainstem downstream of J and K ranches at culvert under Pierce Point Rd	1999 - 2013	114	1,840 (10 - 1,280,000)	2010 - 2013	46	10.7 (3.1 - 322.0)
Kehoe	PAC2A	Branch of N. Kehoe Creek at culvert under Pierce Point Rd. adjacent to J Ranch concrete cattle runway above dairy buildings	2001 - 2013	104	1,240 (10 - 1,280,000)	2010 - 2013	46	7.0 (2 - 41.6)
Kehoe	PAC2B	Branch of N. Kehoe Creek at culvert under ranch road downstream of J Ranch dairy	2003 - 2013	92	2,700 (50 - 400,000)	2010 - 2013	46	7.9 (1.4 - 256.0)
Kehoe	PAC2D	Tributary of N. Kehoe Creek just downstream of J Ranch waste storage ponds	2004 - 2013	16	4,450 (75 - 128,000)	2010 - 2013	6	21.9 (4.8 - 36.5)
Kehoe	PAC3	Kehoe Creek lagoon adjacent to Pacific Ocean	2004 - 2013	95	520 (10 - 128,000)	2010 - 2013	47	7.6 (2.6 - 48.1)

Best Management Practices

Concurrent with FIB monitoring, ranch operators, NPS, the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and others collaborated to implement approximately 30 BMPs across the study area in the following categories: (1) ranch infrastructure improvement, including the installation of loafing barns, roofs, gutters and piping to manage the location of dairy cattle feeding and loafing, divert runoff from manured areas and reduce erosive surface area; (2) fencing, to exclude cattle from streams and erosive areas, or create seasonal or rotational pastures; (3) manure management to contain manure in storage ponds or distribute it to low-slope fields via pipelines; (4) livestock water supply to provide alternative off-stream drinking water for cattle; and (5) a pond restoration involving the repair of a levee to reestablish holding capacity, fencing and piping to troughs (Figs. 1, 2 & 5B, Table 1).

Water Quality Data

FC, EC, and NTU were collected by NPS under different projects and grants between water year 2000 and 2013. Sample collection procedures and analytical methods for FC, EC and NTU can be found in Ketcham (2001), Cooprider and Carson (2006), and Wallitner and Pincetich (2017). FC sample analysis was conducted by a certified laboratory using multiple-tube fermentation technique (Standard Method 9221) and EC sample analysis was conducted by enzyme substrate coliform test (Standard Method 9223) using IDEXX Quanti-Tray 2000 (APHA-AWWA-WEF 1998).

A total of 1057 FC and/or EC samples and 427 NTU samples were collected from 14 and 13 stations, respectively (Table 1). In 2003 and 2007 both FC and EC parameters were collected concurrently from 38 samples. We compared FC to a numeric objective of 400 MPN/100ml based on the San Francisco Bay Water Quality Control Board (SFRWQCB) single-sample 90th percentile threshold for water contact recreation[3] and EC to a numeric objective of 320 CFU/100ml[4] based on the SFRWQCB statistical threshold value not to exceed >10% of samples collected in a calendar month[5]. Non-contact water recreation recommended objectives (90^{th} percentile < 4,000 MPN/100ml for FC) were also evaluated[6].

We chose ecological thresholds for turbidity of 25 and 55 NTU based on review of literature for effects on growth of salmonids (Sigler *et al.* 1984, Martin *et al.* 2019). We also looked for evidence of persistent turbidity above these thresholds as an indicator of biological impairment (Shaw and Richardson 2011, Molinos and Donahue 2011). Rainfall data were collected from the Olema Valley weather station[7] approximately 15 km from the center of the study area.

Analyses

Fecal Indicator Bacteria

We calculated the linear model and Pearson correlations between the 38 FC and EC samples as well as the log proportion of FC comprised of EC from a simple ratio. We then compared this ratio to those found in previous studies (Cude 2005, Garcia-Armisen 2007, Hachich *et al.* 2012, Rasmussen and Ziegler 2013) and used both the mean and lower bound estimates of the EC/FC ratio to estimate an EC equivalent from FC samples. Prior to analysis we: (1) removed pre-2000 data (except for 4 samples from the end of water year 1999) due to limited information on QA/QC and data was only collected at two of 14 stations; (2) applied a

[3]SFRWQCB Basin Plan: www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/bp_ch3.html. Accessed January 13, 2020.

[4]CFU is the benchmark used by the SFRWQCB for *E. coli*. It is generally considered equivalent to MPN (U.S. EPA 2019), but there is some evidence that while CFU and MPN are are highly correlated, they are not always equivalent (Gronewold and Wolpert 2007, Cho *et al.* 2010)

[5]SFRWQCB Water Quality Control Plan: www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf. Accessed January 13, 2020.

[6]www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/tab/tab_3-01.pdf

[7]https://mesowest.utah.edu/cgi-bin/droman/meso_base.cgi?stn=TS261&product=&time=GMT

value of *0.5 x minimum detection limit* if EC or FC sample results were below analytical laboratory detection limits; and (3) assigned the detection limit value to samples above analytical detection limits (Table 2).

Table 2: Summary of non-detects (below minimum analytical laboratory test limit) and max-detects (above maximum analytical laboratory test detection limit). For example, 17 FC samples were below the lab test detection limit of 1,000 and were halved to 500 for analysis. Max-detects were analyzed at the maximum test limit value. The full FIB data set consisted of 1057 samples and therefore these 120 max-detect and non-detect samples represent 11.3% of the data.

Parameter	Direction	Detection Limit (MPN/100ml)	Count
FC	Non-Detect	1,000	17
	Max-Detect	1,600	13
	Max-Detect	16,000	21
	Max-Detect	24,000	2
	Max-Detect	160,000	18
	Max-Detect	1,600,000	4
	Total Samples		**75**
EC	Non-Detect	10	9
	Non-Detect	100	18
	Max-Detect	2,419	3
	Max-Detect	24,190	13
	Max-Detect	241,900	2
	Total Samples		**45**

We evaluated competing hypotheses driving patterns in FIB and NTU values using Bayesian log-normal generalized linear mixed-effects models (GLMM) implemented in the rstanarm package (Goodrich *et al.* 2020) in R (R Core Team 2019). Competing explanatory variables were: (1) water year (Oct 1 - Sept 30), (2) 24-hr precipitation at the sample collection time, (3) season (winter/summer) and (4) total water year rainfall. We included a random intercept for site with random slopes for the fixed effect. If two fixed effects were considered in a single model, models were compared with a random slope and intercept structure for each fixed effect in separate competing models. Daily precipitation was centered to mean = 0 and sd = 1. Models were run for 3000 iterations on three Markov chains including 1,000 iterations of warm-up and were thinned every 5 samples to eliminate auto correlation. The prior probability distribution for all slope coefficients was normal (0, 0.05) which includes the 0.0020 $\pm$ 0.0006 year slope coefficient found by Lewis *et al.* (2019) for FIB trends after implementation of BMPs. Competing hypotheses (models) were ranked and weighted using leave-one-out cross-validation with the R package loo ("leave-one-out" sampling) (Vehtari *et al.* 2017, Yao *et al.* 2017). Percentage change at each station was calculated by exponentiating the year slope coefficient (random for sites, fixed for overall slope) and then exponentiating to the length of the time series in years for each station. To explore model robustness to other distributions often used for water quality data, we analyzed the same suite of models using both negative binomial (with response variable rounded to integer when needed) and gamma distributions (Sylvestre *et al.* 2020, Wilkes *et al.* 2013). The relationship between the number of BMPs upstream of a station and the model slope of FIB was assessed with a simple linear model.

To examine robustness of results to patterns in rainfall and FC correction ratio, identical FIB GLMMs were also implemented for three different data sets/scenarios including: (1) FC correction at a lower bound of 0.62 rather than 0.80, (2) samples only collected on days with rainfall $>$ 0.2 in, and (3) both 0.62 FC correction and samples when 24-hr rain $>$ 0.2 in.

In addition to the Bayesian GLMMs, we also analyzed the FIB data set in the context of the original

parameters (FC and EC) by designating 5 classes for each parameter: (1) 0 - 320[8] for EC and 400[9] for FC, (2) 320 or 400 to 4,000, (3) 4,000 to 10,000, (4) 10,000-100,000 and (5) > 100,000. The five classes were designed to assist with comparison of FC and EC over time (irrespective of FC to EC conversions) by having the first two classes relative to the SFRWQCB regulatory objectives for that parameter. During years 2003 and 2007 we used the maximum value of either EC or FC in that year if both parameters were analyzed from a sample. Other covariates were treated as described earlier. Models were built using cumulative link mixed-models (clmm) analysis (Christensen 2019) in R with one or more random effects via the Laplace approximation on five classes of EC and FC results combined over time to predict the frequency of samples within each class before and after the change in parameter while accounting for other covariates if needed. We chose a temporal break point at 2007 since that was the time when the parameter was changed from FC to EC. Competing hypotheses (models) were ranked by Akaike information criterion (AIC).

Turbidity

We analyzed the NTU time series at 13 of the 14 stations (there was no NTU data available from station ABB3) using Bayesian GLMMs in the same general protocol and manner (log normal) as described for FIB. However, we additionally included competing models without a random slope since we suspected that the long-term time series had no temporal trend. NTU models were run for 5000 iterations and a 2000 iteration warm-up because the Markov chains required more time to mix properly. Turbidity at each station was compared to thresholds of both 25 and 55 NTU.

Results

Relationship between EC and FC

There was good correlation ($r_s = 0.76$) between EC and FC for 38 co-collected samples in 2003 and 2007 and the log proportion of EC to FC was 0.85 ± 0.17 (Fig. 3). We therefore used the mean (geometric mean was similar) of our results (0.85) and those of other recent studies (Garcia-Armison *et al.* (2007): 0.77, Rasmussen and Ziegler (2003); 0.77, and Hachich et al (2012): 0.80) for an overall mean ratio of 0.80. We applied this last ratio, as well as the lower conservative ratio of 0.62 recommended by Rasmussen and Ziegler (2003), to FC to create a continuous data set of EC equivalents for FIB analyses.

Fecal Indicator Bacteria Sample Collection and Rainfall

FIB samples from water year 2000 - 2013 were collected under slowly declining mean 24-hr precipitation from 2000 - 2008 (Fig. 4). This trend reversed after 2009, with mean rainfall on sample days being similar for 2010 - 2013. A similar pattern was apparent when only considering samples from days with >0.2 in rain, except that post-2009 sample day rainfall increased more dramatically than for the full data set.

Fecal Indicator Bacteria

Of the twelve models investigated for FIB, *Year + 24-hr precipitation* had the most support representing 83% of model weights (Top 3 models in Table 3), regardless of whether data were censored for rainfall > 0.2 and/or the EC/FC correction was 0.80 or 0.62. Model Markov chains mixed well with all R-hat values at 1 and there was no auto-correlation among model iterations. Diagnostics plots indicated well distributed residuals and no highly influential data points (Supplement). The top model R^2 was 0.43, the overall year

[8]SFRWQCB Water Quality Control Plan: www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf. Accessed January 13, 2020.

[9]SFRWQCB Basin Plan: www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/bp_ch3.html. Accessed January 13, 2020.

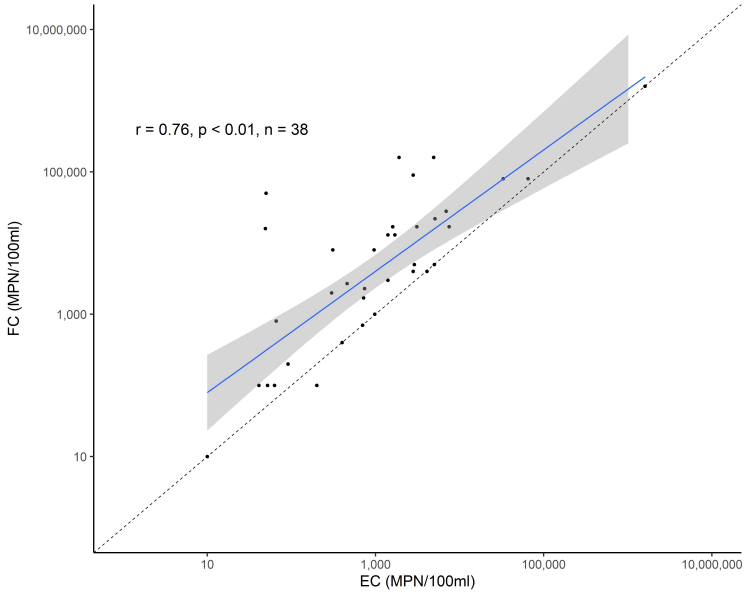

Figure 3: Correlation between EC and FC from co-collected samples in the study area in 2003 and 2007. The log proportion of EC to FC is 0.85 ± 0.17.

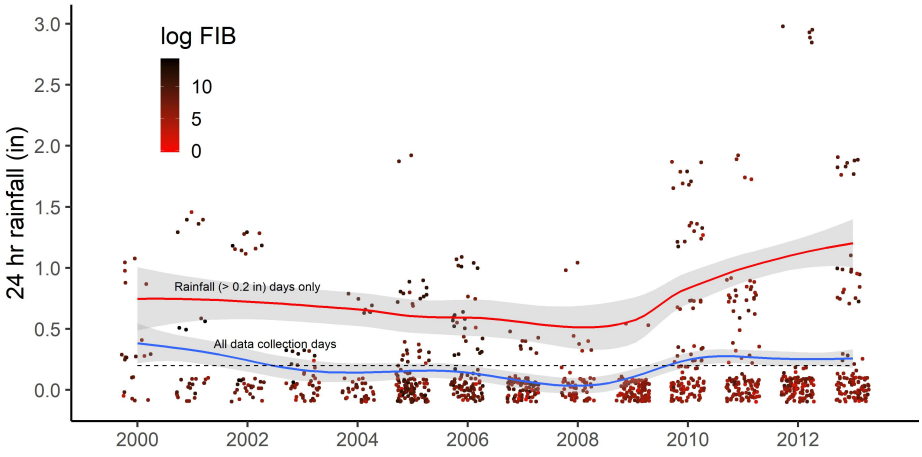

Figure 4: Rainfall on FIB sample days during the study period showing that sampling rainfall first declined and then increased during the study period. The red line represents only sample days with 24-hr rainfall > 0.2 in. and the blue line represents all data. The decline in 2007-2008 represents drought conditions. Point color darkens with increasing FIB. Horizontal dashed line represents 0.2 in rainfall.

Table 3: Competing FIB model weights based on leave-one-out (loo) validation. All models include a random intercept for station.

Model	Random Slope	Loo Weight
Year + Daily Precip	Year	0.40
Year + log(Daily Precip)	Year	0.24
Year + Daily Precip	Daily Precip	0.20
Season	Season	0.14
Year + Annual Precip	Annual Precip	0.02
Year + Daily Precip + Season	Year	0.02
log(Daily Precip)	Daily Precip	0.00
Year + Season	Year	0.00
Annual Precip * Station	Year	0.00
Year * Station	Year	0.00
Daily Precip	Daily Precip	0.00
Year	Year	0.00

coefficient was negative and rainfall had a positive effect on FIB levels. Linear rainfall fit slightly better (loo weights) than $log(rainfall)$ (Table 2, Supplement). Most sampling stations demonstrated a negative slope over with one exception. DES2 (Fig. 5A) had limited potential for impacts on water quality associated with cattle grazing and was not associated with any BMPs (Fig. 5B). The overall year coefficient indicated an overall station reduction of 56% from 2000-2013. However, when not including the 413% increase at the non-BMP site (DES2) the mean reduction of the remaining 13 sites was 84% (range 54-99%; Table 4). The number of BMPs implemented upstream of specific stations had no quantitative relationship with changes in FIB over time (linear model $p > 0.97$).

Despite variation in sample day rainfall over the study period, slope results were similar at most stations whether analyzing all samples or rainfall $>$ 0.2in (Fig. 5A). The generally similar results (except for the precipitation coefficient) show that the full data model appropriately accounted for rainfall effects when calculating station slopes. However, three sites (ABB1, ABB2, and ABB3) were sensitive enough to using all vs. rainfall only data to reduce the probability of a negative slope. Similarly, using rainfall only data changed the result that DES 2 was without a trend to a slight positive trend. Reducing the mean EC/FC fraction from 0.80 to 0.62 had minor qualitative effects on the results, with similar slopes within rainfall data and all data analysis. Implementing the models with gamma or negative binomial rather than log normal distributions had negligible effects on model coefficients and no effect on model interpretation or ranking (Supplement).

Cumulative link mixed-models

Similar to the Bayesian GLMMs, the CLMM models found that both time and daily rainfall best explained the proportions of FIB values in each of 5 classes with $time * rainfall$ being the best model by ~1.5 AIC units (with the second ranking model adding *season*) and an r^2 of 0.49. Model residuals were well distributed (Supplement). FIB classes were different and declined more over time on higher rainfall days driving the interaction term (Table 5), but only mean results at all rainfall levels are reported here. Overall, FIB below the numeric objective increased six-fold, from 0.06 to 0.38 of all samples after 2006 while the values >4,000 MPN/100ml declined by more than 75%, from 0.59 to 0.13 (Table 6, Fig. 7).

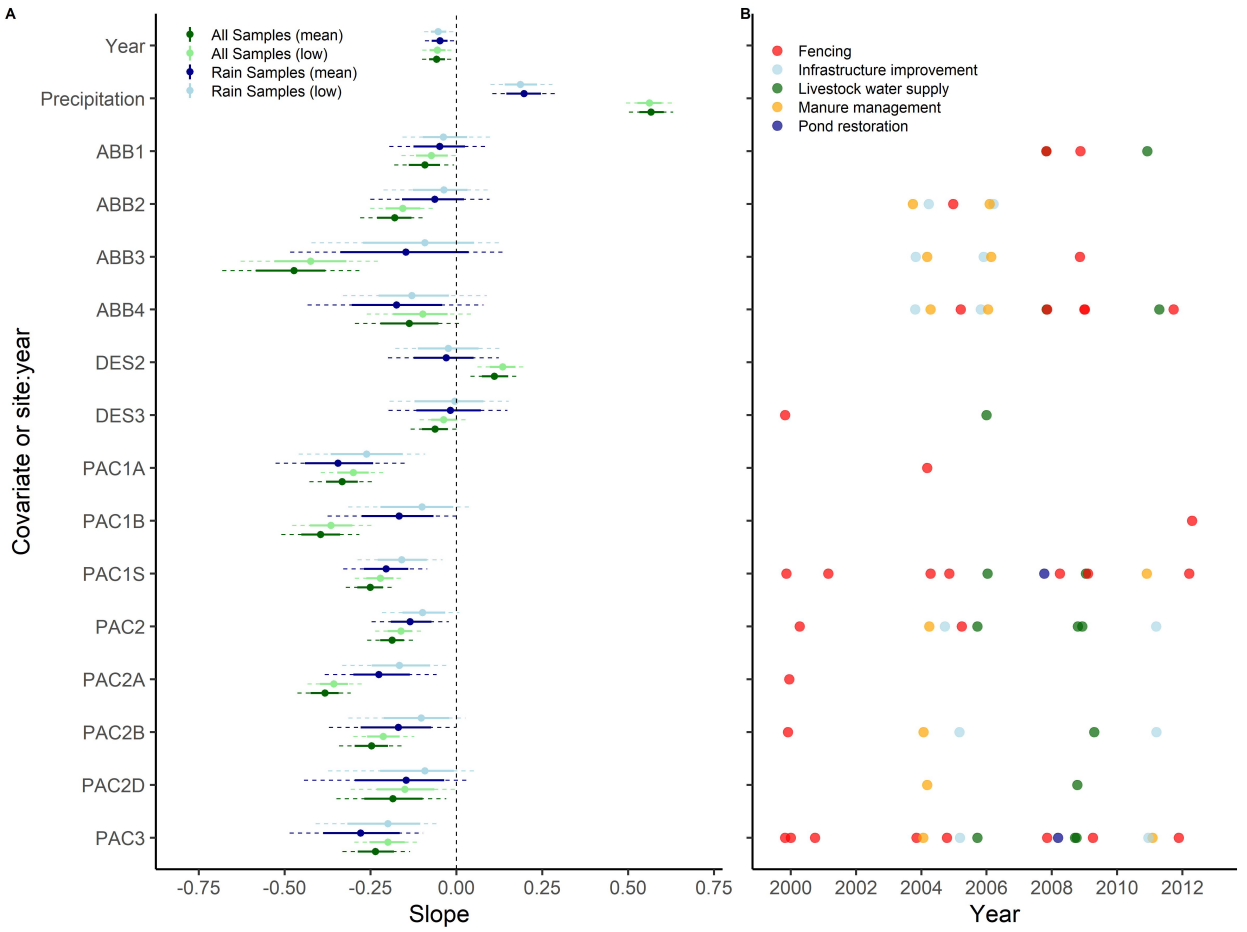

Figure 5: (A) Slope (beta) coefficients for best FIB models (Table 4) using all samples or samples only on rain days with either mean or lower estimate of EC/FC ratios. Neither the selected datasete nor the correction ratio impacted the interpretation, indicating that rainfall covariate performed well predicting FIB after removing rainfall effects. Points represent mean coefficient estimate, solid line represents 25-75th percentiles and dashed line represents 10-90th percentiles. (B) Year and location (upstream of monitoring station) of best management practices implemented during the study period. A total of 30 BMPs were implemented, but most were expected to influence more than one downstream testing station and therefore there are more points (n=72) than BMPs. The BMPs shown in 2000 have estimated implementation dates between 2000 and 2002.

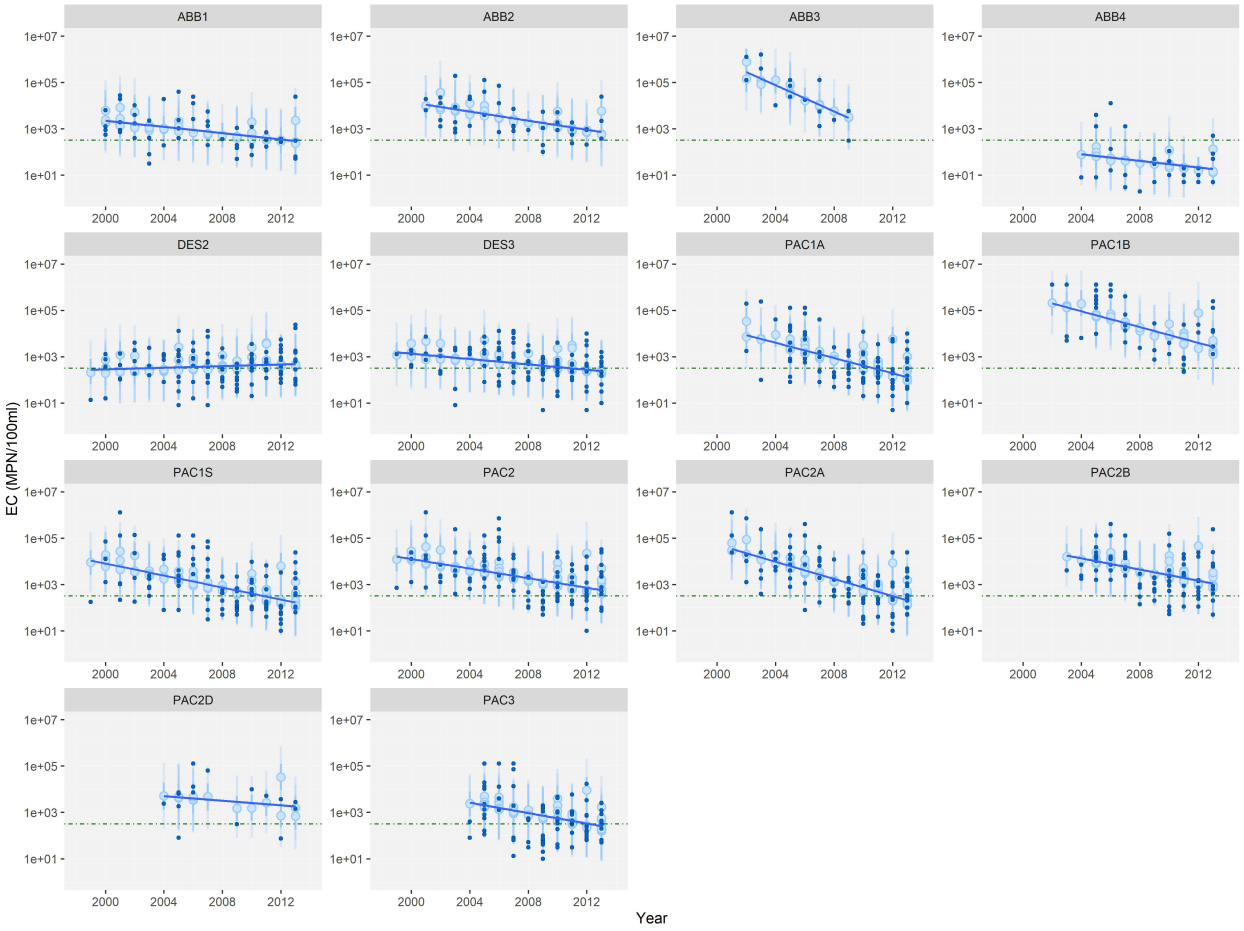

Figure 6: Year effects plots by station from the best full data FIB model (Table 4). The dark blue points are data and the light blue circles are posterior model predictions with vertical error lines representing 90% confidence intervals. The blue line is a linear fit of posterior predictions.

Table 4: Summary slope coefficients with 10th to 90th percentiles of the best FIB model (Table 4). 'n eff' is number of effective Markov chain samples, 'R-hat' indicates how well Markov chains mixed (below 1.1 is best), and 'proportional change' in FIB over the time series. For example, FIB values at ABB1 declined 69 percent over the study period and DES2 increased more than four-fold.

Variable	Mean	10%	90%	n eff	R-hat	Proportional change
WaterYear	-0.06	-0.10	-0.01	1155	0.999	0.46
Daily Precip	0.57	0.50	0.63	1188	0.998	NA
ABB1	-0.09	-0.18	-0.01	1059	1.000	0.31
ABB2	-0.18	-0.28	-0.09	923	1.000	0.12
ABB3	-0.48	-0.68	-0.28	1090	0.998	0.03
ABB4	-0.14	-0.30	0.02	1073	0.999	0.28
DES2	0.11	0.04	0.18	1204	0.999	4.18
DES3	-0.06	-0.13	0.01	1095	0.998	0.46
PAC1A	-0.33	-0.43	-0.25	1137	0.999	0.03
PAC1B	-0.40	-0.51	-0.28	916	1.001	0.01
PAC1S	-0.25	-0.32	-0.18	1187	1.002	0.04
PAC2	-0.19	-0.26	-0.12	1140	0.999	0.08
PAC2A	-0.38	-0.46	-0.31	1200	0.999	0.01
PAC2B	-0.25	-0.34	-0.15	1129	1.000	0.08
PAC2D	-0.19	-0.35	-0.03	1258	0.999	0.18
PAC3	-0.24	-0.33	-0.13	1152	1.003	0.12

Table 5: AIC ranking for competing CLMM models (Table 6, Fig. 7). 'PrePost' refers to before or after 2007.

Model	df	AIC
PrePost * Daily Precip	10	2447.8
PrePost * Daily Precip + Season	11	2449.1
PrePost + Daily Precip	9	2453.0
PrePost * WY Precip	10	2547.2
PrePost	8	2549.2
Daily Precip	8	2721.9

Table 6: Best CLMM model estimates of proportion of samples in each class by time period. Standard errors for each estimate were 0.01 - 0.07 (Table 5 and Fig. 7).

Class (MPN/100ml)	2000-2006	2007-2013
below numeric objective	0.06	0.38
numeric objective to 4,000	0.35	0.49
4,000 - 10,000	0.17	0.06
10,000 - 100,000	0.32	0.06
>100,000	0.10	0.01

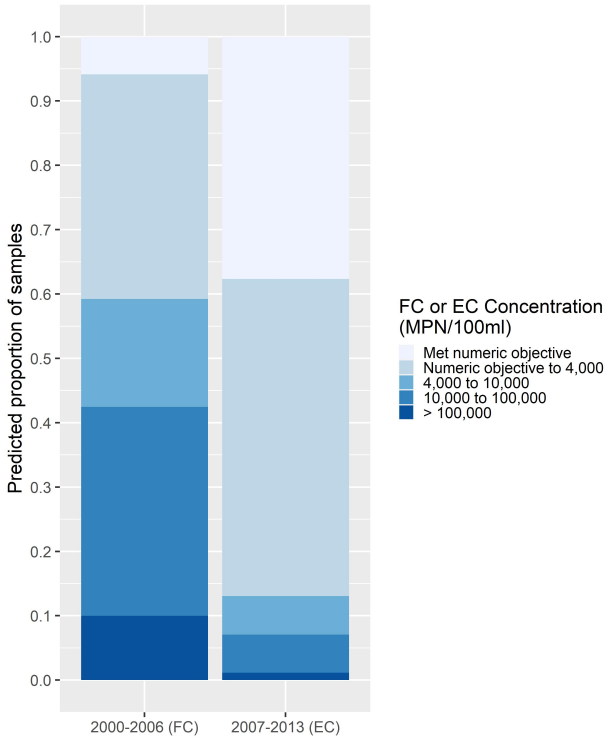

Figure 7: Cumulative link mixed-model FIB predictions by numeric class before and after 2007. See Table 6 for details.

Turbidity

Turbidity was generally below selected comparison thresholds (<25 or <55 NTU) at the Abbotts and Drakes Estero watershed stations (Table 7). Within the Kehoe watershed, station PAC1A had more exceedances than any other site, with PAC1B, PAC2, and PAC2B each having about 25% of samples exceeding 25 NTU. Only four of the 13 sites every had 2 or more consecutive exceedances and only PAC1A had more than 3 (Table 8, Fig. 8). Rainfall was associated with most exceedances except at PAC1A, where slow moving water likely promotes excessive algal growth that increases turbidity. NTU was best explained by 24-hr rainfall and station and there was little evidence for any global or station levels temporal trends over the four-year time series (Table 9, Supplement).

Table 7: Turbidity samples exceeding 25 and/or 55 NTU from 2010 - 2013. The '>25' count includes the '>55' counts. Rain samples are from days with >0.2 inches of precipitation.

	All Samples			Rain Samples		
Station	>55 NTU	>25 NTU	Samples	>55 NTU	>25 NTU	Samples
ABB1	0	1	15	0	0	3
ABB2	0	1	15	0	0	3
ABB4	0	0	14	0	0	3
DES2	1	4	45	1	3	5
DES3	1	3	46	1	2	5
PAC1A	9	21	45	1	2	12
PAC1B	0	4	14	0	4	8
PAC1S	1	6	42	1	5	13
PAC2	3	10	46	3	10	12
PAC2A	0	4	46	0	3	13
PAC2B	4	10	46	4	7	13
PAC2D	0	2	6	0	2	4
PAC3	0	2	47	0	2	13
Total	19	68	427	11	40	107

Table 8: Frequency and length of consecutive samples exceeding 25 and/or 55 NTU (see Fig. 8). Non-listed sites had no consecutive sample exceedances.

Station	> 25 NTU	> 55 NTU
PAC1A	2, 2, 5, 6, 5	4, 3
PAC2	3	NA
PAC2A	2	NA
PAC2B	2	NA

Table 9: Competing turbidity model weights based on leave-one-out (loo) validation. All models included station with a random intercept. Top model r-square was 0.35.

Model	Random Slope	Loo Weight
Daily Precip + Station	Daily Precip	0.523
Daily Precip	Daily Precip	0.297
Year + Daily Precip	Daily Precip	0.165
Season	Season	0.009
Year + Daily Precip + Season	Year	0.004
Daily Precip	-	0.001
Year + Daily Precip	Year	0.001
Year + Daily Precip	-	0.000
Year + Season	Year	0.000
Annual Precip + Station	Annual Precip	0.000
Year + Station	Year	0.000
Year	Year	0.000

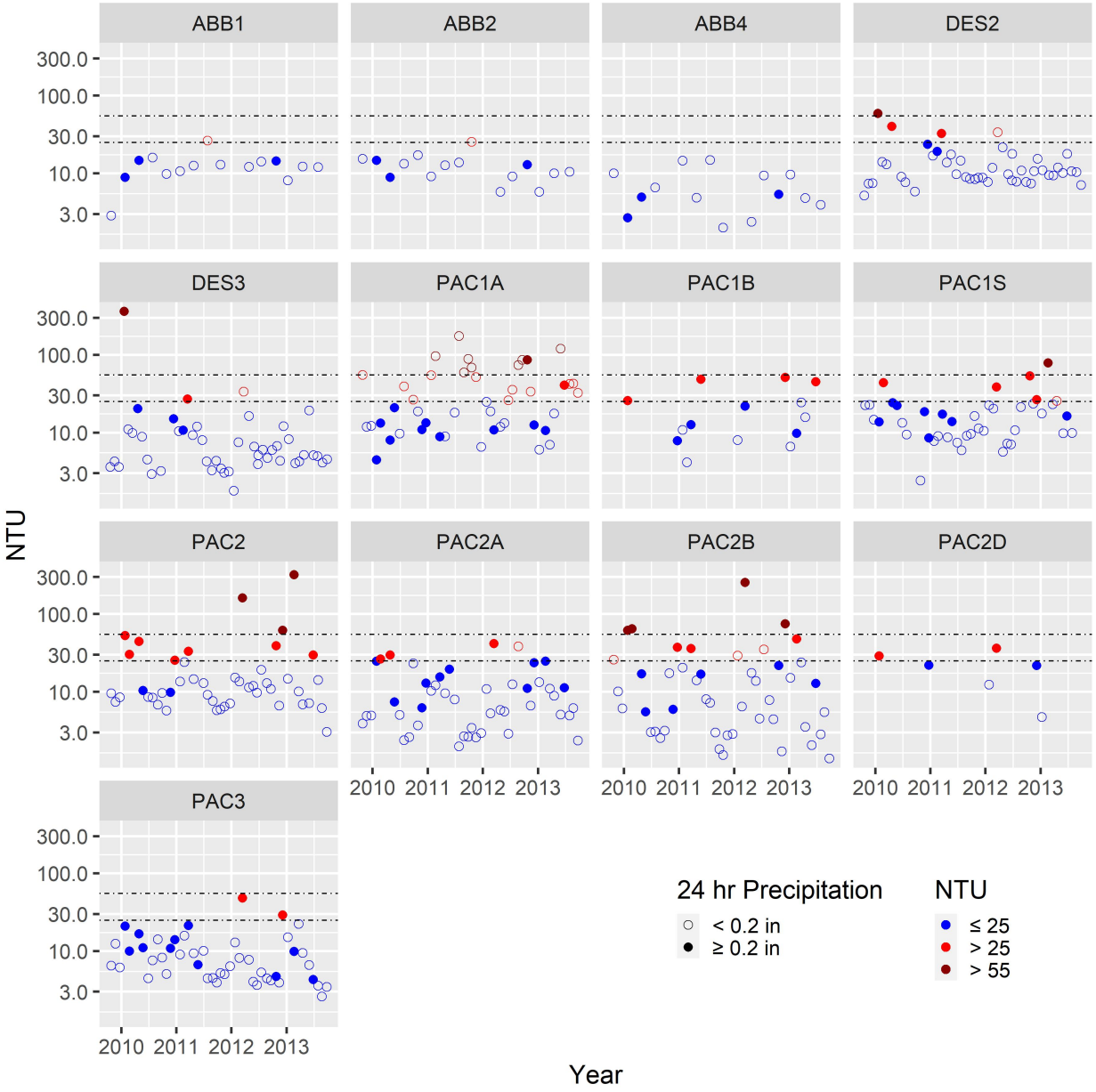

Figure 8: Time series of NTU measurements from 2010-2013. Horizontal reference lines are at 25 and 55 NTU. Filled points represent samples collected on days with precipitation > 0.2 in. Point color represents whether NTU exceeded thresholds in legend.

Discussion

Our results of a six-fold increase in meeting numeric objectives and overall FIB reductions of ~1-2 orders of magnitude (~54-99%) are consistent with FIB reductions associated with grazing BMPs from studies in other watersheds (*e.g.* Kay *et al.* 2018, O'Callaghan *et al.* 2018) and elsewhere within the Point Reyes National Seashore (Lewis *et al.* 2019). Additionally, we saw a decline in FIB values >4,000 MPN/100ml by more than 75%. Elsewhere, dairy BMPs have demonstrated a two-fold decrease in FIB associated with removing winter use alone in the nearby Tomales Bay Watershed (Lewis *et al.* 2009), and up to a 10-fold reduction from BMPs reported by Simon and Makarewicz (2009). Inamdar *et al.* (2002) found reductions (44%) associated with dairy BMPs at the watershed scale, despite increases in some subwatersheds.

The only station in our study with a positive FIB trend over time was East Schooner Creek (DES2), which was not downstream of any BMPs and only has limited upstream sources of potential fecal contamination from grazing activities. Although not a paired study, the lack of downward trend for this station stands out compared to the other watersheds where targeted management activities were occurring over the monitoring period.

Specific levels of acceptable FIB concentrations are related to law, policy, public health and public opinion (Wolf *et al.* 2017). Subsequently, numeric objectives differ by region, regulatory entity, and type of use (*i.e.*, recreational, non-recreational; Russo *et al.* 2020) and are often slow to change even though monitoring technology for microbial pollution makes advances (Boehm *et al.* 2009). As with the general shift that has occurred from FC to EC, many practitioners are now advocating for testing to directly identify and track pathogenic microbial pollutants of concern to develop risk assessments, as the large class FIB often does not correlate well with pathogens, which can be present even at low FIB concentrations (Straub and Chandler 2003; Field and Samadour 2007; Edge *et al.* 2012; Bradshaw *et al.* 2016; Li *et al.* 2019). This targeted source tracking can be used to inform management decisions and develop site-specific objectives (Rodrigues and Cunha 2017). This study demonstrates that FIB monitoring across multiple watersheds can be effective in tracking trends in the status of fecal bacteria over time. While FIB concentrations can still exceed regulatory objectives and microbial pollutants remain that may introduce human, ecosystem and other risks in our study watersheds, the reduction in impacts informed by monitoring FIB on multiple use lands demonstrates that mitigation is possible with proper management.

The input of sediments into streams is a natural process, and increased turbidity is generally associated with precipitation events during the wet season in Mediterranean systems (Gasith and Resh 1999). Persistent and high concentrations can affect aquatic organisms across all life stages, though these impacts are often site- and species-specific, and can depend on timing, abiotic conditions and interaction with other stressors, thus making the establishment of justifiable numeric targets is difficult (Kemp *et al.* 2011; Jones *et al.* 2012). We found that turbidity (NTU) was generally not persistent at selected levels referenced in the literature for salmonids, and that higher measurements were largely associated with rainfall.

Early BMPs targeting substantial sources of FIB appear to have had a large effect on improving water quality, with subsequent implementation contributing less (Lewis *et al.* 2005; Lewis *et al.* 2019). Also, numerous factors including soil type, vegetation characteristics, groundwater influx and stream bed re-suspension can affect FIB transport (George *et al.* 2011, Pandey *et al.* 2014). Consideration of loading in terms of runoff volume versus concentration of microbial pollution is also important, as monitoring stations were placed in numerous subwatersheds at varying distances from areas that have been observed to contribute high FIB concentrations, such as manure management systems and animal concentration areas (Lewis *et al.* 2005).

Changes in management not documented in this study could have also contributed to reductions in FIB concentrations. This included conversion of the dairies to organic operations in the mid to late 2000's (2006 for I and J ranches, 2011 for L Ranch). General changes associated with this conversion included overall reduction of herd sizes and adherence to number of regulatory requirements under the National Organic Program including management to prevent runoff of wastes and contaminated waters to adjoining or nearby surface water, at least 120 days on pasture with minimum 30 percent dry matter intake from grazing, a pasture management plan that ensures pasture of a sufficient quality and quantity is available to graze throughout the grazing season, and practices for erosion control and the protection of natural wetlands

and riparian areas (National Organic Program 2009[10]). Improved pasture management practices related to these requirements may have also contributed to observed declines in FIB concentrations, for example by increasing use of rotational grazing or ground cover in high use areas (see Lewis *et al.* 2009).

Despite animal unit densities an order of magnitude higher than Roche *et al.* (2013), we found that initially high FIB levels were dramatically reduced over time in conjunction with BMPs demonstrating that mitigation management for water quality on multiple-use lands is possible. Our results add to the growing body of literature showing that agricultural BMPs implemented on public lands supporting recreational, ecological and grazing uses can greatly improve water quality conditions. Nonetheless, continued monitoring and management of public lands is important to assist land managers in managing these multiple uses.

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References

American Public Health Association, American Water Works Association, and Water Environment Federation (APHA-AWWA-WEF). 1998. Standard methods for the examination of water and wastewater (18th ed.), pp. p. 9-47 to 9-70, American Public Health Association, Washington, D.C.

Belsky AJ, Matzke A, Uselman S. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. J Soil Water Conserv 54:419–431.

Boehm AB, Ashbolt NJ, Colford JM, Dunbar LE, Fleming LE, Gold MA, Hansel JA, Hunter PR, Ichida AM, McGee CD, Soller JA, Weisberg SB. 2009. A sea change ahead for recreational water quality criteria. J Water Health 7, 9– 20.

Bradshaw JK, Snyder BJ, Oladeinde A, Spidle D, Berrang E, Meinersmann RJ, Oakley B, Sidle R C and Sullivan K. 2016. Characterizing relationships among fecal indicator bacteria, microbial source tracking markers, and associated waterborne pathogen occurrence in stream water and sediments in a mixed land use watershed. Water Res. 101:498–509

Brown TC, Froemke P. 2012. Nationwide Assessment of Nonpoint Source Threats to Water Quality. BioScience. 62:136–146. https://doi.org/10.1525/bio.2012.62.2.7

Chin DA. 2010. Linking pathogen sources to water quality in small urban streams. J Environ Eng 136:249–253

Cho KH, Han D, Park Y, Lee SW, Cha SM, Kang J, Kim JH. 2010. Evaluation of the relationship between two different methods for enumeration fecal indicator bacteria: colony-forming unit and most probable number. J Environ Sci (China) 22:846-850. doi:10.1016/s1001-0742(09)60187-x

Christensen RHB. 2019. ordinal - Regression Models for Ordinal Data. R package version 2019.12-10.

Conley DJ, Paerl HW, Howarth RW, Boesch DF, Seitzinger SP, Havens KE, Lancelot C, Likens GE. 2009. Controlling eutrophication: Nitrogen and phosphorus. Science 323: 1014–1015.

Cooprider MA, Carson RG. 2006. San Francisco Bay Area Network Freshwater Quality Monitor Protocol: Version 2.11 October 2006. Natural Resource Report. NPS/SFAN/NRR—2006/016. National Park Service. Sausalito, California.

[10] www.ecfr.gov/cgi-bin/text-idx?SID=d622ec00bf0e4d43c7758dc644d2e896&mc=true&node=pt7.3.205&rgn=div5

Cude CG, 2005. Accommodating Change of Bacterial Indicators in Long Term Water Quality Datasets. Journal of the American Water Resources Association (JAWRA) 41:47-54.

Derlet RW, Carlson JR. 2006. Coliform Bacteria in Sierra Nevada Wilderness Lakes and Streams: What Is the Impact of Backpackers, Pack Animals, and Cattle? Wilderness & Environmental Medicine. 17:15-20.

Dillaha TA, Sherrard JH, Lee D, Mostaghimi S, Shanholtz VO. 1988. Evaluation of vegetative filter strips as a best management practice for feed lots. J. of the Water Pollution Control Federation 60:1231-1238 .

Edberg S, Rice E, Karlin E, Allen M. 2000. *Escherichia coli*: the best biological drinking water indicator for public health protection. Journal of Applied Microbiology, 88: 106S-116S. doi:10.1111/j.1365-2672.2000.tb05338.x

Edge TA, El-Shaarawi A, Gannon V, Jokinen C, Kent R, Khan IUH, Koning W, Lapen D, Miller J, Neumann N, Phillips R, Robertson W, Schreier H, Scott A, Shtepani I, Topp E, Wilkes G, van Bochove E. 2012. Investigation of an Escherichia coli environmental benchmark for waterborne pathogens in agricultural watersheds in Canada. J Environ Qual 41:21–30

Ellison CA, Skinner QD. 2009. Assessment of Best-Management Practice Effects on Rangeland Stream Water Quality Using Multivariate Statistical Techniques. Rangeland Ecology & Management 62:371-386.

Field KG, Samadpour M. 2007. Fecal source tracking, the indicator paradigm, and managing water quality. Water Research. 41: 3517-3538. 10.1016/j.watres.2007.06.056.

Garcia-Armisen T, Prats J, Servaisa P. 2007.Comparison of culturable fecal coliforms and *Escherichia coli* enumeration in freshwaters. Canadian Journal of Microbiology 53: 798-801

Gasith A, Resh VH. 1999. Streams in Mediterranean Climate Regions: Abiotic Influences and Biotic Responses to Predictable Seasonal Events. Annual Review of Ecology and Systematics 30:1, 51-81

George MR, Jackson RD, Boyd CS, Tate KW. 2011. A scientific assessment of the effectiveness of riparian management practices. In: Bridke DD, editor. Conservation benefits of rangeland practices: Assessment, recommendations, and knowledge gaps. Lawrence: Allen Press. 213–252.

Goodrich B, Gabry J, Ali I & Brilleman S. 2020. rstanarm: Bayesian applied regression modeling via Stan. R package version 2.19.3 https://mc-stan.org/rstanarm.

Gronewold D, Wolpert RL. 2007. Modeling the relationship between most probable number (MPN) and colony-forming unit (CFU) estimates of fecal coliform concentration. Water Research 42:3327-3334.

Hachich EM, Di Bari M, Christ APG, Lamparelli CC, Ramos SS, Sato MIZ. 2012. Comparison of thermotolerant coliforms and *Escherichia coli* densities in freshwater bodies. Brazilian Journal of Microbiology 2012:675-681.

Inamdar SP, Mostaghimi S, Cook MN, Brannan KM, McClellen PW. 2002. A long-term, watershed-scale, evaluation of the impacts of animal waste BMPs on indicator bacteria concentrations. Journal of the American Water Resources Association 38: 819–833.

Jin G, Englande AJ, Bradford H, Jeng H. 2004. Comparison of *E. coli*, Enterococci, and Fecal Coliform as Indicators for Brackish Water Quality Assessment. Water Environment Research 76:245-254.

Jones JI, Murphy JF, Collins AL, Sear DA, Naden PS, Armitage PD. 2012. The Impact of Fine Sediment on Macro-Invertebrates. River Res. Applic., 28: 1055-1071. doi:10.1002/rra.1516

Kemp P, Sear D, Collins A, Naden P, Jones I. 2011. The impacts of fine sediment on riverine fish. Hydrol. Process., 25:1800-1821. doi:10.1002/hyp.7940

Ketcham B. 2001. Point Reyes National Seashore water quality monitoring report. U.S. Department of Interior, National Park Service. 68 pp. + appendices.

Kratzer CR, Saleh DK, Zamora C. 2006, Assessment of Hydrologic and Water Quality Data Collected in Abbotts Lagoon Watershed, Point Reyes National Seashore, California, during Water Years 1999 and 2000: U.S. Geological Survey Scientific Investigations Report 2005–5261, 35 p.

Lewis DJ, Atwill ER, Lennox MS, Hou L, Karle B, Tate KW. 2005. Linking on-farm dairy management practices to storm-flow fecal coliform loading for California coastal watersheds. Environ Monit Assess 107:407–425. https://doi.org/10.1007/s10661-005-3911-7

Lewis DJ, Atwill ER, Lennox MS, Pereira MDG, Miller WA, Conrad PA, Tate KW. 2009. Reducing microbial contamination in storm runoff from high use areas on California coastal dairies. Water Sci Technol 60:1731–1743. doi: https://doi.org/10.2166/wst.2009.561

Lewis DJ, Voeller D, Saitone TL, Tate KW. 2019. Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters. Sustainability 11:5516. doi:10.3390/su11195516

Li X, Chase JA, Bond RF, Lor P, Fernandez F, Nguyen TH, Partyka ML, Thiptara A, Atwill ER. 2019. Microbiological safety of popular recreation swimming sites in Central California. Environ Monit Assess 191:456 https://doi.org/10.1007/s10661-019-7601-2

Mach ME, Wedding LM, Reiter SM, Micheli F, Fujita RM, Martone RG. 2017. Assessment and management of cumulative impacts in California's network of marine protected areas. Ocean & Coastal Management 137:1-11

Martin DJ, Shelly AA, Danehy RJ, Lang ED, Hvozda J. 2019. Coho Salmon Growth in Relation to Natural Turbidity Regimes in a Coastal Stream of Northern California. Trans Am Fish Soc, 148:817-831. doi: 10.1002/tafs.10174

Molinos JG, Donohue I. 2011. Temporal variability within disturbance events regulates their effects on natural communities. Oecologia, 166:795-806.

National Research Council. 2010. Toward sustainable agricultural systems in the 21st century. National Academies Press.

Nickerson C, Ebel R, Borchers A, Carriazo F. 2011. Major Uses of Land in the United States, 2007, EIB-89, U.S. Department of Agriculture, Economic Research Service.

O'Callaghan P, Kelly-Quinn, Jennings E, Antunes P, O'Sullivan M, Fenton O, Uallacháin DÓ. 2019. The Environmental Impact of Cattle Access to Watercourses: A Review. J. Environ. Qual., 48: 340-351. doi:10.2134/jeq2018.04.0167

Pandey PK, Kass PH, Soupir ML, Biswas S, Singh VP. 2014. Contamination of water resources by pathogenic bacteria. AMB Express 4:51.

Pawley A, Lay M. 2013. Coastal watershed assessment for Golden Gate National Recreation Area and Point Reyes National Seashore. Natural Resource Report NPS/PWR/NRR-2013/641. National Park Service, Fort Collins, Colorado.

Pinto RL. 2014. Cattle Grazing in The National Parks: Historical Development and History of Management in Three Southern Arizona Parks. Dissertation, University of Arizona. 360p.

R Core Team. 2019. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Rasmussen PP; Ziegler AC. 2003. Comparison and continuous estimates of fecal coliform and *Escherichia coli* bacteria in selected Kansas streams, May 1999 through April 2002. In: Proceedings of 2003 Spring Specialty Conference on Agricultural Hydrology and Water Quality, May 12-14, 2003, Kansas City, Missouri: Middelburg, Virginia, American Water Resources Association, AWRA Technical Publication Series No. TPS-03-01.

Roche LM, Kromschroeder L, Atwill ER, Dahlgren RA, Tate KW. 2013. Water Quality Conditions Associated with Cattle Grazing and Recreation on National Forest Lands. PLoS ONE 8(6):e68127. doi: 10.1371/journal.pone.0068127

Rodrigues C, Cunha MÂ. 2017. Assessment of the microbiological quality of recreational waters: indicators and methods. Euro-Mediterr J Environ Integr 2:25. https://doi.org/10.1007/s41207-017-0035-8

Russo GS, Eftim SE, Goldstone AE, Dufour AP, Nappier SP, Wade TJ. 2020. Evaluating health risks associated with exposure to ambient surface waters during recreational activities: A systematic review and meta-analysis. Water Res. 176:115729. doi:10.1016/j.watres.2020.115729

Shaw E, Richardson J. 2011. Direct and Indirect Effects of Sediment Pulse Duration on Stream Invertebrate Assemblages and Rainbow Trout (*Oncornhynchus mykiss*) Growth and Survival. Canadian Journal of Fisheries and Aquatic Sciences. 58. 2213-2221.

Sigler JW., Bjornn TC, Everest FH. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. Transactions of the American Fisheries Society 113:142-150.

Simon R, Makarewicz JC. 2009. Storm water events in a small agricultural watershed: characterization and the evaluation of improvements in stream water microbiology following the implementation of Best Management Practices. J. Great Lakes Res. 35 Supplement 1:76–82.

Straub TM, Chandler DP. 2003. Towards a unified system for detecting waterborne pathogens. J Microbiol Methods 53:185–197.

Sylvestre É, Burneta JB, Smeets P, Medema G, Prévost M, Dorner S. 2020. Can routine monitoring of *E. coli* fully account for peak event concentrations at drinking water intakes in agricultural and urban rivers? Water Research 170:115369.

U.S. Department of Agriculture Natural Resource Conservation Service (USDA). 2020. Web Soil Survey. Marin County California – CA041. Accessed May 27, 2020. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

U.S. Environmental Protection Agency (U.S. EPA). 2012. Impaired Waters and Total Maximum Daily Loads. Accessed May 27, 2020

U.S. Environmental Protection Agency (U.S. EPA). 2019. The EPA's Action on the Revisions to Chapter 173-201A of the Washington Administrative Code Regarding the Recreational Use Criteria for Fresh and Marine Waters. Accessed 06/03/2020 at: https://ecology.wa.gov/DOE/files/39/39c03a3e-9f09-4daa-a7cc-d5b5289d579c.pdf

U.S. National Park Service (U.S. NPS). 2019. Point Reyes National Seashore Draft General Management Plan Amendment.

Vehtari A, Gelman A, and Gabry J. 2017. Practical Bayesian model evaluation using leave-one-out cross-validation and WAIC. Statistics and Computing 27:1413-1432.

Wallitner K, Pincetich A. 2017. Freshwater quality monitoring in the San Francisco Bay Area: Biennial report on water years 2015 and 2016. Natural Resource Report. NPS/SFAN/NRR—2017/1471. National Park Service. Fort Collins, Colorado.

West AO, Scott JT. 2016. Black disk visibility, turbidity, and total suspended solids in rivers: A comparative evaluation. Limnol. Oceanogr.: Methods 14:658–667.

Wilkes G, Brassard J, Edge TA, Gannon V, Jokinen CC, Jones TH, Neumann N, Pintar KDM, Ruecker N, Schmidt PJ, Sunohara M, Topp E, Lapen DR. 2013. Bacteria, viruses, and parasites in an intermittent stream protected from and exposed to pasturing cattle: Prevalence, densities, and quantitative microbial risk assessment. Volume 47:6244-6257

Wolf KM, Baldwin RA, Barry S. 2017. Compatibility of Livestock Grazing and Recreational Use on Coastal California Public Lands: Importance, Interactions, and Management Solutions. Rangeland Ecology and Management 70:192-201.

Yao Y, Vehtari A, Simpson D, Gelman A. 2017. Using stacking to average Bayesian predictive distributions. Bayesian Analysis. doi: 10.1214/17-BA1091

Supplement for Improved water quality in coastal watersheds at Point Reyes National Seashore associated with rangeland best management practices, 2000 - 2013

Dylan Voeller Brannon Ketcham Ben Becker*

2020-07-13

Table 1: Percentage of watersheds by slope category.

Watershed	0-15% slope	15-20% slope	20-25% slope	>25% slope
Abbotts	72.6%	11.1%	5.7%	10.6%
Abbotts South	89.4%	3.8%	2.2%	4.6%
Home	29.9%	10.4%	9.3%	50.4%
Kehoe	60.0%	14.4%	9.4%	16.3%
Schooner	28.0%	15.0%	13.5%	43.6%

Table 2: Off-road off-trail erosion hazard percentage by watershed.

Watershed	Slight	Moderate	Severe	Very severe	Not rated
Abbotts	51.8%	25.3%	0.3%	0.0%	22.7%
Abbotts South	67.9%	4.1%	1.5%	0.0%	26.4%
Home	28.5%	18.7%	27.4%	23.6%	1.9%
Kehoe	57.4%	28.6%	2.5%	0.0%	11.5%
Schooner	18.6%	31.2%	24.4%	25.0%	0.8%

*U.S. National Park Service, Point Reyes National Seashore, Point Reyes Station, California.

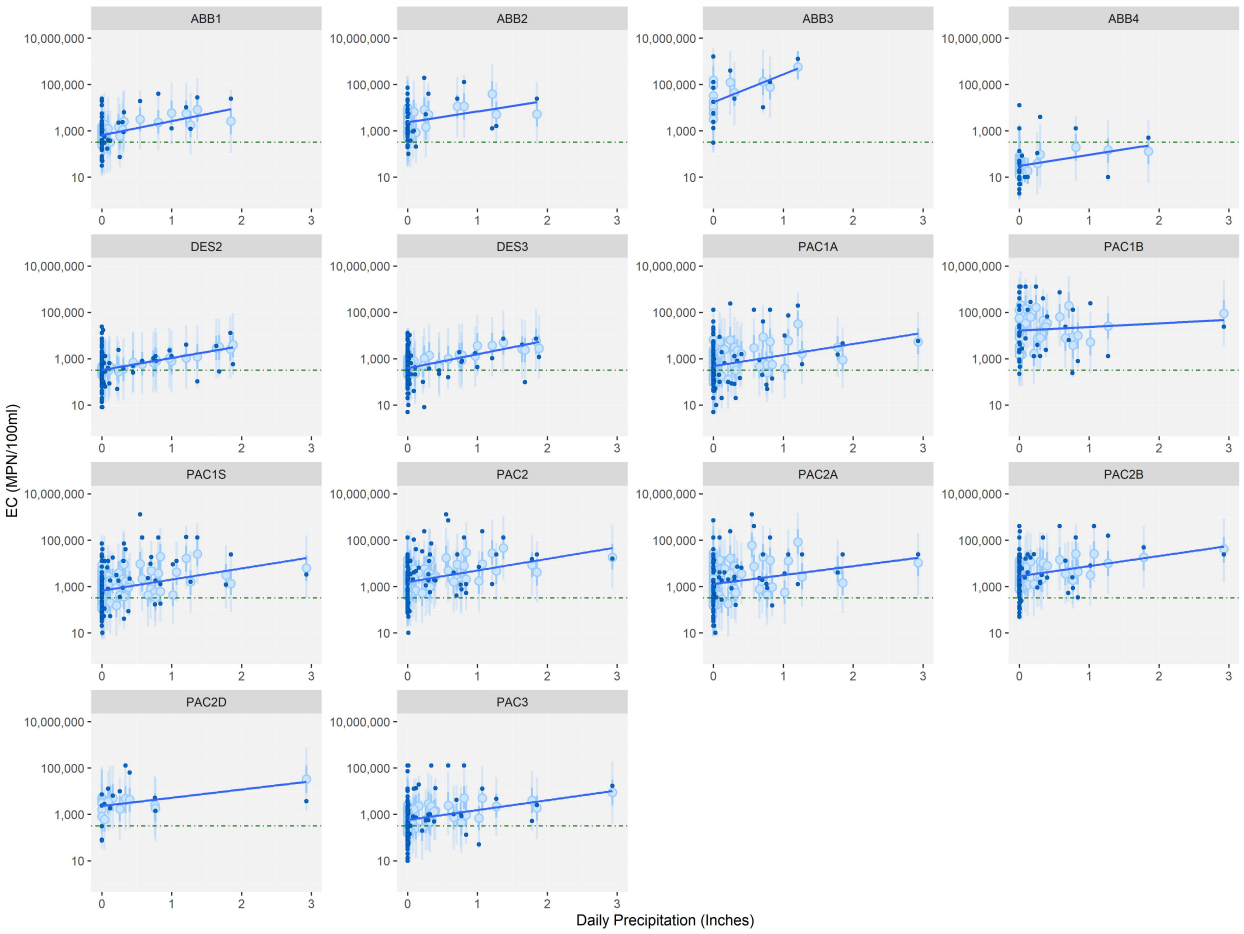

Figure 1: Effects plot of 24hr rainfall on FIB levels from the best full dataset model at 80% EC/FC ratio.

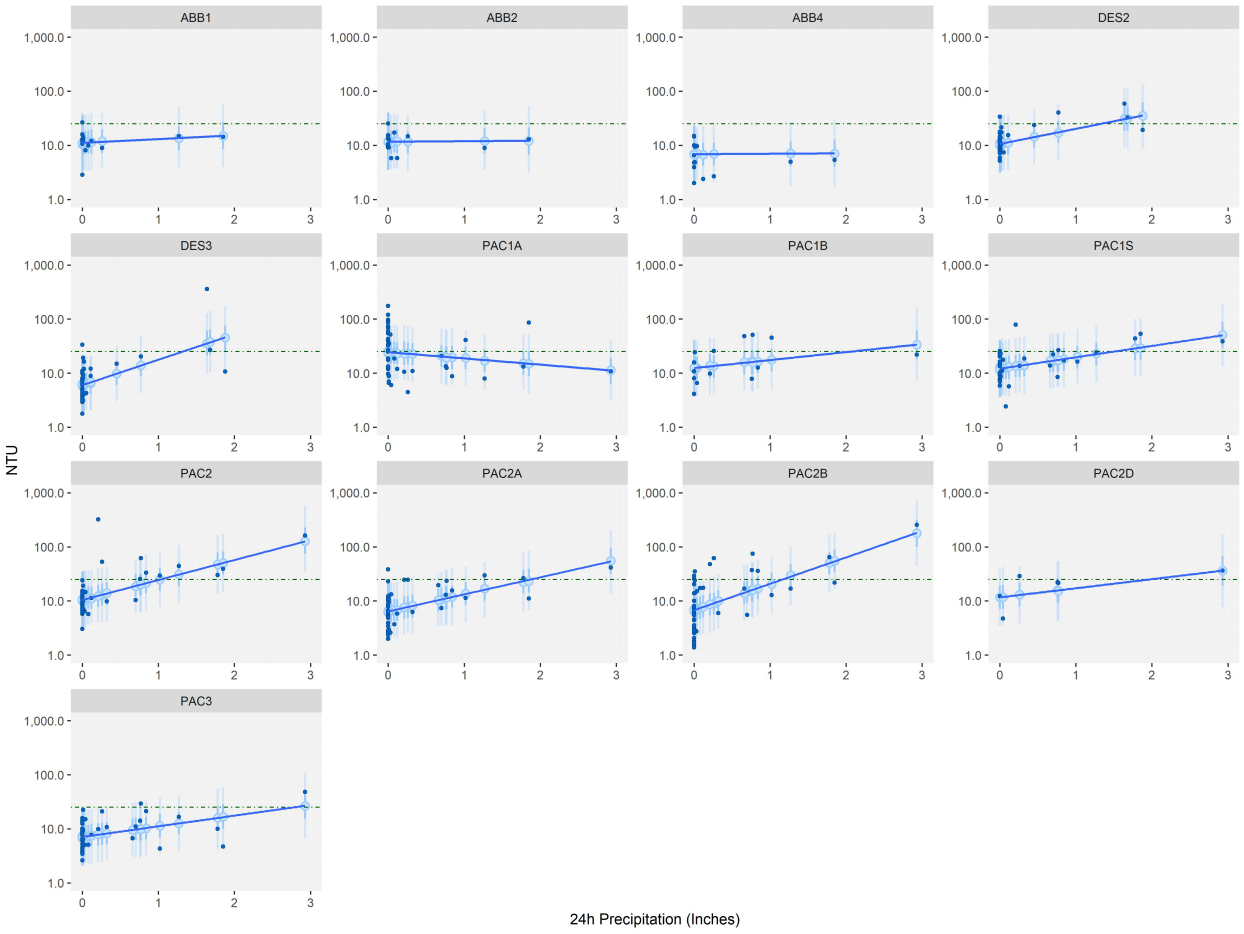

Figure 2: Effects plot of 24hr rainfall on NTU levels from the best full dataset model.

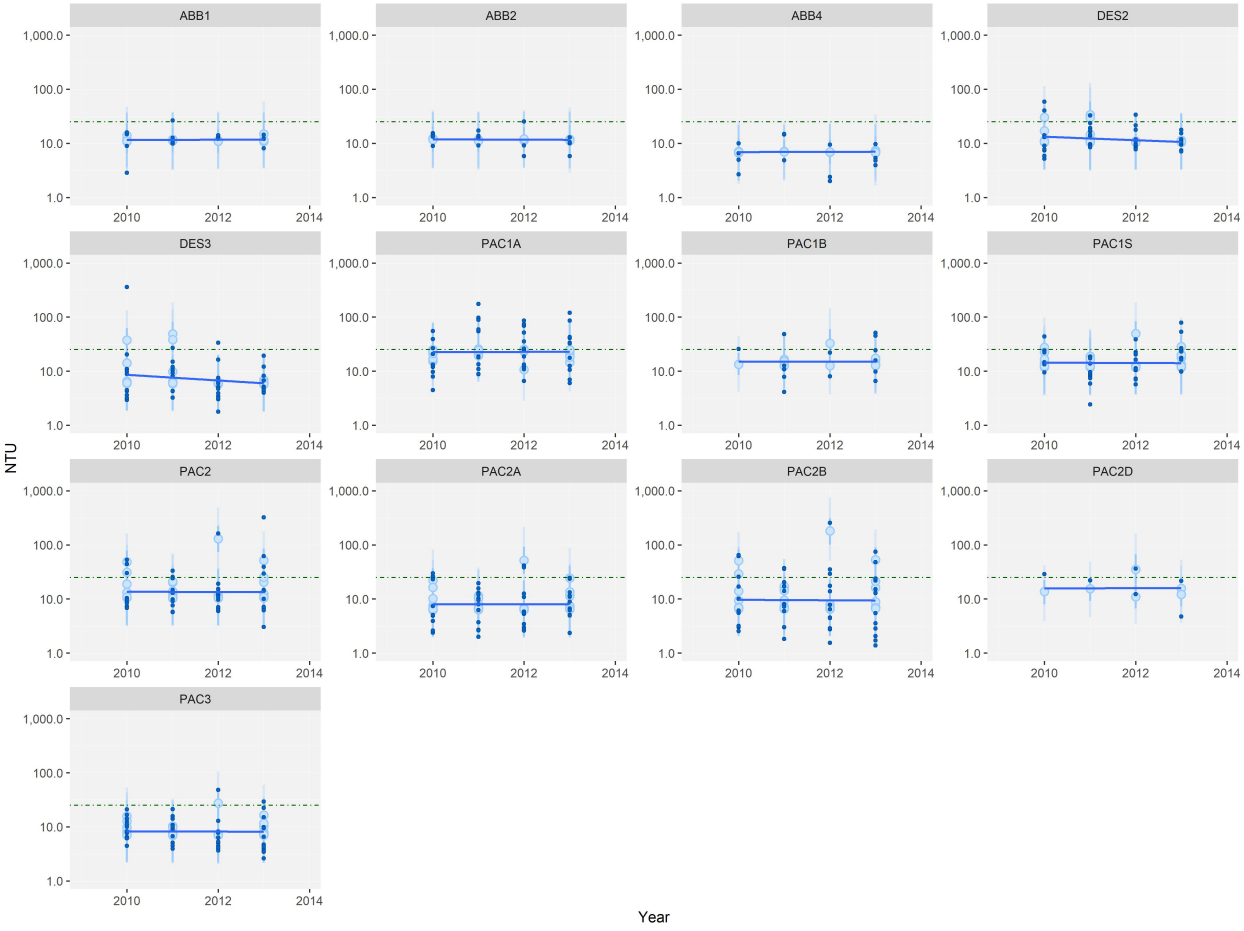

Figure 3: Year effects plots from the best NTU model. Dark blue points are data, light blue points and errors are posterior model predictions. Line is linear fit of posterior predictions.

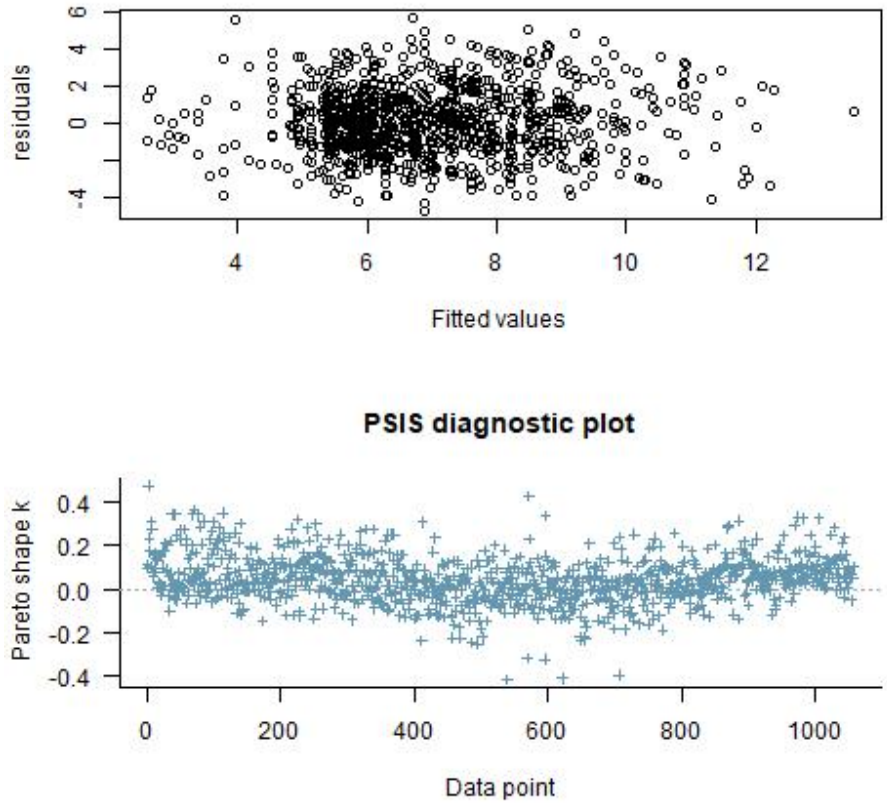

Figure 4: (A) Residuals from best FIB model (Table 2) using all samples are well distributed. (B) Diagnostic plots from leave-one-out (loo) validation shows posterior is not highly sensitive to any particular observations in the dataset (no points > 0.5).

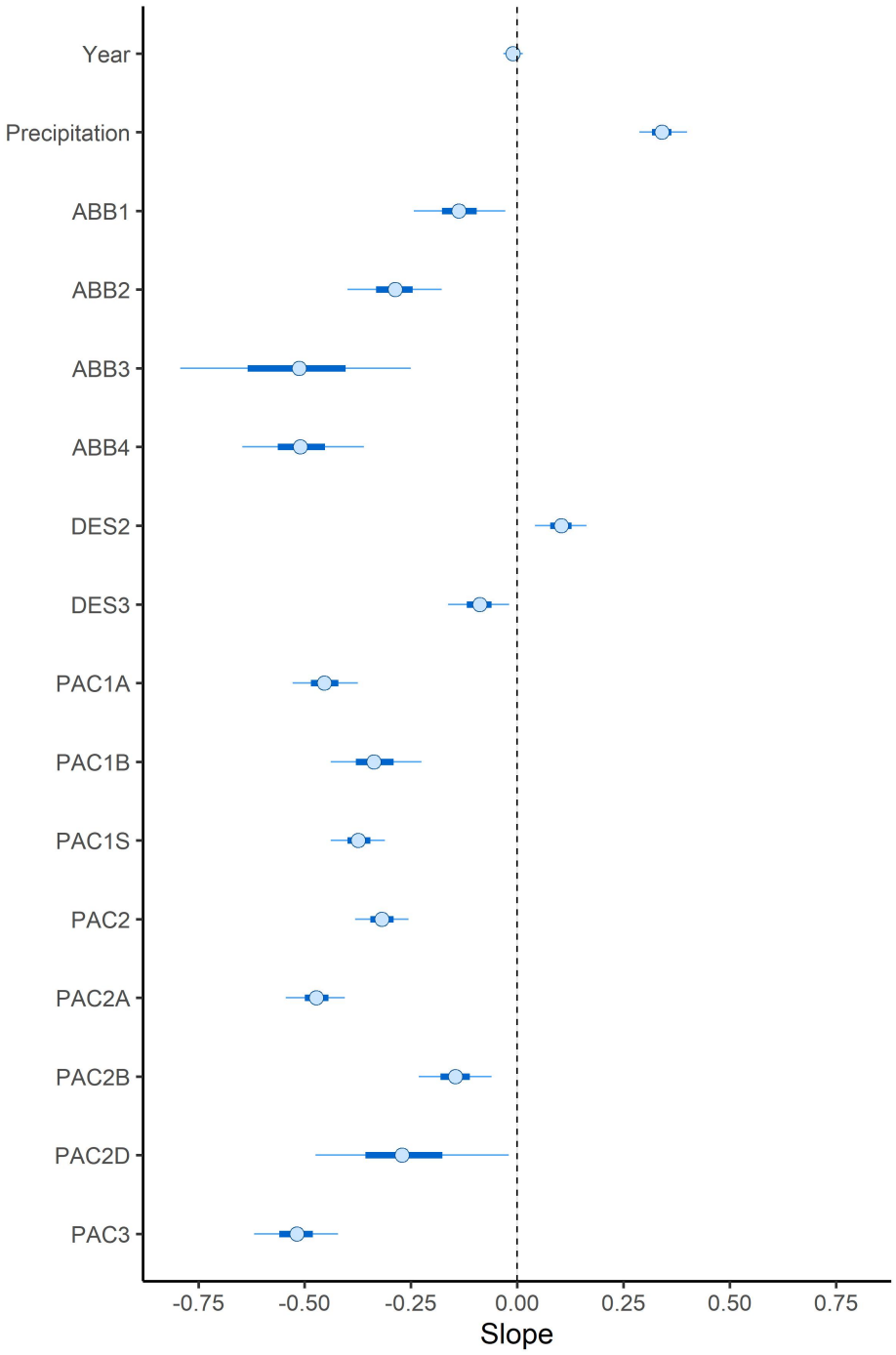

Figure 5: FIB slope coefficients for the full FIB dataset with 0.80 EC/FC correction are essentially identical when using negative binomial rather than lognormal distribution results in Fig. 5A.

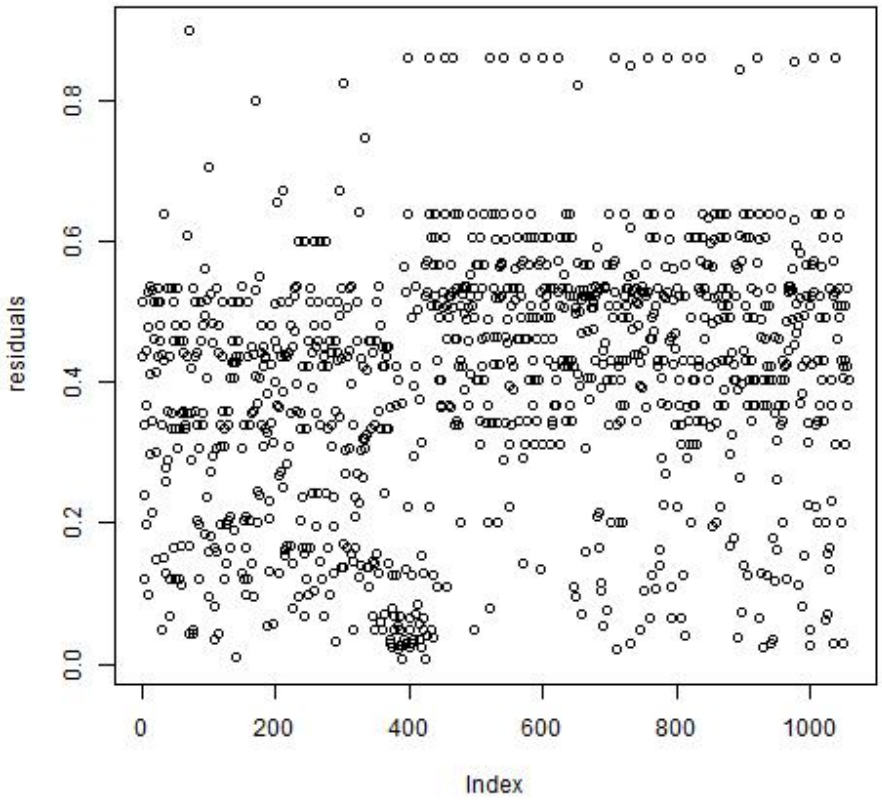

Figure 6: Residuals from best ranked FIB cumulative link mixed-model.

APPENDIX M—THREATENED, ENDANGERED, AND SPECIAL- STATUS SPECIES TABLES

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APPENDIX M: THREATENED, ENDANGERED, AND SPECIAL-STATUS SPECIES TABLES

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

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

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

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

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

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

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TABLE M-2: FEDERALLY LISTED THREATENED AND ENDANGERED PLANTS

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

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

[a] USFWS (2011a)

[b] USFWS (1998)

[c] USFWS (2012)

[d] USFWS (2014)

[e] USFWS (2011b)

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

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

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

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

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

[a] Collins (1998)

[b] Shuford and Gardali (2008)

[c] CDFW (2018a)

[d] CDFW (2018b)

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TABLE M-4: FEDERALLY LISTED THREATENED AND ENDANGERED WILDLIFE

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

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

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

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

Note: Table does not include marine or delisted species.

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

[b] USFWS (2001)

[c] NMFS (2004)

[d] CDFW (2009)

[e] CDFW (2018d)

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References

CDFW (California Department of Fish and Wildlife)

2009 "Longfin Smelt Fact Sheet." Accessed October 15, 2018. https://www.dfg.ca.gov/delta/data/longfinsmelt/documents/LongfinsmeltFactSheet_July09.pdf.

2014 California Interagency Wildlife Task Group. California Wildlife Habitat Relationships, Version 9.0, Personal Computer Program. Sacramento, California. https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range.

2018a "Special Vascular Plants, Bryophytes, and Lichens List." California Natural Diversity Database, August 2018. Quarterly publication. 127 pp. Accessed October 11, 2018. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109383.

2018b "Special Animals List." California Department of Fish and Wildlife website. California Natural Diversity Database, August 2018. Periodic publication. 66 pp. Accessed October 11, 2018. https://www.wildlife.ca.gov/Conservation/SSC.

2018c "Fully Protected Species." California Department of Fish and Wildlife website. Accessed October 11, 2018. http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html.

2018d "California Wildlife Habitat Relationships Life History Accounts and Range Maps." California Department of Fish and Wildlife website. Accessed October 11, 2018. https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range.

2019a "State and Federally Listed Endangered, Threatened, and Rare Plants of California." Accessed June 11, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline.

2019b "State and Federally Listed Endangered and Threatened Animals of California." Accessed June 11, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109405&inline.

2019c "Threatened and Endangered Fish." Accessed June 11, 2019. https://www.dfg.ca.gov/wildlife/nongame/t_e_spp/fish.html.

CNDDB (California Natural Diversity Database)

2018 "State and Federally Listed Endangered, Threatened, and Rare Plants of California." Augusts 6, 2018. California Department of Fish and Wildlife, Biogeographic Data Branch. Accessed March 13, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline.

CNPS (California Native Plant Society)

2019 "Inventory of Rare and Endangered Plants of California" Accessed March 13, 2019. http://www.rareplants.cnps.org/.

Collins, P. W.

1998 "Point Reyes Jumping Mouse, *Zapus trinotatus orarius*." Pp. 132-135 in Bolster, B.C., Ed. *Terrestrial Mammal Species of Special Concern in California*. Accessed February 4, 2019. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84509.

NMFS (National Marine Fisheries Service)

2004 "Biological Opinion on the Continued Issuance of Grazing Leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California." Submitted by the R. R. McInnis, Acting Regional Administrator of National Marine Fisheries Service, Southwest Region, to D. L. Neubacher, Superintendent of Point Reyes National Seashore. April.

2018 "West Coast Salmon & Steelhead Listings." http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/salmon_and_steelhead_listings.html.

NPS (National Park Service)

2017 Geographic Information Systems Data Provided by NPS. October 18, 2017.

Shuford, W. D., and T. Gardali, editors

2008 *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. Studies of Western Birds – San Francisco Common Yellowthroat*. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=10427.

USFWS (US Fish and Wildlife Service)

1998 "Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan." Portland, OR. 141 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/980930d.pdf.

2001 "Short-tailed Albatross (*Phoebastria albatrus*), Threatened and Endangered Species." September 2002. Accessed October 10, 2018. https://www.fws.gov/alaska/fisheries/endangered/pdf/STALfactsheet.pdf.

2011a *Layia carnosa (Beach layia) Draft 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. Accessed February 6, 2019. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3961.pdf.

2011b *Alopecurus aequalis var. sonomensis (Sonoma alopecurus) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3898.pdf.

2012 *Trifolium amoenum (Showy Indian Clover) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. June 2012. Accessed February 6, 2019. https://ecos.fws.gov/docs/five_year_review/doc4018.pdf.

2014 "Section 7 Informal Consultation on the Proposed Point Reyes National Seashore Road Improvement and Maintenance Projects, Marin County, California." September 24, 2014. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Assistant Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 08ESMF00-2014-I-0609-1.

2018 "Information for Planning and Conservation (IPaC)." Accessed April 9-18, 2018. https://ecos.fws.gov/ipac/.

APPENDIX N—BIOLOGICAL ASSESSMENT – US FISH AND WILDLIFE SERVICE

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National Park Service
U.S. Department of the Interior

POINT REYES NATIONAL SEASHORE

GENERAL MANAGEMENT PLAN AMENDMENT ENVIRONMENTAL IMPACT STATEMENT

BIOLOGICAL ASSESSMENT

Prepared for:
US Fish and Wildlife Service

September 2020

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ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

AU	animal unit
AUE	animal unit equivalent
BA	biological assessment
BMP	best management practice
BO	biological opinion
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNPS	California Native Plant Society
DPS	Designated Population Segment
EIS	environmental impact statement
ESA	Endangered Species Act
FR	Federal Register
GMP	general management plan
IPaC	Information for Planning and Conservation
IPM	integrated pest management
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
north district of Golden Gate	North District of Golden Gate National Recreation Area
NPS	National Park Service
NRCA	National Resources Condition Assessment
park	Point Reyes National Seashore and North District of Golden Gate National Recreation Area
PCE	primary constituent element
Point Reyes	Point Reyes National Seashore
RDM	residual dry matter
ROA	ranch operating agreement
San Francisco Bay RWQCB	San Francisco Bay Regional Water Quality Control Board
SFAN	San Francisco Area Network
UC	University of California
U.S.C.	United States Code
USDA	US Department of Agriculture
USDA-NRCS	US Department of Agriculture, Natural Resources Conservation Service
USFWS	US Department of the Interior, Fish and Wildlife Service

1.0 INTRODUCTION

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

1.1 Purpose of this Biological Assessment

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

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

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

1.2 Current Management Direction

The *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980) designates a "Pastoral Lands" zone "to permit the continued use of existing ranchlands for ranching and dairying purposes." In 1990, NPS adopted the *Range Management Guidelines* (NPS 1990a) in response to countywide concerns about flooding and large-scale erosion control in the early 1980s. NPS has updated and adapted authorizations based on this guidance and other best available science. Recently, NPS contracted with the University of California (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.

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. RDM monitoring is conducted annually. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review and update the RDM monitoring program. The UC report (Bartolome et al. 2015) examined 25 years of 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), but the report also notes that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. Bartolome et al. (2015) also recommend expanded use of visual RDM mapping across pastures to better inform overall management of the ranched lands. Updated monitoring protocols have been in place since 2015. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available as appendix E of the EIS.

In addition to RDM, 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 2019c) evaluates this data set. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review. NPS has also established forage productivity plots on a subset of ranches that are monitored in spring to aid in determination of stocking rates.

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

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

- ESA of 1973, as amended
- 1916 NPS Organic Act
- NPS General Authorities Act of 1978
- *NPS Management Policies 2006* (NPS 2006)

- Migratory Bird Treaty Act (MBTA)
- National Environmental Policy Act (NEPA)
- Taylor Grazing Act of 1934
- *1980 Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980)
- *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998a)
- *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b)
- *Recovery Plan for California Freshwater Shrimp* (*Syncaris pacifica* Holmes 1895) (USFWS 1998c)
- *Recovery Plan for the California Red-legged Frog* (USFWS 2002a)
- *Western Snowy Plover* (*Charadrius alexandrinus nivosus*) *Pacific Coast Population Recovery Plan* (USFWS 2007a)

2.0 CONSULTATION HISTORY

February 20, 2018	Dave Press, NPS Wildlife Biologist, and Dylan Voeller, NPS Range Program Manager/Ecologist, had a phone conversation with Ryan Olah, USFWS Coast Bay Division Chief, to discuss potential issues with threatened and endangered species in the park.
April 30, 2019	Dave Press, NPS Wildlife Biologist, emailed Ryan Olah, USFWS Coast Bay Division Chief, to inquire about the USFWS' preference for displaying species occurrence data on figures in this BA.
May 2, 2019	Ryan Olah, USFWS Coast Bay Division Chief, replied via email to Dave Press, NPS Wildlife Biologist, regarding which maps of occurrence data should be presented as an attachment, with summaries of monitoring data in text.
August 8, 2019	NPS provided draft BA and requested formal consultation on the GMP Amendment
January 22-23, 2020	Leif Goude, USFWS Coast Bay Division Biologist, toured the action area with Dave Press, NPS Wildlife Biologist, Dylan Voeller, NPS Range Program Manager/Ecologist, Brannon Ketcham, NPS Management Assistant, Carey Feieraband, Acting Superintendent, and Melissa Stedeford, NPS Environmental Quality Division, to help USFWS prepare its Biological Opinion.
January 23, 2020	As part of the planning process, park ranchers requested applicant status under section 7 of the ESA. In coordination with USFWS and the National Marine Fisheries Service (NMFS), NPS hosted a Rancher Applicant meeting at the park headquarters. The purpose of the meeting was to provide rancher applicants an update regarding the agency Technical Assistance/Pre-consultation phase, the process for USFWS and NMFS consultation, what the applicant's role would be during that consultation process, and answer questions related to the consultation process.

3.0 DESCRIPTION OF THE PROPOSED ACTION

3.1 Location and Background

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

The detailed history of agricultural land in the park is described in chapter 1 of the EIS. Currently, approximately 18,000 acres (20%) of Point Reyes and 10,000 acres (60%) of the north district of Golden Gate are used for beef and dairy ranching under agricultural lease/permits. Twenty-four families hold lease/permits for beef cattle and dairy operations, and approximately 2,400 animal units (AU) of livestock on beef ranches and 3,325 dairy animals are currently authorized under existing lease/permits (attachment A, figure 1). Eighteen lease/permits include residential uses specific to on-site ranch operations. NPS has worked to maintain a direct relationship with the ranchers.

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

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

NPS prepared an EIS for the GMP Amendment that evaluates the potential impacts of agricultural diversification, increased operational flexibility, ranch and dairy succession planning, and similar ranch management practices as part of several action alternatives. The purpose of the EIS is to establish guidance for the preservation of natural and cultural resources and the management of infrastructure and visitor use in the action area. In this context, the EIS addresses the future management of leased ranchlands and tule elk in the action area.

3.2 Proposed Action

Alternative B is identified as the NPS preferred alternative in the Final EIS and is the proposed action for the BA. The following text provides an overview of the proposed action. See chapter 2 of the EIS for a complete description of all elements.

3.2.1 General Description and Zoning

Under the proposed action, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the action area (referred to as the planning area in the EIS). NPS would allow for continued multi-generational ranching and establish a population threshold for management of the Drakes Beach tule elk herd.

NPS would apply two new management zones, the Ranchland zone and the Scenic Landscape zone, to the action area. This new zoning would amend the 1980 GMP by replacing the Special Use-Pastoral Lands and Pastoral Landscape Management zones in the action area with these zones (figure 7 in appendix A of the EIS). New opportunities and improvements to facilitate public use and enjoyment in the action area would be implemented in both the Ranchland and Scenic Landscape zones. NPS would also establish a new framework for managing visitor capacity that establishes indicators and thresholds for the action area.

Like the Special Use-Pastoral Lands and Pastoral Landscape Management zones from the 1980 GMP, multi-generational ranching activities would be considered an appropriate use in the Ranchland zone. Ranching activities would only be authorized in the Ranchland zone. NPS would implement a subzoning framework that would authorize specific activities based on resource management goals and objectives as described in the "Ranch Operations" section below. Continued occupancy and use of existing lease/permit areas for multi-generational ranching would occur according to the management strategies identified in table 3-1 for ranchlands and in support of desired conditions. Of the 28,700 acres in the action area, 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. These areas would be rezoned from the Natural Environment, Special Use, and Deferred Acquisition zone and the Natural Landscape Management zone to the new Ranchland zone. This zoning change is consistent with longstanding use patterns. These lands have been actively ranched before and after their acquisition by NPS and since the completion of the 1980 GMP. In total, 28,100 acres would be allocated to the Ranchland zone; however, not all 28,100 acres would be under lease/permit.

The Scenic Landscape zone would apply to 600 acres that are in the action area but not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd. These lands had been zoned as part of the Pastoral Lands zone in the 1980 GMP.

Beef and dairy cattle operations would continue to operate in the Ranchland zone as described in the "Ranching Overview" section in chapter 2 of the EIS. NPS would issue lease/permits with up to 20-year terms to the existing families to continue ranching operations on approximately 26,100 acres (see figure 8 in appendix A of the EIS). Each ranch would be managed pursuant to an agricultural lease/permit and associated ranch operating agreement (ROA), which would be an exhibit to the lease/permit. The ROA would identify ranch-specific operational details and requirements associated with (1) beef or dairy ranching (as applicable); (2) authorized diversification activities; and (3) maintenance requirements.

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. Elements specific to the proposed action are described below.

3.2.2 Preservation of Area Resources

GMPs are required to articulate measures for the preservation of an area's resources. Table 3-1 outlines the detailed management strategies that NPS would adopt to achieve the desired conditions related to the preservation of park resources in the action area. For each desired condition, the table outlines management strategies that NPS would adopt for: all lands in the action area; additional management strategies taken on lands in the Ranchland zone; and additional management strategies taken on lands in the Scenic Landscape zone. Some of these strategies could require further 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 action area. Only those desired conditions that have implications for species and habitats included in this BA are described.

TABLE 3-1: STRATEGIES FOR THE PRESERVATION OF AREA RESOURCES

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
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, and 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 on ecological functions.	Range, Pasture, and Ranch Core subzone* ▪ Incorporate applicable US Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Practice Standards and mitigation measures from appendix F 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. ○ Monitoring data would facilitate adaptive management to protect valued resources. ▪ Incorporate management actions that promote habitat heterogeneity, connectivity, and species that are considered ecosystem engineers into individual ROAs as appropriate. Resource Protection subzone* ▪ Identify disturbance regimes that may need to be maintained by management. ○ Targeted Grazing could be used to maintain rare and endangered habitat and species. ○ May require increased effort in management, early detection, and additional IPM strategies. *For definitions of subzones, please see “Subzoning Framework” section, below.	▪ 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. ○ Use Targeted Grazing to maintain rare and endangered habitat and species. Future implementation planning may be needed to determine specific locations. ▪ Increase effort in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.
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 action area. Use monitoring data to target areas for improvement. Implement practices to reduce impacts on 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. ○ Reduce and shield artificial light sources to protect natural night skies and minimize human-caused intrusions to natural soundscapes. ○ Locate and design visitor use improvements to minimize contributions to air, water, and noise pollution. ○ Monitor and minimize noise/unnatural sounds that adversely affect action area resources or values or visitors’ enjoyment of them. ○ 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 action area.	▪ Incorporate USEPA, state, and Regional Water Quality Control Board requirements into individual ROAs, including implementation of water quality improvement practices, monitoring, Manure and Nutrient Management, and grazing management. Regulations include total maximum daily loads and associated grazing waivers in the Tomales Bay watershed, as well as waste discharge requirements or waivers of discharge requirements for confined animal facilities. ▪ Evaluate lighting on all ranch buildings and noise from farm machinery and equipment to determine best practices and incorporate relevant mitigation measures from appendix F 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. ○ Monitoring data would facilitate adaptive management to protect valued resources. ○ RDM monitoring would be used to ensure the vegetation cover necessary to minimize soil erosion. ▪ Continue to seek funding and partnerships to implement water quality improvement projects on grazing lands.	▪ Prioritize implementation of water quality improvement practices, water monitoring, and restoration to mitigate for ongoing water quality impacts associated with historical ranch operations.

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
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 action 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 using 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.	Range, Pasture, and Ranch Core subzone* ▪ 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. Resource Protection subzone* ▪ Implement management actions such as Targeted Grazing, which benefit species in the absence of grazing. **For definitions of subzones, please see “Subzoning Framework” section, below.	▪ Implement management actions such as Targeted 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. ▪ Maintain a viable population of free-ranging tule elk in Point Reyes. 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.	▪ Identify disturbance regimes that may need to be maintained by management. ▪ Implement management actions such as Targeted Grazing and stock pond maintenance, which benefit species in the absence of ranching. ▪ Increase efforts in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
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.		
▪ Use Early Detection and Rapid Response to prevent introductions of non-native species. Monitoring by ranchers, NPS staff, partners, and volunteers 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. ▪ Use 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 action area.	▪ Ranchers and their employees would comply with individual ROAs to prevent accidental introductions and manage non-native species of concern.	▪ Increase efforts in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.

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3.2.3 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 action 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. The approaches identified in this section are applicable to both the Ranchland zone and the Scenic Landscape zone. Adopting these strategies and actions would amend the 1980 GMP by providing revised guidance and management direction for visitor use for the action area.

Many of the specific strategies and project recommendations described below would be accomplished over time and would be subject to available funding. Development proposals, including but not limited to, new trail connections and parking improvements would occur over the next 20 years and would require additional site-specific review and compliance, including NEPA and NHPA compliance and cost estimates before project implementation could occur.

3.2.3.1 Development of Trails and Trail-Based Recreation

NPS would strive to improve hiking, biking, and equestrian access in the action area through enhanced trail connections. Lands in the action 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 action area would be on expanding access for multi-use trails. Trail-based recreation opportunities offering more solitude exist outside the action area in wilderness areas of the park. However, individual trails in the action area could 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 and on methods to ensure minimal disruption to ranch operations (e.g., self-closing or spring-loaded swing gates with simple signage that would help ensure that gates are closed once people pass through). NPS would 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 action 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 explore opportunities to facilitate larger, regional trail connections to the action area from outside the park and improve trail connectivity for pedestrians, equestrians, and bicyclists. Examples of opportunities include connecting the Cross Marin Trail to routes through the park.

Appendix H of the EIS: 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).

3.2.3.2 Development to Support Day Use and Overnight Accommodations

NPS would look for opportunities to expand day use and overnight accommodations in the action area, with a focus on previously developed areas, such as former ranch complexes, and would prioritize the adaptive use of historic buildings to support these uses 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. Potential day use and overnight opportunities that NPS would consider in the action 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 and hike-in camping sites with limited services and amenities
- 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)
- 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 use at the RCA Receiving Station

3.2.3.3 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 action area and would collaborate with ranchers and other park partners, such as Point Reyes National Seashore Association or park concessioners, on interpretive messaging, programs, and other techniques to share the story of multi-generational ranching in the park. As ranch operations diversify and engage in additional public serving activities, NPS would collaborate with ranchers to identify opportunities to integrate interpretive and educational messaging and programming. Selected waysides could 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 consider establishing a trailhead on Sir Francis Drake Boulevard and use of 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.

3.2.3.4 Development Related to Shuttles and Parking

NPS would continue to maintain the existing basic transportation network in the action area. No new roads or significant changes to circulation patterns are envisioned. Marin County and the State of California would continue to serve as leads for roads within their respective jurisdictions in the action area. NPS would continue to work with Marin County on maintenance and improvements for Pierce Point Road and Sir Francis Drake Boulevard and would similarly work with the State of California for State Route 1.

NPS may continue to use shuttle or other operational strategies to manage traffic and crowding issues at various locations in the park and 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.

3.2.4 Ranch Operations

3.2.4.1 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 28,100-acre Ranchland zone that would define the Resource Protection, Range, Pasture, and Ranch Core subzones. This subzoning framework was developed based on analysis of topography and existing sensitive resource information. By implementing a subzoning framework, NPS can better ensure resource protection by identifying the most appropriate locations for ranch activities. Appendix J of the EIS provides the methods used to develop the initial estimates for each subzone. The area of each subzone would differ by ranch, based on site topography and the presence of wetlands, rare plants, and other sensitive resources. Ranch-specific subzoning maps are provided in figures 9 through 32 in appendix A of the EIS. NPS may make technical revisions to the zone maps based on additional monitoring, surveys, or on-the-ground field verification efforts (see appendix J of the EIS). These maps would also continue to be refined in collaboration with ranchers, including delineating the clear boundary of each Ranch Core subzone. Section 3.2.4.5 identifies specific diversification activities that would be authorized in the Pasture and Ranch Core subzones.

Resource Protection Subzone. The Resource Protection subzone includes lands containing sensitive resources, such as creeks and riparian areas, some threatened and endangered species habitat, and archeological sites. No ranching activities would be authorized in this subzone; however, limited Management Activities, including Targeted Grazing, may be authorized to meet NPS resource management goals and objectives. Under the proposed action, the Resource Protection subzone would encompass approximately 2,000 acres comprising approximately 800 acres within current lease/permit boundaries but already excluded from ranching and an additional 1,200 acres that would be excluded from ranching.

Range Subzone. The Range subzone is identified as lands where grazing is compatible with resource protection objectives, but more intensive activities would not be allowed because of the documented presence of sensitive resources, including rare plants, native grasslands, wetlands, riparian/stream/pond habitats, forested areas, and threatened and endangered species habitat or habitat necessary for critical components of threatened and endangered species' life cycles. 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 Mowing 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 areas 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. Existing levels of Manure and Nutrient Management on dairies (approximately 2,500 acres) and Forage Production (approximately 1,000 acres) would be authorized in the Pasture subzone. Under the proposed action, some diversification activities would be authorized in the Pasture subzone as described in the section 3.2.4.5, below. Generally, construction of permanent buildings would not be authorized in the Pasture subzone.

Ranch Core Subzone. The Ranch Core subzone includes the developed complex of buildings and structures and up to 2.5 acres of disturbed lands located immediately adjacent to the developed complex that do not contain or have the potential to affect sensitive resources. The 2.5 acres would be sited in the most appropriate location on each eligible ranch to minimize adverse impacts. Diversification activities and new infrastructure could be authorized in this subzone on the 18 residentially occupied ranch complexes that are identified in figure 8 in appendix A of the EIS. Geographic constraints could limit Ranch Core subzone activities on individual ranches. Approximately 220 acres (less than 1%) of the area under lease/permit would be identified as Ranch Core subzone. The exact location of the Ranch Core subzone would be defined in each ROA.

3.2.4.2 Agricultural Lease/Special Use Permits

NPS would issue agricultural lease/permits with up to 20-year terms to continue multi-generational ranching operations on approximately 26,100 acres. When the two remaining life estates expire, other members of the immediate family would be offered a 20-year lease/permit, consistent with other ranches in the action area. 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 ranching operations.

Ranch Operating Agreements. The lease/permit would require each rancher to enter into an ROA to continue ranching. The ROA would identify ranch-specific operational details and requirements associated with (1) beef or dairy ranching (as applicable), (2) authorized diversification activities, and (3) maintenance requirements. The ROA would also identify Natural Resources Conservation Service (NRCS) Practice Standards and mitigation measures that apply to authorized Management Activities (see appendix F of the EIS). Maps identifying the subzones within each ranch would be attached to the ROA to guide the location of the authorized activities. ROAs would be developed with each rancher and reviewed during an annual meeting with NPS staff. If no changes are made, the existing ROA would be recertified for the following year of the lease term. If NPS approves changes to operational practices or requirements, the ROA would be revised accordingly (subject to applicable compliance as described below) and signed by both parties.

Because the EIS analyzes some ranch Management Activities at a detailed level and others at a conceptual level, only actions analyzed in detail in the EIS would be authorized in a ranch's initial ROA. For future years of their lease term, ranchers could submit proposals to conduct activities analyzed conceptually in the EIS. Such proposals would be subject to additional review and compliance. Depending on the proposal, other types of compliance and permitting requirements could also apply (e.g., NHPA, ESA, building permits, San Francisco Bay Regional Water Quality Control Board [San Francisco Bay RWQCB permits]). If approved by NPS following the conclusion of all compliance and permitting processes, the proposed Management Activity would be included in a revised ROA for the ranch.

Animal Units. Each ranch would continue to have a maximum number of AU or dairy animals allowed to graze at one time. AU or dairy animals allowed under a lease/permit would continue to be managed to meet the 1,200 pounds per acre RDM standard and other NPS management objectives. NPS would determine annual adjustments to AU or dairy animals based on the use of a rangeland forage production model (see appendix K of the EIS), monitoring data, NPS range program manager and rancher expertise, historical information, US Department of Agriculture (USDA) guidelines, and variation in ground conditions and weather/climate. All dairy ranch lease/permits would be permitted based on the number of dairy animals. Annually, NPS and ranchers would review performance measures, including RDM, to identify grazing levels that would ensure site conditions are maintained to meet the minimum RDM standard. RDM performance standards would remain as described for alternative A. Under the proposed action approximately 2,400 AU of beef cattle and 3,115 dairy animals would be authorized, reflective of current reported dairy operations.

Ranch operators would be authorized to have a limited number of livestock and conduct other activities common within a typical ranch complex (e.g., small family garden, non-breeding pigs, horses for personal use) as an accessory use and defined in the ROA as long as the intent is not for commercial or diversification purposes. The type of livestock that would be allowed for this purpose would be consistent with those authorized in the EIS. If located in the Pasture subzone, the animal unit equivalent (AUE) of these animals would be part of the overall AU, not in addition to the authorized AU. Any confinement of these species would be required to meet the San Francisco Bay RWQCB regulations for waste management and any other applicable regulations.

Succession. In the event an existing rancher decides to discontinue ranching, NPS would follow the Succession Policy to determine future use of the ranch.

3.2.4.3 Range Management and Monitoring

NPS manages ranching in the action 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, applicable regulations, and other best available science. In addition, NPS contracted with the UC Berkeley Range Ecology Lab to review existing ranch management practices and make recommendations that NPS could consider as part of this planning process. Collectively, these guidelines set forth standards and 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.

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 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 representative 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. RDM monitoring is conducted annually. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review and update the RDM monitoring program. The UC report (Bartolome et al. 2015) examined 25 years of RDM monitoring data and concluded that the minimum 1,200 pounds/acre standard remains appropriate based on the RDM guidelines developed by UC researchers for coastal

prairie (Bartolome et al. 2006), but the report also noted that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. Bartolome et al. (2015) also recommended expanded use of visual RDM mapping across pastures to better inform overall management of the ranched lands. Updated monitoring protocols based on the UC Berkeley Range Ecology Lab review have been in place since 2015. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available in appendix E of the EIS.

In addition to RDM, 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 2019c) evaluates this data set. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review. NPS has also established forage productivity plots on a subset of ranches that are monitored in spring to aid in determination of stocking rates.

Other range management activities include planning, implementation, and monitoring to improve resource conditions, protect water quality, and maintain infrastructure integral to ranch operations. To date, more than 170 activities to improve resource conditions have been implemented in the action area in partnership with USDA-Natural Resources Conservation Service (USDA-NRCS), San Francisco Bay RWQCB, the Marin Resource Conservation District, ranch operators, and others (figure 4 in appendix A). These activities have been implemented on a case-by-case basis with some variations in required mitigation measures and BMPs. A majority of the activity types implemented are described in detail in appendix F of the EIS.

Regular monitoring of ranches is conducted to ensure compliance with lease/permit conditions and regulatory requirements, and to assess changes that may affect resource conditions (e.g., early detection of invasive species, identification of new areas of erosion). Periodic monitoring is also conducted in association with the implementation of projects, restoration activities, or other requirements. Types of monitoring include water quality, vegetation (including rare plants and invasive species), riparian condition, and infrastructure condition. Riparian restoration and invasive species management are also performed on a routine basis.

Under the proposed action NPS authorization would continue to be required before ranchers implement any range improvements beyond routine maintenance. Typical activities include changes to cattle management infrastructure (e.g., fencing, watering systems, roads), erosion control measures, and land treatments to manage vegetation. Types of Management Activities are described in more detail below. Many of these activities also require regulatory review by other agencies, including the San Francisco Bay RWQCB, US Army Corps of Engineers, USFWS, NMFS, and the California Coastal Commission. They may also require consultation with the State Historic Preservation Officer and the Federated Indians of Graton Rancheria. Regulatory review would be conducted as needed. NPS currently manages compliance and permit coordination for authorization of an average of 9 ranch activities per year (actual numbers have ranged anywhere from 1 to 24 activities in a given year). NPS would also work with the San Francisco Bay RWQCB to ensure ranches in the Tomales Bay watershed meet all applicable requirements.

The expectations and requirements for authorized range Management Activities would be incorporated into each ROA and updated and revised as new information becomes available. Additional monitoring requirements specific to authorized activities would also be included in each ROA.

3.2.4.4 Management Activities and Practice Standards

The EIS groups common ranch Management Activities into Activity Types. Activity Types are organized into three broad categories throughout the document: Ranch Infrastructure and Water Control Management, Vegetation Management, and Other Management Activities. Review and compliance of all Management Activities are conducted on a case-by-case basis. Reviews are typically linked to a specific proposal or funded project, which can include more than one Management Activity.

Ranchers seeking to undertake a Management Activity would submit a proposal to NPS that would be discussed as part of the ROA process. For authorized Management Activities, the ROA would require ranchers to adhere to the established USDA-NRCS Practice Standards for that activity. These Practice Standards are technical guidelines for the conservation of soil, water, air, and related plant and animal resources and are described beginning on page F-9 of appendix F of the EIS. In addition to Practice Standards, specific mitigation measures were developed to avoid or minimize impacts from all ranch Management Activities and are mandatory unless otherwise noted in an ROA. These mitigation measures are listed in tables F-11 through F-13 of appendix F of the EIS where they are cross-referenced with their associated Practice Standards.

In addition to the established guidance from USDA-NRCS, appendix F of the EIS incorporates mitigation measures and standards from other environmental compliance documents, such as the Marin Resource Conservation District Permit Coordination Program (which was established to streamline permitting for many of the activity types listed herein), previous NEPA compliance reviews for park-specific projects, and previous biological opinions (BOs) from USFWS and NMFS. The Management Activities, Practice Standards, and mitigation measures described in appendix F and analyzed in the EIS were developed to ensure protection of natural and cultural resources and streamline the compliance review for common ranch management activities.

No additional NEPA analysis would be required as long as a covered Management Activity authorized in an ROA is conducted in accordance with all applicable Practice Standards, size limitations and mitigation measures. Some activities may nevertheless still require additional permitting and review by other agencies before incorporation into an ROA.

Practice Standards and mitigation measures may be revised in the future as new information becomes available that would result in better protection of park resources or as a result of changes in law, policy, or regulatory agencies' standards.

A general description of Management Activities is provided below, and additional detail is provided in appendix F of the EIS. The analysis assumes a total number of individual projects that would occur over the 20-year lease/permit term as well as in any given year, when applicable.

Ranch Infrastructure and Water Control Management. Ranch Infrastructure and Water Control Management Activities, including Road Upgrade and Decommissioning, Infrastructure Improvements, Fencing, Livestock Water Supply, Pond Restoration, Waterway Stabilization, and Stream Crossing are part of the regular management and maintenance of ranch operations. 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.

Road Upgrade and Decommissioning. The purpose of Road Upgrade and Decommissioning 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 several Road Upgrade and Decommissioning activities in the action area; however, a number of roads still have erosion issues and/or are no longer actively used or maintained. NPS assumes 20 Access Road projects, up to 10 Trail and Walkways, 40 Structures for Water Control, and 5 Road Closure and Treatment projects would be implemented over the 20-year lease/permit term. NPS anticipates up to 3 Road Update and Decommissioning projects annually.

Infrastructure Improvements. The purpose of these activities is to protect areas that are heavily used by ranch operations to (1) prevent erosion or degradation of critical infrastructure, (2) separate clean runoff from potential pollutant sources, and (3) 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 high-intensity-use areas such as corrals in the ranch complex to direct clean rainwater away from these areas. NPS assumes 10 Roof and Covers projects would be implemented over the 20-year lease/permit term, with additional roof runoff structures developed as needed, associated with all buildings. Heavy use area protections are a regular practice associated with troughs and feeding areas, as well as corrals and heavily travelled lanes in the ranch complex.

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

Fencing. The purpose of this activity is to help accomplish management goals and objectives by controlling the movement of animals, people, and 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 action area include barbed wire livestock fencing, electric fencing, and rail fencing. Removal of abandoned fencing would continue to occur on ranchlands. New fencing would require wildlife-friendly designs. NPS would require the removal of abandoned fence on ranchlands to address wildlife and visitor safety. Construction of temporary fencing (i.e., electric fencing) would be authorized following NPS approval. NPS assumes approximately 20% of the 340 miles of existing fencing would be replaced, 24 miles of fence would be installed for the Resource Protection subzone, and an additional 35 miles of new fence would be constructed to improve livestock management over the 20-year lease/permit term. NPS anticipates up to 5 Fencing projects annually.

Livestock Water Supply. The purpose of developing alternative water sources is to help address potential impacts of unrestricted livestock access to streams and wetlands and to provide cleaner, more reliable, and well-distributed drinking water to animals. 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. Troughs would require wildlife escape ramps. Redevelopment of existing water sources and associated distribution infrastructure would be authorized following NPS review and approval. Establishment of new water sources (e.g., new wells) would require separate environmental review. NPS assumes up to 25 Spring Developments, 40 Livestock Pipelines, 30 Watering Facilities, and 24 Pumping Plants would be authorized over the 20-year lease/permit term.

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 accumulated silt to restore a pond's original storage capacity. This activity does not include new instream ponds or activities that would increase the original storage capacity of a pond. NPS has worked with ranchers in the action area to maintain functioning stock ponds and the habitat they provide for wildlife such as the California red-legged frog (*Rana aurora draytonii*). NPS assumes up to 25 Pond Restoration projects would occur over the 20-year lease/permit term.

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 action area in coordination with ranchers to prevent erosion and protect resources. NPS assumes up to 40 Grade Stabilization Structure (headcut repair) and 20 Lined Waterway projects (drainage ditch stabilization) would occur over the 20-year lease/permit term. NPS anticipates up to 4 Waterway Stabilization projects annually.

Stream Crossing. 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). Sites would be evaluated to determine if a Stream Crossing is necessary and to account for habitat requirements for wildlife species present. Work could include modifications to, or removal of existing crossings. Many Stream Crossings in the action 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. NPS assumes up to 16 Stream Crossing projects would occur over the 20-year lease/permit term. NPS anticipates up to 3 Stream Crossing projects annually.

Vegetation Management. Vegetation Management activities described below could be implemented after inclusion in a rancher's approved ROA.

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 would be limited to hand broadcast and no-till seed drill using an NPS approved seed mix in the Pasture and Ranch Core subzones. Seeding would also continue to be authorized for Forage Production on 1,000 acres (see below). Seedbed preparation would be conducted in the fall before germinating rains and would continue to follow an approved USDA-NRCS or NPS compliance plan. Requests for aeration would only be allowed if a need is demonstrated (e.g., via soil test). NPS assumes up to 40 Critical Area Planting projects, 50 Riparian Forest Buffers, and up to 24 Windbreak/Shelterbelt Establishments would occur over the 20-year lease/permit term. Range planting would be evaluated on a site-specific basis in the Range subzone.

Mowing. 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 of the EIS). 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. Ranchers would continue to request prior approval and receive written authorization from NPS to conduct Mowing, except for mowing non-native thistles, which is currently authorized in lease/permits. NPS has approved shrub mowing in specific cases, but it is generally only conducted for fence or infrastructure maintenance activities. Mowing undesirable species as a form of weed treatment would be authorized in the Pasture and Ranch Core subzones once reviewed by NPS. There would be no limit to the amount of Mowing, but Mowing would be approved on an individual basis and incorporated into ROAs. Between 4 to 8 Brush Management and Herbaceous Weed Treatment requests are anticipated annually.

Brush Management would generally be considered in the Pasture and Ranch Core subzones. NPS would consider proposals for Brush Management in the Range subzone under limited circumstances. Brush Management authorizations in any subzone would be conducted outside the bird nesting season. If authorization for Brush Management were granted, ranchers would be responsible for maintenance of desired conditions for the treated area.

Integrated Pest Management. IPM is a decision-making process that coordinates knowledge of pest biology, the environment, and cost-effective available technology to prevent unacceptable levels of pest damage while posing the least possible risk to people, resources, and the environment. IPM is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies.

NPS addresses pest issues on a case-by-case basis following an IPM policy that helps determine the combination of procedures that are most effective for each pest situation. The decision to incorporate a chemical, biological, or bioengineered pesticide into a management strategy is based on a determination that a product is necessary, and other available options are either not acceptable or not feasible.

The park's IPM Coordinator reviews proposals for the use of a pesticide, herbicide, biological control agent, or genetically modified organism (also known as Pesticide Use Proposals) on a case-by-case basis considering site-specific conditions. In the case of ranching operations in the action area, requests have been made to NPS to treat non-native, invasive weeds with herbicide. NPS must approve a Pesticide Use Proposal before a product can be purchased or applied. Under NPS policy, pesticide applications can only be performed by or under the supervision of a certified or registered applicator who is licensed under the procedures of a federal or state certification system. All pesticide applications would continue to be reported to NPS annually.

IPM related to Vegetation Management would be authorized in the Pasture and Ranch Core subzones as appropriate. Site-specific management for weed treatments would also be allowed in the Range subzone, depending on rancher requests, park vegetation management goals, and extent of infestation. Manual removal of invasive vegetation would also be considered, where appropriate, in areas where listed species are present. IPM is ongoing and would continue annually based on presence of species and site-specific evaluation.

Targeted Grazing. Targeted Grazing prescriptions optimize the timing, frequency, intensity, and selectivity of grazing (or browsing) in combinations that purposely exert grazing/browsing pressure on specific plant species or portions of the landscape. Targeted Grazing differs from traditional grazing management in that the goal of Targeted Grazing is to apply defoliation or trampling to achieve specific resource management objectives, whereas the goal of traditional livestock grazing management is generally the production of livestock commodities (Bailey et al. 2019).

Targeted 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 Targeted Grazing to maintain and enhance rare plant species populations, ensure adequate vegetative cover in riparian areas, and control weeds. Targeted Grazing would be authorized as necessary to meet NPS management goals and objectives.

Other Management Activities. The following types of Other Management Activities, completed in accordance with the associated Practice Standards and mitigation measures identified in appendix F of the EIS, could be implemented after inclusion in a rancher's approved ROA. Forage Production and Manure and Nutrient Management activities would only be applicable on ranches where these activities are currently authorized.

Manure and Nutrient Management. The purpose of Manure and Nutrient Management is to protect water and air quality and to improve soil conditions. These activities apply specifically to dairies because they are required under San Francisco Bay RWQCB regulations to manage waste generated from operations. 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. 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 22560–22565 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 the proposed action, dairies would continue to produce large quantities of manure waste that ranchers would be required to manage consistent with state and federal regulations to avoid impacts on water quality and sensitive resources. Application of animal manure and compost generated in the action area would be allowed on up to six dairies annually with an approved nutrient management plan and would remain at a level consistent with existing conditions (approximately 2,500 acres, including approximately 715 acres of dairy Forage Production areas, with some pastures not treated every year). Spreading of compost would be restricted to the Pasture and Ranch Core subzones of operations that have generated it on site. Compost would only be spread on the ranch where it originated. Application of commercially produced compost and fertilizer would not be authorized. Waste transfer projects are assumed at up to 12 projects annually.

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. Forage Production includes harvest mowing to produce silage, haylage, or hay. Silage is cut earlier in the season than haylage and is wetter; hay is drier and cut later 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.

Approximately 1,000 acres on four ranches (two beef and two dairy) are currently authorized for Forage Production under lease/permits (see table 1 of the EIS). Under the proposed action, Forage Production would continue, consistent with lease/permit language updated as necessary to reflect current USDA-NRCS Conservation Practices or other site-specific considerations under an approved plan. Forage Production would be authorized in the Pasture subzone. Should ranchers discontinue Forage Production in permitted areas, those acres would be returned to grazing, and the total acreage of Forage Production in the action area would be reduced. Forage and Biomass Planting, Forage Harvest Management, and Residue and Millage management would occur on up to 1,000 acres annually where authorized.

3.2.4.5 Diversification

New diversification activities could be allowed in specified subzones with the use of required mitigation measures specific to each activity (see appendix F of the EIS, table F-14). Diversification of ranching activities could include new types of livestock, crops, horse boarding, ranch tours and farm stays, and small-scale processing and sale of dairy, meat, and agricultural products produced in the action area. Diversification activities listed in table 3-2 would not require additional NEPA compliance provided they are consistent with the prescribed size and location and use all relevant mitigation measures described in appendix F of the EIS. Proposals for other types of diversification activities would be subject to additional review and compliance. Ranchers would be required to submit a detailed proposal in writing to NPS for review and consideration. All diversification activities would be required to be incorporated into the individual ROA prior to implementation.

Existing diversification activities on ranches would need to conform to the guidance under the proposed action (e.g., scale, location, and applicable mitigation measures). Ranchers would not be allowed to harm or harass wildlife or predators to protect crops or livestock. Livestock guardian animals (i.e., dogs, llamas, donkeys) would be allowed with the use of established mitigation measures and a requirement to report any wildlife and visitor conflicts to NPS (see appendix F of the EIS, table F-14).

Diversification activities would only be authorized on the 18 ranches with a ranch complex. The six grazing-only operations that do not include a developed complex or authorized residential use of buildings would not be authorized to conduct diversification activities (F Ranch, Martinelli Ranch, Genazzi Ranch, E Gallagher Ranch, McFadden Ranch, and C. Rogers Ranch).

Ranch Core Subzone. In addition to cattle, livestock species that are analyzed in detail in the EIS and could be allowed in the Ranch Core subzone include chickens, sheep, and goats, as described in table 3-2. Any confinement of these species would be required to meet the San Francisco Bay RWQCB regulations for confined animal facilities and any other applicable regulations.

Up to 2.5 acres of crops could be allowed in the Ranch Core subzone. NPS, together with the rancher, would identify the most appropriate location in the Ranch Core subzone to minimize adverse impacts. Ranchers would be allowed to fence the 2.5 acres of crops to exclude wildlife. Crops that have the potential to escape or become invasive (e.g., fennel) would not be authorized.

NPS would consider farm stays and ranch tours that are limited to adaptive use of existing structures and in compliance with applicable codes. Ranch tours could originate in the Ranch Core subzone but could occur in all subzones.

Ranch-specific proposals for small-scale processing of products produced in the action area, additional animals (e.g., species consistent with the EIS), horse boarding, and irrigated crops in the Ranch Core subzone would be considered on a case-by-case basis and would require additional environmental review. Although NPS would not consider proposals for species dismissed in the EIS (ducks, geese, turkeys, and rabbits), other species not analyzed in the EIS would be considered on a case-by-case basis and would require additional review and compliance. In addition, proposals that exceed the limits for sheep, goats, and chickens in table 3-2 would also be considered on a case-by-case basis and would require additional review and compliance. Ranchers would be required to submit detailed proposals to NPS and document that resources (e.g., water) are available to support new operational requirements prior to NPS conducting additional review and compliance.

Pasture Subzone. Sheep, goats, and chickens are analyzed in detail in the EIS and could be allowed in the Pasture subzone, as described in table 3-2. Pasture diversification activities should be located in the vicinity of the occupied Ranch Core subzone on authorized ranches. Construction of permanent infrastructure associated with diversification activities would not be allowed in the Pasture subzone; however, temporary electric fencing would be approved.

TABLE 3-2: DIVERSIFICATION ACTIVITIES

Activity	Size/Scale[a]	Subzones Where Authorized[b]
Chickens	▪ Up to 500 chickens with up to 3 associated mobile huts. ▪ Huts would be of a limited height and in a color that minimizes visual impacts on the landscape and would be moved regularly.	▪ Ranch Core and Pasture
Sheep or Goats	▪ Up to 50 sheep or up to 66 goats (10% of authorized AU or not to exceed 10 AU if authorized AU is greater than 100).[c] ▪ This allocation is part of permitted AU, not in addition. Cattle AU would be reduced to accommodate sheep and goats.	▪ Ranch Core and Pasture
Crops	▪ Up to 2.5 acres, not requiring irrigation.[d]	▪ Ranch Core
Farm stays/ Ranch tours[e]	▪ Limited to adaptive use of existing structures.	▪ Ranch Core[e]

[a] All activities must follow applicable mitigation measures provided in appendix F.

[b] Diversification activities are only authorized on the 18 ranches with a developed complex.

[c] For grazing purposes, sheep and goats have AU equivalents of 0.2 and 0.15 AU, respectively (USDA-NRCS 2006a).

[d] Consistent with the agricultural lease/permit, ranchers are not allowed to establish new water rights, but NPS would recognize valid existing water rights.

[e] Ranch tours are anticipated to originate in the Ranch Core subzone but could occur on Ranch Core, Pasture, and Range subzones.

3.2.4.6 Ranch Complexes

Ranchers would continue to use residential units, barns, and other structures. Occupancy of residential units in the 18 developed complexes would be limited to family members of lease/permit holders, employees of that ranch (and their family), and, with NPS approval, employees of other park ranches. As a condition of the lease/permit, all ranch worker housing would be maintained in a safe and sanitary condition to ensure the health and well-being of occupants.

Use of Ranch Complexes. NPS and its partners would strive to preserve and maintain the significant physical attributes or character-defining features that contribute to the integrity of the historic districts in the action 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 collaborate with the ranchers to preserve the ranch complexes in the action area (by including maintenance and upkeep requirements in the ROAs), which could include support from the Point Reyes Historic Preservation Crew, and other NPS stewardship and preservation programs. Appendix G of the EIS provides a list of preservation and maintenance guidelines for ranch buildings under lease/permit. Adaptive use 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 review and approve all proposed new uses and associated modifications to ranch complexes and structures to ensure conformance with the EIS and the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Maintenance. Maintenance is an important ongoing activity that would continue to be accomplished in collaboration between NPS and ranchers. Ranchers would continue to maintain ranch complex infrastructure, including all water, sewer, and electrical systems, as well as most ranch service roads in a safe condition, using Practice Standards and mitigation measures that limit impacts on sensitive resources; no new roads or trails would be established without prior written permission from NPS.

Maintenance activities that are not analyzed in the EIS would require additional environmental review. Maintenance on ranch buildings would be a requirement for ranchers and would occur annually.

The overall condition of historic structures is poor to fair (see EIS "Chapter 3: Cultural Landscapes, Historic Districts, and Historic Structures"). A substantial level of investment is needed to address the deferred maintenance needs on many of these structures and to bring them up to a maintainable state. Completion of these one-time investments would then make it easier for ranchers to fulfill ongoing maintenance needs for these facilities.

New Development/Infrastructure Improvements and Alterations. The proposed action allows for improvements and alterations of existing structures, upgrades to worker housing, and new development and infrastructure in compliance with the subzoning framework of this alternative. All such work would be the responsibility of the rancher at their own cost, would require prior written approval from NPS through the ROA process, and would be done in accordance with applicable laws. All worker housing would comply with local building codes and safety standards. New development would require site-specific review and compliance once a detailed proposal is submitted to NPS. Approved projects would be authorized in an individual ROA. Except in very limited circumstances, development of new structures and minor additions would only be considered in the Ranch Core subzone.

3.2.5 Elk Management

The management of free-ranging elk under the proposed action would allow elk in the Point Reyes portion of the action 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. A new herd would consist of a group of elk that split from either the Drakes Beach or Limantour herds to occupy a distinctly new home range and where the juveniles and adult females in the splinter group have limited interaction with, or do not return to, their herd of origin. Adult males may move between herds without constituting a new herd.

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. In the event of an unforeseen circumstance that causes the herds to completely move from long-established core use areas to other locations in the action area, NPS would reevaluate the impacts and management approaches set forth in this alternative as needed to ensure maintenance of a viable free-ranging elk population in Point Reyes, which may result in the need for further environmental review.

3.2.5.1 Population Level Management and Geographic Extent

NPS would actively manage the free-ranging elk herds in the Point Reyes portion of the action area. NPS would manage the herds to remain in Point Reyes, in coordination with the California Department of Fish and Wildlife (CDFW). At Tomales Point, NPS would continue to maintain the elk fence that serves as the northern boundary to the action area, and any elk that leave the reserve would be returned to the reserve. The elk at Tomales Point would continue to be managed as a fenced population in accordance with the 1998 Tule Elk Management Plan/EA.

No new herds would be allowed to establish on the areas under lease/permit in the action area. A graduated response would be taken to deter establishment of new herds. First, NPS staff would try to haze elk back to their original location. If unsuccessful, NPS would employ more aggressive hazing techniques such as firing bean bag shots at the elk. If hazing does not work, lethal removal of a few individuals, particularly the lead female if she can be identified, could be tried. As a last resort, NPS would move forward with complete elimination of the new herd through lethal removal.

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 and viable population level, consistent with desired conditions for the action area. 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 K of the EIS). 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, and no reproductively active females or bulls would be lethally removed during the calving and rut seasons. The population threshold is not anticipated to change unless there are long-term or permanent changes to existing conditions. In the event of such a change, NPS would revise the population threshold consistent with the goal to maintain a viable free-ranging elk population, which may result in the need for further environmental review. 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. CDFW's comment letter in response to the draft GMP Amendment, dated September 23, 2019, reads in part, "Translocation of elk out of PRNS [Point Reyes] is not a viable option for population management due to the potential for translocation of diseases, short and long-term costs, risk to staff or contractors, and risk to animals." 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 for population management 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 12 to 18 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.

Because the elk herd consisted of 138 animals in late 2019 and more calves will be born in spring 2020, initial implementation would require removing more than 18 elk. The total number of elk that would initially need to be removed to reach 120 would depend on the size of the herd at the time of implementation and may take more than one year depending on the resources available to conduct the removals. 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, 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 action area using the graduated response noted above. 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 consistent with desired conditions for the action area. While male elk would continue to be present on ranchlands, areas of high elk concentration would be monitored and managed in response to localized resource impacts. In these cases, the graduated management response described above would be implemented, including standard and aggressive hazing techniques and the potential for lethal removal of individual elk. NPS would not allow new female groups to become permanently established on lands under lease/permit in the action area. NPS would also take management actions if new Limantour female groups from the wilderness area begin spending considerable time on lands under lease/permit in the action area, particularly during the rut and calving seasons (figure 2 in appendix A of the EIS). Female groups would be hazed back to the wilderness area, and lethal removal may be needed to prevent the permanent establishment of new herds on lands under lease/permit in the action area.

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 tule elk in Point Reyes and to manage with minimal intrusion to regulate population size, where possible, as part of natural ecosystem processes.

3.3 Avoidance, Minimization, and Mitigation Measures

The 1990 *Range Management Guidelines* identify several management prescriptions that may be used to correct damage to rangeland resources stemming from livestock use, including reducing the number of livestock permitted, deferring grazing on seasonal vulnerable areas, excluding livestock from damaged or especially vulnerable areas, and removing invasive plants. The terms and conditions of grazing permits have been made more rigorous since adoption of the guidelines to reflect the goals stated there. Under the proposed action, NPS would implement Practice Standards and mitigation measures to protect and restore resources on ranches based on results of monitoring and other site-specific factors (see appendix F of the EIS). BMPs identified in the 1990 *Range Management Guidelines* would continue to be applicable under the proposed action.

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

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

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Projects in potential California red-legged frog habitat shall be designed to minimize disturbance to vegetation near or in permanent and seasonal pools of streams, marshes, ponds, or shorelines with extensive emergent or weedy vegetation.	All	California red-legged frog	All
Site-specific design plans shall show the maximum extent of grading and include requirements to protect sensitive natural and cultural resources during construction and maintenance activities, including erosion control measures.	All	California red-legged frog; California freshwater shrimp	
Use of heavy machinery shall be performed by experienced operators and heavy machinery shall: ▪ avoids steep slopes (20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ be kept at least 10 feet from any cliffs or steep banks ▪ only allowed based on daily fire danger rating ▪ avoid woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ avoid significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoid waterbodies and riparian zones unless specifically required and approved by NPS as critical to the project objective (e.g. Pond Restoration, Waterway Stabilization, Stream Crossing) ▪ avoids lands designated by USDA-NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	All	California red-legged frog; California freshwater shrimp; all federally listed plants	All

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

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Erosion control and sediment detention measures must be available on site at all times and in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water. Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway. When required by NPS or project regulators, NPS staff or a qualified designee shall inspect in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly.	All	California red-legged frog, California freshwater shrimp	All
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities (other than native vegetation planting or erosion control activities on disturbed sites without mechanized equipment) during the dry season, generally June 1 through October 31; exceptions may be made by the NPS in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by the NPS and project regulators.	All	California red-legged frog, California freshwater shrimp	All
Perform work in and around areas, including structures that may support bird nesting before March 15 or after July 31, unless vegetation height is less than 8 inches, or otherwise authorized by the NPS.	All	Western snowy plover	All
Conduct preconstruction breeding bird surveys for projects with construction activities occurring from March 15 through July 31 for special-status birds, migratory birds, and raptors (surveys for raptors would be required for work beginning as early as February 1). Conduct these preconstruction surveys in all locations identified by a qualified biologist. Conduct the surveys within three days two weeks prior to initiation of vegetation clearing, tree removal and trimming, or other construction activities. Note: the results of surveys will be reviewed by NPS prior to any work authorization. If nests are identified by the biologist, NPS will work with the project manager to identify appropriate avoidance measures and buffers. Determinations of the appropriate measures are be based on the nesting species, sensitivity, and listing status. If the biologist finds no active nesting or breeding activity, NPS may authorize work to begin.	All	Western snowy plover	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter. Exclusion fencing must be highly visible and installation overseen by the project biologist. Openings shall be restricted to areas of construction site access. Note: the purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats	Ranch Infrastructure and Water Control Management; Vegetation Management	All federally listed species	All
If suitable California red-legged frog breeding habitat is present, only conduct project activities between July 1 and October 15 to avoid impacts on breeding California red-legged frog or egg masses. If a project site occurs in potential California red-legged frog habitat, an NPS approved biologist must conduct a preconstruction survey of potential California red-legged frog habitat and immediately adjacent uplands with suitable vegetation cover that is potential habitat for the California red-legged frog no more than 48 hours before the start of construction activities. The biologist shall look for individual frogs, evaluate the likelihood of usage, and determine whether additional biological monitoring is needed during construction to ensure that individuals present are be removed or avoided. The biologist shall monitor initial ground-disturbing activities within 300 feet of California red-legged frog habitat and halt work activities that may adversely affect the California red-legged frog until it no longer occupies the project area. Note: relocation of California red-legged frog can be performed only by individuals, who are approved in advance by CDFW and USFWS.	Ranch Infrastructure and Water Control Management; Vegetation Management	California red-legged frog	All
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until August 1 and complete work by October 15. Note: work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from the NPS and project regulators. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams.	All	California freshwater shrimp	All
Reconnaissance-level surveys must be performed by a designated project biologist to determine whether suitable habitat for listed butterflies, including Myrtle's silverspot butterfly, is present in the project area. If larval host or nectar plants for listed butterflies are present and the target species is documented in the project vicinity, project work must be conducted with minimum soil compaction and disturbance, and with hand tools wherever possible.	All	Myrtle's silverspot butterfly	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Protect host plants for listed butterflies identified by the designated project biologist, including *Sedum spathulifolium* and *Viola adunca*, with a clearly demarcated 20-foot buffer zone.	All	Myrtle's silverspot butterfly	All
All pond restoration activities shall adhere to the following conditions: ▪ No new or enlarged ponds are authorized. ▪ No more than 3,000 cubic yards of fill shall be removed from a pond under any single project. ▪ Ensure that maintenance activities are conducted either when a pond has dried out completely, or during the driest period of the year in September or October (late August is an option if necessary, but not preferred). ▪ Ensure that no mowing occurs around ponds unless pre-approved by NPS. ▪ Avoid excavating below original pond depth. ▪ Provide sloping or benched sides with shallow areas and keeping deep areas at least a yard deep. ▪ Use spoils from the ponds to buttress the berm; otherwise, place excess soils in an NPS-identified area for stockpiling or spreading. ▪ Place excavated material on pond berm or on upland fields approved by NPS with <5% slope, >100 feet from wetlands, and spread to a height of 12 inches or less. ▪ Install a staff gage in the pond before construction begins to monitor water level. ▪ Maintain 10% to 35% cover if the pond has existing emergent vegetation.	Ranch Infrastructure and Water Control Management	California red-legged frog	All
In-stream crossings shall not be designed for placement within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 1,500 meters (4,921 feet) apart. Crossings in a non-fish bearing stream must be at least 100 feet apart.	All	California freshwater shrimp	All
Design culverts to minimize habitat fragmentation and barriers to aquatic movement. Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible. Culverts that require Section 401/404 permits shall be designed and stamped by a licensed engineer, geologist, landscape architect or a qualified NRCS engineer.	Vegetation Management	California freshwater shrimp	All

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
With the exception of silage harvest and management of certain weed species as approved by NPS, mowing shall be timed to minimize resource impacts: ▪ August 1–October 15 (or first autumn rains, whichever comes first) is preferred to avoid impacts to ground nesting birds and California red-legged frog. ▪ March 15–July 31 (bird nesting season) is limited to removal of vegetation less than 8 inches in height or can take place only if bird nesting surveys are completed.	Vegetation Management; Other Activities	California red-legged frog; Western snowy plover	All
Rotational mowing practices (i.e., early, late, or rested) must be followed to maintain grassland communities in various stages of growth and vegetative diversity, promoting nesting habitat for grassland birds. Do not mow at night due to the risk of higher wildlife mortality.	Vegetation Management; Other Activities	California red-legged frog; Western snowy plover	Pasture
Ensure that any use of herbicides conforms to relevant restrictions on use in and near potential habitat for protected amphibians or invertebrates. Consult with a PCA and/or NPS, and: ▪ address measures to minimize the use of high-persistence herbicides and the potential for leaching to surface and groundwater, especially in soil types with high leaching potential ▪ consider the use of herbicides specifically formulated and approved for use in water for application of herbicides to uplands that may have California red-legged frogs or other rare amphibians present ▪ consider the use of pollinator-protective strategies as described in NOAA Fisheries (2014), especially when considering broadcast applications and applications when pollinator host plants are flowering ▪ minimize the use herbicides or fertilizers in habitat that supports special-status butterflies and do not use herbicides in this habitat during Myrtle's silverspot butterfly flight season (June 15-early September)	Vegetation Management	California red-legged frog; California freshwater shrimp; Myrtle's silverspot butterfly	Ranch Core
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains. Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season.	Other Livestock, Horse Boarding, and Crop Diversification	California red-legged frog; California freshwater shrimp	Ranch Core

Mitigation Measure	Activity Types	Potentially Affected Species	Subzone
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands. Minimize the amount of water used by using sponges or hoses equipped with shut-off or low-flow nozzles; and the amount of soap used, especially soap with surfactants.	Other Livestock, Horse Boarding, and Crop Diversification	California red-legged frog; California freshwater shrimp	Ranch Core
As part of any crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate. Use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late fall and use certified weed-free straw if purchased from outside the park or from a different ranch. Incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin). Store harvested crops in enclosed structures (i.e., buildings, barrels, crates). If wildlife control is needed, only non-lethal management methods are permitted (i.e., scarecrows or decoys and control garden debris). Lethal control of wildlife is explicitly prohibited.	Other Livestock, Horse Boarding, and Crop Diversification	California red-legged frog; California freshwater shrimp	Ranch Core
Plant cover crop or cover soils with mulch and use at least 30% cover in fallow crop areas throughout the rainy season.	Other Livestock, Horse Boarding, and Crop Diversification	California red-legged frog; California freshwater shrimp	Ranch Core
For crop diversification, conclude tilling activities row crop areas, such as ripping, disking, or harrowing, before the first rains or November 1, whichever comes later	Other Livestock, Horse Boarding, and Crop Diversification	California red-legged frog; California freshwater shrimp	Ranch Core

4.0 ACTION AREA DESCRIPTION

The action area includes all lands currently leased for ranching in the park (i.e., Point Reyes and the north district of Golden Gate), as well as adjacent lands in Point Reyes where the Drakes Beach tule elk herd currently occurs (attachment A, figure 1). The park, located in western Marin County in central California, is a landscape ranging from dramatic headlands and expansive sand beaches to open grasslands, brushy hillsides, and forested ridges. It is approximately 30 miles northwest of San Francisco and within 50 miles of the nine-county San Francisco Bay Area, the fifth largest metropolitan area in the United States. The park is bounded to the north, west, and southwest by the Pacific Ocean and to the east by the residential communities of Inverness, Inverness Park, Point Reyes Station, Olema, and Dogtown. The town of Bolinas is south of the park at the southern tip of the peninsula. Western Marin County is primarily rural, with scattered, small, unincorporated towns that serve tourism, agriculture, and local residents. 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 approximately 86,000 acres.

The action area consists of gently rolling to hilly uplands with basement rocks that include the granitic spines of northern Inverness Ridge and Point Reyes proper and the broad sweep of marine sandstones and shales that lie between. Elevations range from the beaches at sea level to 600 feet on Inverness Ridge. Most of the rangeland lies between 100 and 200 feet. Slopes range from nearly level on the ridgetops and sandy flats to 50% on the steeper hillsides. Average hillslopes and drainage sides are about 40%.

Soils of the action area are described in detail in chapter 3 of the EIS, in the “Soils” section. Generally, rangeland soils are deep, productive, well-drained loams and sandy loams. However, many range soils are identified as having such limitations as susceptibility to compaction and slippage, seasonal high-water table, low available water capacity and a high erosion hazard. The loss of the soil surface layer results in a severe decrease in forage productivity. In steeper units, the slope restricts access by livestock and promotes increased grazing pressure on the less sloping areas.

Vegetation in the action area is characterized by approximately 60% grassland, 18% coastal scrub, 14% forest, with the remaining portion mostly composed of wetlands, coastal dunes, and riparian forests/shrublands. Most of the upland plateaus and ridgetops in Point Reyes were cleared of shrubs and patches of forest in the past to put the land into cultivation for various crops and hay or for improved livestock pasture. Chapter 3 of the EIS also provides further detail about the vegetation communities in the action area, in the “Vegetation, including Federally Listed Species” section.

The action area is surrounded by Drakes and Limantour Esteros and Abbotts Lagoon, which are among the last estuaries remaining in a mostly natural state along the California coast, and are considered to have high ecological importance as waterfowl habitat, as a nursery for numerous marine fish and invertebrate species and as a protected retreat for harbor seals. Abbotts Lagoon is ecologically important for migratory and resident waterfowl, shorebirds and other avian species. Olema and Lagunitas Creeks are the two major drainages within the action area and are important for anadromous fish. Numerous wetlands and riparian areas exist throughout the action area and are locally important for wildlife habitat. Many ranch units border on the Pacific Ocean beaches and one extends to Tomales Bay.

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

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

5.0 PRE-FIELD REVIEW OF LISTED SPECIES

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

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

5.1 Species Considered and Evaluated

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

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

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Baker's larkspur (*Delphinium bakeri*)	E	No	No	RANGE	Decomposed shale soils within moist coastal scrub
Beach layia (*Layia carnosa*)	E	Yes	No	--	Openings in sparsely vegetated, semi-stabilized coastal sand dunes and similar areas of recent wind erosion
Marin dwarf flax (*Hesperolinon congestum*)	T	Yes	No	--	Chaparral, valley and foothill grassland; in serpentine barrens and in serpentine grassland and chaparral; 60–370 meters
Robust spineflower (*Chorizanthe robusta var. robusta*)	E	No	No	TAX[c]	Sandy soils associated with active coastal dunes and inland sites with sandy soils
Showy Indian clover (*Trifolium amoenum*)	E	Yes	No	--	Valley and foothill grassland, coastal bluff scrub; sometimes on serpentine soil, open sunny sites
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	E	Yes	No	--	Freshwater marshes
Sonoma spineflower (*Chorizanthe valida*)	E	Yes	No	--	Coastal prairie
Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta)*	E	Yes	No	--	Serpentine grassland
Tidestrom's lupine (*Lupinus tidestromii*)	E	Yes	No	--	Coastal dune

TABLE 5-2: FEDERALLY LISTED THREATENED AND ENDANGERED AMPHIBIANS AND REPTILES UNDER THE JURISDICTION OF USFWS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
California red-legged frog (*Rana draytonii*)	T	Yes	Yes	--	Pools of slow-moving streams, perennial or ephemeral ponds, marshes, and moist cool upland habitat

TABLE 5-3: FEDERALLY LISTED THREATENED AND ENDANGERED BIRDS UNDER THE JURISDICTION OF USFWS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
California clapper rail (Ridgway's rail) (*Rallus longirostris obsoletus*)	E	No	No	HAB	Associated with abundant growths of pickleweed but feeds away from cover on invertebrates from mud-bottomed sloughs. Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay.
California least tern (*Sternula antillarum browni*)	E	No	No	HAB	Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas. Nests along the coast from San Francisco Bay south to northern Baja California.
Marbled murrelet (*Brachyramphus marmoratus*)	T	No	Yes	NE	Uses mature or old-growth forest near the coastline during summer, where it nests on large horizontal branches high up in large trees. Does not nest in the action area. Coastal birds that occur mainly near saltwater. Winters at sea.
Northern spotted owl (*Strix occidentalis caurina*)	T	Yes	No	NE	Nest in a dense section of old forest, well protected from open sky by a dense tree canopy. Mature forests with dense canopies and a complex array of vegetation types, sizes and ages.

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Short-tailed albatross (*Phoebastria albatrus*)	E	No	No	HAB	Primarily a seabird with limited presence along coastal shorelines. Very small breeding range only in two Pacific islands, south of Japan. Resident of the northern Pacific Ocean, including California coast.
Western snowy plover (*Charadrius alexandrines nivosus*)	T	Yes	No	--	Sandy marine and estuarine shores
Yellow-billed cuckoo (*Coccyzus americanus*)	E	No	No	HAB	Relatively large blocks of riparian habitats. Cottonwood and willow trees are an important foraging habitat in areas.

TABLE 5-4: FEDERALLY LISTED THREATENED AND ENDANGERED INVERTEBRATES UNDER THE JURISDICTION OF USFWS WITH THE POTENTIAL TO OCCUR IN THE ACTION AREA

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Rationale for Exclusion[b]	Habitat Preferences
Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	E	Yes	No	--	Coastal areas (dunes, scrublands and grasslands) with species of violets (preferably western dog violet [*Viola adunca*]).
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	E	No	No	RANGE	Steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*. Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County.
California freshwater shrimp (*Syncaris pacifica*)	E	Yes	No	--	Small, perennial, low-gradient coastal streams

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

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

Source: USFWS (2018a)

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

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

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

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

5.2 Critical Habitat in the Action Area

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

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

6.0 EVALUATED SPECIES INFORMATION

6.1 Species Status and Biology

6.1.1 Federally Listed Plants

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

6.1.1.1 Beach Layia—Endangered

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

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

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

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

Status in the Vicinity of the Action Area. According to the California Native Plant Society (CNPS) (2018), as of 2015, there are 21 extant occurrence records of beach layia. USFWS (2011a) reported no significant change in the distribution of beach layia since the species was listed. Fourteen populations of beach layia have been identified in the park, all located along the 10-mile stretch of the Great Beach. These 14 populations are comprised of several occurrences that NPS (2015a) mapped during field surveys with both points and polygons (attachment A, figure 2). The majority of known point occurrences are in coastal dunes outside ranch boundaries (63%), or within existing resource protection exclusion areas (17%) on the B, C, E, F, and AT&T Ranches (NPS 2015b). The other 20% of beach layia occurrences are on remnant dune features within grazed pastures on B, C, F, and AT&T Ranches (NPS 2015b). Although livestock are excluded from coastal dune habitat where most beach layia is found, the species is also affected to a small extent by grazing from deer, hares, and rabbits (USFWS 1998b). The *Point Reyes National Resources Condition Assessment* (2019c) provides the most recent condition assessment of beach layia within the park.

A complete census of all populations in the action area was performed in 2003, estimating over 66,000 plants (Imper 2014). A sampling protocol was initiated in 2004, when 8 of the 15 populations were sampled, and the boundaries recorded with GPS. The total count for beach layia that year exceeded 44,000, occupying just over 16.3 acres of dunes within only a portion of the habitat occupied by the 8 sampled populations (USFWS 2011a). In general, beach layia numbers appear to be declining in most populations, with the exception of the stable population at AT&T (Population 5) and the population at Abbotts Lagoon (Population 6), which has benefitted from a large coastal dune restoration project. Not

only have plant numbers within the remnant native Dune Mat area that supported Population 6 increased since removal of the European beachgrass that surrounded this native dune area on all sides, but, after a bit of a lag, beach layia has also expanded dramatically within the dune areas restored by mechanical removal and, to a lesser extent, herbicide treatment (NPS 2019a). Numbers within fixed census plots dropped from 35,893 in 2004 to 5,689 in 2018, however, abundance in the restored population at Abbotts was estimated in 2018 to be as high as 4 million plants (NPS 2019a).

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

Although beach layia occurrences have increased in areas where coastal dune restoration has occurred, those subject to grazing have declined in abundance since 2004 (NPS 2019a).

6.1.1.2 Marin Dwarf Flax—Threatened

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

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

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

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

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2015, there are 24 extant occurrence records of Marin dwarf flax in California. The known occurrences of Marin dwarf flax in the action area are on McIsaac Ranch, on generally on exposed serpentine soils with sparse vegetative cover along Nicasio Ridge (NPS 2015b, 2019d). The population varies between 10,000 to perhaps over 100,000

plants. The largest occurrence extends along the ridgetop from the McIsaac Ranch into private land and overlaps with the Tiburon paintbrush population in that area (NPS 2004). Occurrences are also located on small rocky outcrops on the Cheda and Zanardi Ranches (NPS 2001, Rilla and Bush 2009) (attachment A, figure 3).

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

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

6.1.1.3 Showy Indian Clover—Endangered

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

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

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

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

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

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

The listing rule for Showy Indian clover (62 FR 54791) suggested that some historic locations could have been eliminated due to grazing. However, livestock grazing was not an impact on the one known natural population at Dillon Beach at the time of listing or the first five-year review (USFWS 2007b). Gopher activity was a primary source of plant mortality and other native herbivores (deer, rabbits, voles, snails, slugs, and insects) could have deleterious effects to showy Indian clover plants (USFWS 2012b). The introduced population on the D Ranch is divided by a fence with cattle grazing on only one half. The cattle grazed portion had the highest observed number of flower heads when last monitored in 2016 (Jeffery 2016).

6.1.1.4 Sonoma Alopecurus—Endangered

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

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

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

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

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

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

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

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

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

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

6.1.1.5 Sonoma Spineflower—Endangered

Legal Status. The Sonoma spineflower was listed as endangered under the ESA in 1992 (57 FR 27848). It was listed as endangered under the CESA in 1990 (CDFW 2018). The USFWS plan to recover Sonoma spineflower is found in the *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly*

(USFWS 1998b). USFWS (2010a) conducted a five-year status review of Sonoma spineflower and determined that no change was needed to its endangered status.

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

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

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

Status in the Vicinity of the Action Area. According to the CNPS (2018), as of 2010, there are 3 extant occurrence records of Sonoma spineflower in California. Historically, it was more widespread in the park, occurring near the Point Reyes Post Office, then located west of Schooner Bay, as well as north of Creamery Bay in Drakes Estero (USFWS 1998b). USFWS (1998b) reported that the species was thought to have been widespread in Marin and Sonoma Counties, but was believed to be extinct for 77 years, although Parsons and Ryan (2018b) reported that little historical data was recorded about the species. In 1980, the species was rediscovered in the action area south of Abbotts Lagoon, in the same pasture on G Ranch where a population of Sonoma alopecurus is located. At the time, this population was estimated to cover around 1,000 square feet (0.02 acre) and had increased to nearly 17,000 square feet (0.39 acre) by 1984 due to presumably natural population fluctuations (USFWS 1998b). The CNPS monitored the population annually since 1983, but NPS took over monitoring in the early 2000s. Since 2010, the areal extent of the wild population has ranged from 3.2 acres (2012) to 4.2 acres (2016) (Parsons and Ryan 2019b). Though population numbers of Sonoma spineflower vary dramatically from year to year, the population boundary of the main G Ranch population has been largely unchanged, which shows a high degree of site fidelity (Parsons and Ryan 2019b). Figure 6 in attachment A shows the location of the main population on G Ranch and introduced populations on G, F, and AT&T Ranches. An introduction in 2010–2011 on the H Ranch appears to have failed (Parsons and Ryan 2019b).

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

Due to variations in sampling and wide year-to-year fluctuations, population trends are uncertain, and the long-term viability of the introduced population(s) is not known (USFWS 2010a). Figure 7 in attachment A, from Parsons and Ryan (2019b), shows the estimated abundance of Sonoma spineflower within the

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

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

With funding assistance from USFWS, the park has also (1) removed yellow bush lupine and coyote brush from within and adjacent to the Abbotts Lagoon population; (2) realigned a dirt road that runs through the Abbotts Lagoon population to eliminate off-road vehicle traffic; (3) collected seeds for accession; (4) established additional seed introduction plots; and (5) collected soils and other physical and biological information to better select introduction sites (Parsons and Ryan 2019b).

6.1.1.6 Tiburon Paintbrush—Endangered

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

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

Habitat Requirements/Ecology. Tiburon paintbrush grows on serpentine soils, similar to Marin dwarf flax, as described above under *Habitat Requirements/Ecology* in section 6.1.1.2. It is often found in association with an evergreen, spiny-leafed ceanothus taxa (NPS 2001).

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

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

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

6.1.1.7 Tidestrom's Lupine—Endangered

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

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

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

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

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

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

The main threat to Tidestrom's lupine in the action area is from non-native invasive plants, primarily European beachgrass and iceplant. Almost all the populations at Point Reyes exist within islands of native dune habitat that are surrounded by European beachgrass and/or iceplant (Parsons 2018). These invasive plants directly compete with Tidestrom's lupine and indirectly affect the plant by providing habitat for increased numbers of native deer mice (*Peromyscus maniculatus*) that can eat up to 82% of the seeds of Tidestrom's lupine (NPS 2015a). As compared to native plant communities, predation from deer mice on Tidestrom's lupine has been documented to be 70% higher near European beachgrass, effectively reducing the potential for successful reproduction of this species (NPS 2015a). Encroachment by invasive plants may have eliminated one population (Population #5) (Parsons 2018). Other threats include trampling by humans and large animals, including cattle. In 2010 within the action area, very few fruits were produced because many reproductive plants reverted to a non-reproductive status after being trampled in spring 2009 (NPS 2015a). However, as noted above, in the action area 85% of occurrences of Tidestrom's lupine are in areas excluded from cattle grazing.

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

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

6.1.2 Federally Listed Wildlife

6.1.2.1 California Red-legged Frog – Threatened

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

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

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

Critical Habitat in the Action Area. Critical habitat for the California red-legged frog was designated in 2001 (66 FR 14626) and revised in 2006 (71 FR 19244) and 2010 (75 FR 12816). Critical habitat includes three units in Marin County, one of which encompasses most of the southern portion of the Point Reyes Peninsula with the other two being located on the east side of the Tomales Bay watershed (USFWS 2018b). California red-legged frog Critical Habitat Unit MRN-3 spans the southern portion of Point

Reyes peninsula, from Point Reyes Lighthouse east along Drakes Bay to Bear Valley and north past the northernmost tip of Drakes Estero and extending east into the Olema Creek watershed (attachment A, figure 10). The action area is within this designated critical habitat for California red-legged frog.

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

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

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

marshes in the park, surveys by Halstead and Kleeman (2017) found California red-legged frogs in 18 of the 21 coastal dune drainages along the Great Beach. These occurrences were located in both the grassland and dune portions of linear swales or drainages, with most of the frogs found in small pools along these drainages (Halstead and Kleeman 2017). During recent surveys in the park, the probability of detecting California red-legged frogs at surveyed sites varied among years, with a mean detection rate of 0.43 (range = 0.22–0.67). Although no trend is apparent in these data, recent breeding habitat restoration and construction efforts for California red-legged frogs have occurred in the park (NPS 2019c). Figure 10 in attachment A shows the distribution of documented California red-legged frog occurrences in the action area.

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

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

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

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

6.1.2.2 Western Snowy Plover – Threatened

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

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

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

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

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

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

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

Status in the Vicinity of the Action Area. The western snowy plover uses the Point Reyes peninsula as both wintering and nesting habitat. In winter, the western snowy plover is found on beaches and estuarine sand and mud flats. Wintering birds occur on the Great Beach, Drake's Beach and Estero and along Limantour Spit. Roosting snowy plovers use small depressions in the sand or in the lee of kelp, other debris, or small dunes (Adams et al. 2014). The western snowy plover may begin the breeding season between March–April and can lay more than one clutch to extend breeding, nesting, and rearing into mid-September (Adams et al. 2014). Snowy plover nesting in the action area occurs on the northern portion of the Great Beach between the South Beach parking lot and Kehoe Beach, which includes beach fronting AT&T and North Beach Dunes. Snowy plovers also occasionally nest along the western edge of Abbotts Lagoon. Nesting at Limantour Spit is limited by high spring tides, leaving much of the best nesting habitat inundated by water (Adams et al. 2014). Figure 11 in attachment A shows the location of critical

habitat along beaches in the action area, where western snowy plover nesting occurs adjacent to ranches in the action area.

From 2010 to 2019, numbers of nests on Point Reyes beaches ranged between 7 and 50 (NPS 2019i). During these same years, an average of 15 chicks have been fledged in the park per year, ranging from 7 to 23 chicks (NPS 2019i). In 2018, 50 nests were documented, which is the highest number of nests in the last 10 years; however, fewer than half of those nests hatched, and only 14 plover chicks were successfully fledged (NPS 2019i).

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

To minimize predation by ravens and other predators, NPS initiated the use of predator exclosures around snowy plover nests in 1996. The exclosures consist of a wire fence that allows passage of plovers while keeping out mammalian predators and mesh netting on top to prevent access by avian predators. These exclosures have been effective at keeping predators away from nests, increasing the percentage of clutches hatching from an average of 14.9% prior to exclosure use (1986–1989) to 63.3% (1996–2018) (NPS 2020). NPS has also been issued a depredation permit by the USFWS (#MB11627D-0) that allows for lethal removal of ravens observed actively hunting for western snowy plovers or near plover nesting areas. In addition, the reproductive success of western snowy plovers is affected by human disturbance in the action area, which is closely monitored each year. Beach visitors have also been observed approaching active nests, which has been documented as a threat to nesting snowy plovers, especially when those visitors are accompanied by a dog (Adams et al. 2014).

The park has undertaken dune restoration focused on removing non-native European beach grass and iceplant from areas on North Beach, in particular near Abbotts Lagoon. In 2003, the park found two plover nests in areas of non-native beach grass removal. From 2006 to 2008 there were four nests each year in the restored areas. In 2011, a large-scale mechanical removal of 90 acres of non-native European beach grass and iceplant occurred just south of Abbotts Lagoon. This large-scale restoration created a 250-acre natural dune environment (NPS 2019a). Additional efforts to remove non-natives and maintain the restored area were performed in subsequent years.

6.1.2.3 Myrtle's Silverspot Butterfly – Endangered

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

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

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

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

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

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

NPS (2001a) reported eight ranches in the action area that supported habitat for Myrtle's silverspot butterfly. Surveys by NPS for Myrtle's silverspot butterflies in 2003 showed that they were found on 13 ranches that all support livestock operations (Adams 2004). Although there have not been formal Myrtle's silverspot butterfly surveys in the park in recent years, NPS (2019e) has recorded occurrences on B, D, E, F, G, AT&T, J, N, and K Ranches (attachment A, figure 12). During surveys in 2011, butterflies were observed in all surveyed areas, and most of the butterflies were found at AT&T Ranch and North Beach, a moderate number on the D Ranch in proximity to the bluffs above Drakes spit, and a few at both

F Ranch and Home Ranch. In 2012, the subspecies was commonly observed in dunes closest to AT&T Ranch, but none were observed near Abbotts Lagoon, similar to survey results from the original surveys in 2001–2002. Lower numbers occurred in other surveyed park areas in 2012. Myrtle's silverspot butterfly and cattle grazing have co-existed for over a hundred years (Adams 2004, NPS 2007), and NPS research does not suggest that cattle grazing has had a significant detrimental effect on the subspecies. Between grazed and ungrazed areas, the diversity of nectar plants used by Myrtle's silverspots did not differ, and the density of nectar sources was higher within grazed areas. In fact, biologists recorded more butterflies in grazed dunes and grasslands than in ungrazed vegetation communities (NPS 2007).

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

6.1.2.4 California Freshwater Shrimp – Endangered

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

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

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

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

Status in the Vicinity of the Action Area. California freshwater shrimp reside in the Lagunitas and Olema watersheds in the action area. Of the roughly 20 streams known to support California freshwater shrimp throughout its limited range of only Marin, Sonoma, and Napa Counties, Lagunitas Creek has been the highest rated stream for its abundance and distribution of shrimp. Lagunitas and Olema Creeks are the only streams where the shrimp occur on protected lands (USFWS 1998c; Serpa 2016). The current range of the shrimp within Lagunitas Creek extends from Shafter Bridge in Samuel P. Taylor State Park downstream for about 8 miles, to a point at least 0.3 mile downstream of the US Geological Survey gage at Gallagher Bridge to roughly 1 mile below the confluence with Nicasio Creek (Serpa 2016). Shrimp

habitat along the main stem of Lagunitas Creek within the park is generally protected from agricultural activities occurring in the watershed. Small numbers of shrimp were collected in 1996 and 1997 near the confluence of Olema and Lagunitas Creeks (Fong 1999). Surveys for California freshwater shrimp detected small numbers in lower Olema Creek in 2001, but none were found in the same reaches during a subsequent investigation (Lobianco and Fong 2003). The species' distribution appears to be increasing in proximity to the action area, as more recent surveys by Serpa (2016) found that Olema Creek provides viable California freshwater shrimp habitat and 2019 surveys detected shrimp in the lower reaches of Olema Creek. Native sculpin are a significant predator of the shrimp.

Within its range, populations of California freshwater shrimp are threatened by introduced fish, deterioration or loss of habitat resulting from water diversion, impoundments, livestock and dairy activities, agricultural activities and developments, flood control activities, gravel mining, timber harvesting, migration barriers, and water pollution (USFWS 1998c). Additionally, environmental factors such as the recent cycle of below average annual rainfall have likely influenced the distribution and quality of suitable habitat throughout its range (USFWS 2018c).

7.0 ENVIRONMENTAL BASELINE

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

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

7.1 Previous Consultations with the USFWS in the Action Area

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

TABLE 7-1: DETERMINATIONS OF EFFECTS OF GRAZING ON FEDERALLY LISTED SPECIES BY NPS BIOLOGICAL ASSESSMENT AND USFWS BIOLOGICAL OPINION

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

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

Source: USFWS (2018a)

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

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

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

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

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

- AT&T Dune Restoration Project (USFWS 2015)
- Road Improvement and Maintenance Projects (USFWS 2014)
- Chicken Operation at D Rogers Ranch (USFWS 2010b)
- Abbotts Lagoon Area Dune Restoration Project (USFWS 2009c)
- Giacomini Restoration Project (USFWS 2007e)

Table 7-2 summarizes the USFWS determinations for all recent completed section 7 consultations that have occurred previously between NPS and the USFWS.

TABLE 7-2: RECENT CONSULTATIONS WITH USFWS AND DETERMINATIONS FOR ACTIONS IN THE ACTION AREA FOR ALL FEDERALLY LISTED/PROPOSED SPECIES AND DESIGNATED/PROPOSED CRITICAL HABITAT

Project	Park Unit	Type of Project	Species Addressed	USFWS Determination[a]	Date
Lagunitas Creek Floodplain and Riparian Restoration Project (USFWS 2018c)	Point Reyes	Floodplain and Riparian Enhancement	California freshwater shrimp (*Syncaris pacifica*)	LAA, No Jeopardy[b]	August 3, 2018
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			Northern spotted owl (*Strix occidentalis caurina*)	NLAA	
			Marbled murrelet *(Brachyramphus marmoratus*)	NLAA	
AT&T Dune Restoration Project (USFWS 2015)	Point Reyes	Dune Restoration	Western snowy plover (*Charadrius alexandrines nivosus*)	LAA, No Jeopardy[b]	October 14, 2015
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	LAA	
			Tidestrom's lupine (*Lupinus tidestromii*)	LAA	
			Beach layia (*Layia carnosa*)	LAA	
Road projects (USFWS 2014)	Point Reyes	Potential Improvements to 12 miles of Sir Francis Drake Boulevard	Beach layia (*Layia carnosa*)	NLAA	September 24, 2018
			Tidestrom's lupine (*Lupinus tidestromii*)	NLAA	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	
			California red-legged frog (*Rana draytonii*)	NLAA	
			Western snowy plover (*Charadrius alexandrines nivosus*)	NLAA	

Project	Park Unit	Type of Project	Species Addressed	USFWS Determination[a]	Date
Chicken operation at D. Rogers Ranch (USFWS 2010b)	Point Reyes	Chicken Egg and Meat Production	Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	April 28, 2010
			California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
Abbotts Lagoon Area Dune Restoration Project (USFWS 2009c)	Point Reyes	Dune Restoration	California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	June 15, 2009
			Western snowy plover (*Charadrius alexandrines nivosus*)	LAA, No Jeopardy[b]	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	LAA, No Jeopardy[b]	
			Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	NLAA	
			Beach layia (*Layia carnosa*)	NLAA	
			Tidestrom's lupine (*Lupinus tidestromii*)	NLAA	
			Sonoma spineflower (*Chorizanthe valida*)	NLAA	
Giacomini Restoration Project (USFWS 2007e)	Point Reyes	Wetland Restoration	California red-legged frog (*Rana draytonii*)	LAA, No Jeopardy[b]	
			California freshwater shrimp (*Syncaris pacifica*)	LAA, No Jeopardy[b]	
			Western snowy plover (*Charadrius alexandrines nivosus*)	NLAA	
			Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*)	NLAA	

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

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

7.2 Monitoring Programs

7.2.1 Vegetation Monitoring

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 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 representative 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. RDM monitoring is conducted annually. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review and update the RDM monitoring program. The UC Berkeley report (Bartolome et al. 2015) examined 25 years of RDM monitoring data and concludes that the minimum 1,200 pounds/acre standard remains appropriate based on the RDM guidelines developed by UC researchers for coastal prairie (Bartolome et al. 2006). The report also notes that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. Bartolome et al. (2015) also recommend expanded use of visual RDM mapping across pastures to better inform overall management of the ranched lands. Updated monitoring protocols based on the UC Berkeley Range Ecology Lab review have been in place since 2015. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available in appendix E of the EIS.

In addition to RDM, 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. NPS has also established forage productivity plots on a subset of ranches that are monitored in spring to aid in determination of stocking rates.

Regular monitoring of ranches is conducted to ensure compliance with lease/permit conditions and regulatory requirements, and to assess changes that may affect resource conditions (e.g., early detection of invasive species, identification of new areas of erosion). Periodic monitoring is also conducted in association with the implementation of projects, restoration activities, or other requirements. This has included surveys and mapping of vegetation (including rare plants and invasive species) and assessments of riparian condition.

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

plant health and mortality, woody debris density (fuels), invasive plant abundance, and soil cover (McClosky 2015).

7.2.2 Rare Plant Monitoring

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

7.2.3 Wildlife Monitoring

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

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

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

7.2.4 Aquatic Monitoring

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

NPS has conducted water quality monitoring in the Lagunitas Creek watershed (including Olema Creek) since 1999. A number of stations in the Abbotts Lagoon, Kehoe, and Drakes Estero watersheds were also monitoring starting around this time, and monitoring continued until 2013. Over the period of record, monitoring has included different objectives, sites, and regimes, including targeted monitoring to search for potential pollutant sources, often coupled with implementation of water quality improvement projects, some of which included monitoring before and after implementation. A long-term data set exists for six primary Olema Creek monitoring sites, where monthly water quality monitoring was formalized under the SFAN Freshwater Quality Monitoring Program beginning in fall 2006 (Wallitner 2016). SFAN also monitors two sampling sites in the Lagunitas Creek watershed on the rotating two-year cycle described below. Point Reyes monitored two additional tributaries of Olema Creek and one of the Lagunitas sites for approximately eight years ending in 2014, collecting only core parameter and fecal indicator bacteria data. Data from secondary sites are not included in this report because they are not part of the SFAN monitoring program.

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). In 2006, the San Francisco RWQCB adopted a total maximum daily load (TMDL) for pathogens in the Tomales Bay watershed. NPS has conducted fecal coliform sampling within the Olema Creek watershed monthly and for two five-week intervals (one during summer and one during winter) to inform the San Francisco Bay RWQCB Tomales Bay Pathogen total maximum daily load program (Wallitner 2016). Monthly Olema Creek watershed samples are also tested for other fecal indicator bacteria (Escherichia coli [E. coli] and total coliform), nutrient parameters (nitrate as nitrogen and total Kjeldahl nitrogen), and turbidity measured in nephelometric turbidity units. NPS conducts monthly sampling in the Lagunitas Creek watershed on a rotating two-year cycle (two years of sampling followed by two years off) and tests for the same parameters as Olema Creek watershed monthly sampling (except fecal coliform). Core parameters measured in the field at all stations include temperature (air and water), dissolved oxygen, pH, and specific conductance.

In 2005, the Tomales Bay watershed pathogen TMDL 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 Bay RWQCB 2014). As part of these efforts, a Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay watershed was developed to outline control measures and operational practices to reduce bacterial input to the watershed from grazing lands, in particular from stormwater runoff (San Francisco Bay RWQCB 2018). The current five-year grazing waiver was renewed in October 2018 and implements the Tomales Bay Pathogen TMDL and the Lagunitas Creek Sediment TMDL (San Francisco Bay RWQCB 2018). Ten park ranch operations report under this conditional waiver. A TMDL for nutrients will be developed along with ongoing management efforts in the Tomales Bay watershed (San Francisco Bay RWQCB 2017).

Nitrate monitoring on Lagunitas and Olema Creeks from 2007 to 2012 generally returned low nitrate values, with the most upstream site having the lowest values and the highest values at a downstream site (Carson 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 reported in Roche et al. (2013) for limiting eutrophication of streams (Carson 2013; Wallitner 2013, 2016; Wallitner and Pincetich 2017). Most of the samples with the highest individual nitrate values for Olema Creek were collected during storm events (Wallitner and Pincetich). Nitrate has been monitored at long-term sites in the Tomales Bay watershed by the NPS Inventory and Monitoring program since late 2006. No samples have exceeded the drinking water standard of 10 milligrams per liter, and fewer than 5% of samples have exceeded 1.0 milligrams per liter.

The 2005 Tomales Bay TMDL staff report showed that of the watersheds in the planning area, Lagunitas and Olema Creek contributed some of the lowest fecal coliform bacteria loads to the bay. Overall, the Olema Creek subwatershed was the second smallest fecal coliform contributor to Tomales Bay, with just 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.

Long-term trend analysis in the Olema Creek watershed indicates average fecal coliform bacteria concentrations were reduced by 95% over the 19-year period from 1999 to 2017 (Lewis et al. 2019). Although the general, long-term fecal coliform bacteria trend was downward, increases in precipitation during rain events (cumulative 24-hour and 5-day) were associated with temporary increases in fecal indicator bacteria concentrations during those events. Turbidity monitoring in the Olema Creek watershed from 2009 to 2017 indicates that approximately 90% of samples collected at long-term monitoring stations were below a threshold of 25 nephelometric turbidity units, with most samples above this threshold occurring during storm conditions (NPS unpublished data). Short-term watershed assessment monitoring (January 2016 to May 2018) in the Olema Creek watershed 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 (Voeller et al. 2018).

The 95% decrease in fecal coliform bacteria concentrations in the Olema Creek watershed from 1999 to 2017 was concurrent with the implementation of Management Activities such as Livestock Water Supply, Fencing, and Stream Crossings intended to reduce pathogen, sediment, and nutrient loading to local streams throughout the watershed. This includes approximately 40 actions in the Olema Creek watershed, which cumulatively provided increased managerial control of livestock access to more than 28 kilometers of Olema Creek and nearby tributaries (Lewis et al. 2019). During approximately the same time period, more than 170 Management Activities intended to improve resource conditions, including water quality, have been implemented across the planning area (see figure 4 in appendix A). Additionally, between 1996 and 2012, NPS established approximately 780 acres of cattle exclusion adjacent to critical coho salmon and steelhead habitat, which were removed from lease/permits and are not in the planning area, and which also likely resulted in benefits to water quality. The effectiveness of these types of Management Activities at reducing pollutants of concern is consistent with findings from other studies (e.g., Line et al. 2000; Line 2003; George et al. 2011; Kay et al. 2018).

Results from monitoring in the Lagunitas Creek watershed are summarized in various reports, but no long-term trend analysis has been conducted to date. Review of data that have been collected by NPS indicates that more than 86% of Lagunitas Creek watershed samples (stations LAG2 and LAG3) analyzed for *E. coli* between 2007 and 2014 were below the San Francisco Bay RWQCB single-sample statistical threshold value for water contact recreation (320 colony forming unit per 100 milliliter; SWRCB 2019). Almost 90% of samples collected at these Lagunitas Creek watershed stations between 2009 and 2014 were below a threshold of 25 nephelometric turbidity units (NPS unpublished data).

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

7.3 Past and Current Activities within the Action Area

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

7.3.1 Coastal Beach and Dune Species

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

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

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

7.3.2 Serpentine Soil Species

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

7.3.3 Coastal Scrub and Coastal Prairie Species

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

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

Native species in coastal scrub and coastal prairie now compete with a large number of non-native annual grasses and forbs that were not historically present (see Ford and Hayes 2007). Beginning in the late 1700s, it is believed that human settlement greatly increased the spread of Eurasian grasses and forbs, primarily from the Mediterranean Basin. These non-native species have since become more abundant than native plant species across most of California and altered natural disturbance regimes (e.g., fire frequency) of coastal prairies (Pawley and Lay 2013; Barry et al. 2015). Non-native invasive plants have

also likely changed overall ecosystem functions by affecting the habitat structure and quality, species genetics, pollination dynamics, soil structure, soil microbes, soil chemistry, and even watershed hydrology, including evapotranspiration rates, stream flow and erosion and sedimentation dynamics (Mack et al. 2000).

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

7.3.4 Wetland and Aquatic Species

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

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

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

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

Numerous stream restoration projects have been conducted during the past couple decades in the action area (see table 7-2) and are expected to continue to occur. For example, the Marin Municipal Water District has implemented several streambank stabilization projects, winter habitat enhancement projects, and other habitat enhancement actions in the Lagunitas Creek watershed (MMWD 2011). Some aspects of aquatic habitat used by California red-legged frogs and California freshwater shrimp would be expected to improve as a result of these restoration actions.

8.0 EFFECTS TO EVALUATED SPECIES AND DETERMINATIONS

Potential effects on federally listed species and their habitat were evaluated using available data and maps of vegetation communities (i.e., grasslands, coastal dune, coastal scrub, riparian areas and wetlands, and forests and woodlands) in the action area (Schirokauer et al. 2003; Gong et al. 2005), in combination with predicted changes in ecosystem processes resulting from continued livestock grazing and other ranch activities under the proposed action. No other elements of the GMP Amendment under the proposed action (e.g., elk management) are expected to have impacts on federally listed species or critical habitats and are therefore not discussed in the analysis below. Recreation and other visitor use activities under the proposed action (e.g., development of trails and trail-based recreation, development to support day use and overnight accommodations, interpretive and educational opportunities, shuttles and parking) would go through site-specific analysis prior to final site selection and implementation. Additional consultation would occur at that time, if necessary.

In addition to the effects of habitat disturbance, impacts on individual animals and populations of listed species were evaluated based on predicted changes in competition for resources at each ranch, such as potential changes to inter-and intra-species interactions (e.g., predation, herbivory, and symbiosis). The area of analysis for impacts on listed species includes the action area and surrounding contiguous habitats that are used by wildlife potentially affected by proposed management activities.

8.1 Federally Listed Plants

8.1.1 Beach Layia

8.1.1.1 Direct and Indirect Effects on Beach Layia

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

Although cattle would be excluded from areas supporting nearly 90% of all known beach layia occurrences in the park, they could occasionally breach pasture fences and trample beach layia in protected coastal dunes (NPS, Parsons, pers. comm. 2019b). This could occur as a result of broken fences, gates being left open, or the poor siting of pasture fences in sandy areas. It should be noted that the

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

geographic extent of beach layia is small relative to the potentially affected areas of excluded coastal dunes.

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

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

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

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

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

8.1.1.3 Cumulative Effects on Beach Layia

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

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.1.4 Conclusion

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

8.1.2 Marin Dwarf Flax

8.1.2.1 Direct and Indirect Effects on Marin Dwarf Flax

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

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

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

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

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

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

of cattle grazing on Nicasio Ridge for the continued protection of Marin dwarf flax. This would be facilitated by ROAs for each ranch where the species occurs.

8.1.2.3 Cumulative Effects on Marin Dwarf Flax

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.2.4 Conclusion

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

8.1.3 Showy Indian Clover

8.1.3.1 Direct and Indirect Effects on Showy Indian Clover

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

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

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

The timing (i.e., season-of-use), duration, and grazing intensity would affect whether livestock grazing has an adverse or beneficial effect on showy Indian clover in the action area. To ensure that adverse effects to introduced showy Indian clover are avoided on the D Ranch, NPS will continue to manage livestock in a manner that is compatible with its persistence. The introduced population on D Ranch has not been monitored by USFWS since 2016, so NPS will coordinate future monitoring efforts with USFWS.

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

8.1.3.3 Cumulative Effects on Showy Indian Clover

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.3.4 Conclusion

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

8.1.4 Sonoma Alopecurus

8.1.4.1 Direct and Indirect Effects on Sonoma Alopecurus

Effects of Livestock Grazing. Too much or too little grazing may be detrimental to Sonoma alopecurus (USFWS 2009c, 2011c). For example, Population 1 was extirpated within three years after grazing cessation, but the number of reproducing tillers at Population 5 was reduced by 90% in 2001 after cattle were released onto the site (Gennet 2004). Fowler and Fellers (1984) stated that grazing was a threat to Sonoma alopecurus occurrences in the action area. Grazing can result in trampling of individual plants, soil compaction, and influence the presence of competitive non-native invasive species. Heavy grazing of the plant can also limit its ability to photosynthesize, which could result in death or diminished reproductive output (USFWS 2011c). Conversely, USFWS reported in the listing rule in 1997 (62 FR 54791) that some grazing may be necessary to maintain Sonoma alopecurus in the face of competition from other plants. More recent understanding of the species' ecology has revealed that the exclusion from grazing can adversely affect Sonoma alopecurus. Gennet (2004) suggests that Sonoma alopecurus may be a disturbance colonizer and a poor competitor. As a short-lived perennial wetland grass, Sonoma alopecurus is most able to establish in locations with low cover (i.e., after grazing), and it can grow rapidly to take advantage of open space. In the action area, Populations 1 and 2 and part of Population 5 were extirpated subsequent to the installation of fences that prevented cattle grazing (Ryan and Parsons 2016). Following cessation of grazing, subsequent increases in sedges (*Carex* spp.), blackberry (*Rhubus ursinus*), and bulrush (*Scirpus* spp.) led to the disappearance of Population 1 within three years of grazing cessation (USFWS 2011c).

Within the park, seasonal grazing may be necessary to sustain this species because both native and, in some cases, non-native species can expand and crowd out or shade out Sonoma alopecurus (Ryan and Parsons 2019). The Sonoma alopecurus populations are subject to some level of grazing, at least periodically. Some of the populations used to be grazed more historically (e.g., Population 8), and it is possible that the lower level of grazing intensity may be negatively impacting those populations.

Under the proposed action, all existing populations in the action area would continue to be grazed by cattle. The benefits of moderate grazing on Sonoma alopecurus is supported by research attempting to mimic the effects of grazing through vegetation clipping and finding significant increases in Sonoma alopecurus seed output (Gennet 2004). Moderate-intensity grazing, as required under the proposed action via RDM standards per Bartolome et al. (2015), would reduce competition from more abundant native plants or non-native invasive species. Furthermore, the zoning framework would reduce the potential for any adverse impact on Sonoma alopecurus because the framework would ensure that cattle grazing would be the only potential disturbance.

Based on results of a grazing study completed in the action area in 2014, the grazing regime is important, including intensity and season of use (Ryan and Parsons 2015). Seasonal grazing appears to result in more Sonoma alopecurus inflorescence production than no grazing or year-round grazing (Ryan and Parsons 2015) and is thus the preferred management tool. Fencing was installed in 2015 to facilitate seasonal grazing of Population 5 at H Ranch, and seasonal grazing has also been conducted for Population 3 on the AT&T Ranch, where the final portion of fencing to allow for more reliable grazing is planned for this year (Parsons and Ryan 2019a; NPS, Parsons, pers. comm. 2019b). Under the proposed action, NPS

would use ROAs to direct the timing, intensity, and duration of grazing, and will continue working with ranchers to conduct seasonal grazing on the AT&T Ranch (Population 3) and H Ranch (Population 5).

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

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

One population, the introduced population 11 on G Ranch, would be managed with a new 7.4-acre resource protection exclusion buffer that would improve control of grazing and allow seasonal grazing for the benefit of Sonoma alopecurus. Management actions could likely involve fence construction around populations, which NPS did around Population 5 and is currently completing around Population 3, allowing cattle to be excluded in the spring and summer to avoid impacts to plants during active growth, flowering, and seed-set (Parsons and Ryan 2019a).

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

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

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

8.1.4.3 Cumulative Effects on Sonoma Alopecurus

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.4.4 Conclusion

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

8.1.5 Sonoma Spineflower

8.1.5.1 Direct and Indirect Effects on Sonoma Spineflower

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

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

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

Effects of Other Ranch Activities. Sonoma spineflower occurs in areas that would be designated as the Range subzone under the proposed action, where grazing would be only authorized activity that could potentially affect Sonoma spineflower. Management Activities that could potentially impact Sonoma spineflower include Road Upgrade and Decommissioning, Fencing, and Livestock Water Supply (Parsons and Ryan 2019b). However, these activities would be located in a way that does not affect or has a beneficial effect on the species. For example, NPS reduced the threat posed by ranch vehicle use in 2010 by realigning a two-track ranch road that ran through the center of the main, wild population on G Ranch, installing motor vehicle barriers, and creating a new two-track alignment at least 50 feet outside the Sonoma spineflower population boundary (Parsons and Ryan 2019b).

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

NPS will continue to monitor Sonoma spineflower populations established on G and F Ranches to ensure the establishment and persistence of these populations. Over the last few decades, NPS has worked with the G Ranch operators to make several changes to grazing and agricultural infrastructure to benefit the

Sonoma spineflower population. New fencing has been deliberately located far enough away from the Sonoma spineflower population, so that any potential impacts from cattle associated with Fencing (e.g., congregating and rubbing on fences) is situated away from these sensitive resources (Parsons and Ryan 2019b).

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

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

8.1.5.3 Cumulative Effects on Sonoma Spineflower

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.5.4 Conclusion

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

8.1.6 Tiburon Paintbrush

8.1.6.1 Direct and Indirect Effects on Tiburon Paintbrush

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

Effects of Other Ranch Activities. Tiburon paintbrush occurs in areas that would be designated as the Range subzone under the proposed action, where only grazing would be authorized. Furthermore, Tiburon paintbrush habitat is found in difficult-to-access terrain on Nicasio Ridge.

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

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

monitoring, and if adverse effects are documented, could work with the rancher to adjust the timing and/or intensity of cattle grazing on Nicasio Ridge for the continued protection of Tiburon paintbrush.

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

8.1.6.3 Cumulative Effects on Tiburon Paintbrush

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.6.4 Conclusion

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

8.1.7 Tidestrom's Lupine

8.1.7.1 Direct and Indirect Effects on Tidestrom's Lupine

Effects of Livestock Grazing. Although cattle grazing has been associated with the extirpation of Tidestrom's lupine elsewhere in Marin County, the recovery plan for the species did not cite grazing as a primary threat (USFWS 1998b). Dangremond et al. (2010) noted impacts on some populations from trampling by cows and suggested that trampling by livestock was the cause of some plants going from a reproductive to a non-reproductive state. Approximately 50% of known Tidestrom's lupine occurrences are in coastal dunes outside the action area and another 35% are within existing resource protection exclusion areas. The remaining 15% of Tidestrom's lupine occurrences from population numbers 2 and 9 are on coastal dunes that would be included in the Resource Protection subzone under the proposed action. Although the potential for adverse impacts to Tidestom's lupine from ranching would be eliminated by new resource protection exclusion areas, a small number of Tidestrom's lupine occurrences could be negatively impacted if cattle breach pasture fences and loaf in coastal dunes (NPS, Parsons, pers. comm. 2019b). Cattle trespassing in coastal dunes could occur in situations where pasture fences are poorly sited in sandy areas, where posts fall over or sand dunes drift over fences, where pasture fences are inadequately maintained by ranchers, or if gates are left open. As noted above, lease/permits require ranchers to maintain fences, and NPS would work with operators through ROAs to move fencelines or address problem areas.

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

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

Under the proposed action, a new 67-acre resource protection exclusion area on the F Ranch would protect all known Tidestrom's lupine occurrences that are potentially impacted by grazing under existing conditions. NPS would continue to enforce lease/permits, including fence maintenance requirements to exclude cattle from coastal dune habitats. Ranchers also typically conduct an inspection of all fences prior to moving cattle into a pasture.

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

8.1.7.3 Cumulative Effects on Tidestrom's Lupine

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.1.7.4 Conclusion

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

8.2 Federally Listed Terrestrial Wildlife

8.2.1 California Red-legged Frog

8.2.1.1 Direct and Indirect Effects on California Red-legged Frog

Effects of Livestock Grazing. Livestock grazing would continue within California red-legged frog habitat in the action area, causing both beneficial and adverse impacts. Ranching in the action area is beneficial to red-legged frogs through the maintenance of stock ponds and the breeding habitat that they provide. Continued grazing would help maintain open-water habitat and allow for increased sunlight necessary for frog basking and the growth of algae, the primary tadpole food. Grazing would also help maintain habitat suitability of breeding ponds by preventing emergent vegetation such as cattails or bulrushes from becoming dominant or by limiting the growth of dense annual grasses around ponds, which reduces both the amount of open water habitat and the duration of pool inundation (Huntsinger, Bartolome, and D'Antonio 2007).

Potential adverse impacts on California red-legged frog habitat could occur due to livestock grazing in the action area, as summarized in table 8-1 and based on pages 20-22 of the recovery plan for the species (USFWS 2002a). There are no known population declines due to ranching in the park.

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

Livestock Effect	Potential Effect on California Red-legged Frog Habitat
Emergent vegetation removed	Emergent vegetation used for anchoring egg masses. Excessive vegetation may reduce sunlight needed for basking and growth of algae, which is chief tadpole food.
Shading vegetation removed (emergent and bank side)	Chiefly harmful to adults, for whom shaded refugia may be critical in drier inland areas during the summer.
Insect habitat vegetation removed	Harmful to adults and juveniles that mainly feed on invertebrates for which bank side vegetation is prime habitat.
Alteration of stream morphology by caving in banks	May cause loss of pool habitat in streams.
Excess trampling of shallow margins of ponds or streams	Risk of trampling egg masses, tadpoles and adults or destroying vegetation.
Excess water drawdown in ponds	May strand egg masses, tadpoles or adults.

Livestock Effect	Potential Effect on California Red-legged Frog Habitat
Excess sediment from cattle-induced erosion	Could cause filling of pond habitat, reduce primary productivity.
Change hydrological regime by accelerating runoff	Pools may dry before metamorphosis completed.
Excess nutrients from livestock manure	Possible impact where animals concentrated - requires study.

Source: USFWS (2002b)

The proposed action could adversely affect California red-legged frog habitat due to trampling and vegetation removal around stock ponds, streams, or adjacent upland habitats. Livestock activity in and around stock ponds or streams may mobilize sediments or contribute to erosion and sedimentation. If excess sedimentation occurs in ponds or streams where red-legged frogs breed, it is possible that their egg masses would suffocate from being buried under sediments. Heavy loss of sediments due to livestock trampling of the streambed could result in down-cutting of channels which could further degrade the stability of banks, and functions of the riparian ecosystem. Cattle loafing in stock ponds could also destroy egg masses or trample tadpoles and adult frogs, although most ponds are large enough that tadpoles and adult frogs can take refuge in deep water. The extent to which such disturbance occurs and its effect on red-legged frogs is not known, but populations have persisted in the action area where livestock grazing has occurred for over 100 years.

The effects to California red-legged frog from livestock would be relatively short-term in duration; in most cases, light-to-moderate levels of livestock use would have no overall adverse effect on California red-legged frog breeding habitat within stock ponds and streams. The relatively large numbers of California red-legged frogs in the action area are mostly found in stock ponds and red-legged frogs have persisted where grazing has occurred for over 100 years. The level of vegetation maintained on grazed lands within the action area would be sufficient to maintain numerous small wetland areas that are used seasonally by red-legged frogs (Ford et al. 2013). Frogs sheltering in terrestrial locations would be at risk from livestock trampling or habitat alteration throughout most of the action area.

Livestock grazing of uplands could adversely affect aquatic habitats used by red-legged frogs by causing accelerated runoff due to reduced vegetation cover and soil compaction. Also, livestock urine and feces could run off into small creeks and stock ponds that support California red-legged frogs, which includes waste lagoons at dairies and other confined livestock feeding areas. Nutrient loading, bacteria, and suspended solids associated with such runoff may result in alteration of pH, dissolved oxygen, excessive nitrogen, or pathogens which could adversely affect all life stages of red-legged frogs. USFWS maintains that unmanaged livestock grazing (overgrazing) can negatively affect riparian and instream aquatic habitat to the detriment of California red-legged frogs (USFWS 2002b).

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

Creek and some East Pasture ditches in the Lagunitas Creek watershed (Fellers and Guscio 2002), and are also present on Drakes Head (NPS, Kleeman, pers. comm. 2019h).

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

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

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

Diversification activities under the proposed action could affect California red-legged frog through mortality, capture, injury, harassment, and harm of individual subadults and adults. Young juvenile California red-legged frogs dispersing from the stock ponds in the action area may move into or across areas where chickens, sheep, or goats are foraging. These additional types of livestock would be authorized only in the Pasture and Ranch Core subzones, which together comprise approximately 30% of the action area but do not include any breeding ponds. Foraging animals, such as chickens, could harass and/or kill dispersing juvenile frogs, and larger livestock could trample California red-legged frogs. Moving chicken huts using motor vehicles could result in adverse effects to California red-legged frogs dispersing into and from the uplands around the ponds. Also, red-legged frogs disperse up to a mile or two from aquatic habitats, so could be killed or injured on lands subject to pasture management activities (e.g., forage crop mowing), other vegetation manipulation (e.g., shrub management), or vehicular use of ranch roads and maintenance of ranch roads. Ranch Infrastructure and Water Control Activities have the potential to adversely affect California red-legged frog if emergent vegetation is removed or aquatic habitats are otherwise disturbed. The presence of additional livestock guardian animals and domestic cats could cause direct injury or mortality to the California red-legged frogs as well. Under the proposed action, increased human activities (i.e., new types of livestock, crops, horse boarding, ranch tours and farm stays, small-scale processing of dairy and meat products, and sales of local agricultural products)

could also attract native predators such as raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), and striped skunks (*Mephitis mephitis*). This increase in predator density may threaten some individual California red-legged frogs.

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

The US Geological Survey, in collaboration with NPS, conducts surveys annually of some wetlands that host California red-legged frogs. Future monitoring data would be used to inform any necessary changes to cattle grazing in pastures with California red-legged frog habitat, such as adjustments in the number of animals, season of use, or duration of use. Furthermore, habitat for California red-legged frogs would be considered in each individual ROA, which would specify areas to be avoided by certain Management Activities, including Mowing IPM, Herbaceous Weed Management, and Manure and Nutrient Management.

NPS would minimize impacts on California red-legged frog by not authorizing ranch activities other than grazing in the Range subzone, which would comprise approximately 65% of the action area and contain nearly all the surface water resources in the lands under grazing lease/permits. The Resource Protection subzone would protect a total of 12.1 miles of streams, 5.7 acres of ponds, and 283 acres of wetlands from direct impacts from cattle. In general, the adherence to RDM standards would provide for maintenance of herbaceous vegetation cover and protection from soil erosion. Because seasonal upland habitats and travel corridors of California red-legged frog could also occur in the Pasture or Ranch Core subzones, NPS would require ranchers to implement avoidance, minimization, and mitigation measures. These measures were provided previously in section 3.3, table 3-3, and those applicable to California red-legged frog are identified under the "Potentially Affected Species" column. In addition, the measures pertaining to "All federally listed species" would apply to California red-legged frog.

8.2.1.3 Cumulative Effects on California Red-legged Frog

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.2.1.4 Conclusion

Continued ranching in the action area may both enhance California red-legged frog populations and be detrimental to habitat in certain situations, depending on the grazing practices and overall habitat conditions of a particular site. The vast majority of California red-legged frogs in the action area are found in artificial stock ponds or on streams that have been historically, if not currently, exposed to livestock grazing. Livestock grazing would maintain habitat suitability of breeding ponds, and despite potential adverse impacts, there are no known population declines due to ranching in the park. USFWS (2002a) reported that grazing in the action area is generally "compatible with sustaining California red-legged frog populations and habitat suitability." Adverse effects from ranching would be minimized through appropriate grazing regimes and other avoidance, minimization, and mitigation measures to the degree that negative population-level effects would be unlikely. Ongoing monitoring of red-legged frog populations would provide data in support of additional mitigation measures, if necessary, to avoid or minimize adverse effects. Due to localized adverse impacts that could significantly affect some individuals, continued ranching in the action area "may affect, is likely to adversely affect" the California red-legged frog.

8.2.2 Western Snowy Plover

8.2.2.1 Direct and Indirect Effects on Western Snowy Plover

Effects of Livestock Grazing. Grazing in western snowy plover habitat could adversely affect nesting individuals via disturbance to birds or trampling of nests and crushing of eggs. The presence of cattle within nesting areas could also result in nest failure due to western snowy plovers being flushed from their nests for extended periods of time. However, this potential impact would only occur if livestock

were to escape pasture fences and trespass onto beaches and coastal dunes occupied by western snowy plovers, which occurs only rarely in the action area.

Effects of Other Ranch Activities. Ranch activities in the action area could pose a risk to western snowy plovers by supporting higher numbers of predatory species, especially common ravens that prey upon snowy plover eggs and chicks. Raven populations could be subsidized by ranch activities that provide food sources, such as livestock feeding and forage mowing that inadvertently kills birds and small mammals that ravens feed upon. Ravens could therefore occur in greater numbers than in the absence of beef and dairy ranches and observations suggest they are most common on the outer Point Reyes peninsula (NPS 2001) in proximity to beaches used by western snowy plovers. Ravens are known predators on western snowy plover chicks and eggs (Roth et al. 1999) and accounted for at least 29% of failed snowy plover egg clutches between 1996 and 2019 (NPS 2020).

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

NPS would continue to minimize the likelihood of livestock trespassing on beaches by requiring that Fencing be inspected and maintained annually to ensure that livestock cannot access beaches or coastal dunes. This includes an inspection of all fences in the action area prior to moving cattle into a pasture. ROAs would also require annual fence maintenance to repair any broken wires or other fence defects that could reduce their effectiveness. In general, the enforcement of fence maintenance would limit the potential for direct adverse effects to snowy plovers to a degree that no take would occur, and overall effects would be insignificant. Additional mitigation measures were provided previously in section 3.3, table 3-3, and those applicable to western snowy plover are identified under the "Potentially Affected Species" column. The measures pertaining to "All federally listed species" would also apply to western snowy plover.

8.2.2.3 Cumulative Effects on Western Snowy Plover

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.2.2.4 Conclusion

While western snowy plovers occur outside of the action area, disturbance from cattle grazing and trampling could occur when cattle occasionally escape designated pastures. The continuation of ranching in the park under the proposed action would include the creation of human trash and agricultural feed stocks in the Ranch Core subzone and Forage Production on 1,000 acres in the Pasture subzone, which could be used by common ravens and support increased raven abundance. Over the long term, nesting western snowy plovers could be indirectly affected due to predation from ravens. Despite avoidance, minimization, and mitigation measures that could reduce this adverse indirect impact, continued ranching in the action area "may affect, is likely to adversely affect" the western snowy plover DPS.

8.2.3 Myrtle's Silverspot Butterfly

8.2.3.1 Direct and Indirect Effects on Myrtle's Silverspot Butterfly

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

inadvertent trampling of host plants by cattle may be considered a relatively minor threat, the impacts of grazing on the persistence of western dog violets, and by extension Myrtle's silverspot butterflies, remains unknown (Launer et al. 1992; USFWS 2009a).

Most documented occurrences of Myrtle's silverspot butterflies in the action area are within pastures grazed by cattle. Two populations inhabit the park within coastal dune habitat, instead of a single population as described in the listing (USFWS 1998b, Adams 2004, USFWS 2009b). At time of the species' listing, USFWS believed that cattle grazing significantly decreased the habitat quality of the Myrtle's silverspot butterfly (USFWS 1998b). A study by Adams (2004) in the park compared grazed and ungrazed vegetation communities for differences in the density and distribution of nectar sources and the host plants, finding that: (1) nectar source species richness was not significantly affected by grazing; (2) nectar source species density was greater within grazed areas; (3) although cattle graze the dune areas, they appear to prefer grazing within grasslands rather than on the dunes, thus, cattle grazing may have little effect on the composition of dune plants; (4) seasonal fluctuations in plant phenology and seasonal weather may be highly variable and could affect the distribution of butterflies between dunes and grasslands; and (5) Myrtle's silverspot butterflies use nectar sources in grazed lands more than predicted. Adams (2004) was unable to survey enough western dog violets to ascertain the effect of grazing on this host plant. Likewise, the five-year status review by USFWS (2009b) concluded that a moderate grazing regime consistent with current RDM standards used by cattle ranchers in the action area did not significantly affect the distribution of Myrtle's silverspot butterfly.

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

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

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

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

Generally, no Vegetation Management or diversification activities would be allowed in the Range subzone, unless they would work toward attainment of NPS resource management goals and objectives. Because the Range subzone comprises approximately 65% of the action area, potential impacts to Myrtle's silverspot butterfly would be reduced. NPS also would require ranchers to implement avoidance,

minimization, and mitigation measures, provided previously in section 3.3, table 3-3. Those applicable to the Myrtle's silverspot butterfly are identified under the "Potentially Affected Species" column. In addition, the measures pertaining to "All federally listed species" would apply to Myrtle's silverspot butterfly.

Adverse effects from overgrazing would be avoided by the continued adherence to the park's RDM standard of 1,200 pounds per acre (Bartolome et al. 2015). This standard would ensure against overgrazing of nectar plants and western dog violets (host plants) and provide for diverse vegetation structure and plant species composition within the action area.

8.2.3.3 Cumulative Effects on Myrtle's Silverspot Butterfly

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.2.3.4 Conclusion

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

8.2.4 California Freshwater Shrimp

8.2.4.1 Direct and Indirect Effects on California Freshwater Shrimp

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

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

Effects of Other Ranch Activities. In the Lagunitas and Olema Creek watersheds, where streams provide potential habitat for California freshwater shrimp, Management Activities in the Ranch Core subzone such as Ranch Infrastructure and Water Control Management, Vegetation Management and diversification could increase erosion and sedimentation of streams. Management Activities could also contribute nutrients and other pollutants during storm events if appropriate mitigation measures are not in place. There could be minor, adverse effects due to water quality as a result of other livestock grazing in certain wetlands and riparian areas. However, there have been documented reductions in fecal indicator bacteria concentrations within the Olema Creek watershed and other park watersheds (see appendix L of the EIS) concurrent with the implementation of water quality improvement practices on ranches (Voeller et al. 2018; Lewis et al. 2019). A reduction in adverse impacts to water quality is expected to continue

because ROAs would incorporate Practice Standards and mitigation measures to protect water quality, and water quality improvement practices would continue to be implemented.

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

Any potential adverse effects of ranching on California freshwater shrimp would be reduced by proper grazing management and adherence to RDM standards, as well as the implementation of Practice Standards and mitigation measures for a defined set of Management Activities to reduce erosion. Numerous mitigation measures listed in table 3-3 would serve to avoid or minimize the effects of the proposed action on California freshwater shrimp, which are generally the same as described above for California red-legged frog, under "Avoidance, Minimization, and/or Mitigation Measures" in section 8.2.1, except the measures associated with Manure and Nutrient Management would not apply to California freshwater shrimp because no dairies are located within the Lagunitas and Olema Creek watersheds where the shrimp are found.

Under the proposed action, NPS would work with ranchers in the Lagunitas and Olema Creek watersheds to consider California freshwater shrimp in terms of project timing. No direct impacts on aquatic habitat occupied by California freshwater shrimp would occur because cattle are excluded from grazing along Lagunitas and Olema Creeks; however, infrequent localized impacts could occur if cattle breach exclusion fences. Ongoing erosion control work in the watershed also protects shrimp habitat (NPS 2001). In general, work in and around streams that support California freshwater shrimp shall not begin until July 1 and shall be completed by October 15. Work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from project regulators. A full description of each avoidance, minimization, and/or mitigation measure applicable to California freshwater shrimp is provided in table 3-3.

8.2.4.3 Cumulative Effects on California Freshwater Shrimp

Because the action consists entirely of federal lands, there would be no cumulative effects under the proposed action.

8.2.4.4 Conclusion

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

8.3 Effects on Critical Habitat

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

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

8.3.1 California Red-legged Frog Critical Habitat

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

8.3.2 Western Snowy Plover Critical Habitat

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

9.0 EFFECTS DETERMINATION SUMMARY

Livestock grazing has been shown to be generally compatible with, or to enhance the habitat for most federally listed species considered in this BA. However, there are known potentially adverse effects to beach layia; Sonoma alopecurus; Sonoma spineflower; Tiburon paintbrush; California red-legged frogs and their critical habitat; and western snowy plovers and their critical habitat. These effects would mostly be avoided or minimized under the proposed action through the implementation of Practice Standards and the mitigation measures described above in sections 3.2 and 3.3. NPS's proposed monitoring of listed species and their habitats, described above in section 7.2, would further ensure that any adverse effects are identified and promptly avoided, minimized, or mitigated.

Tables 9-1 and 9-2 provide a summary of the NPS effects determinations for these species, or subspecies.

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

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Beach layia	*Layia carnosa*	E	LAA	Cattle would be excluded from areas supporting nearly 90% of all known beach layia occurrences in the park, minimizing the likelihood of trampling. However, cattle could occasionally breach pasture fences and trample beach layia in protected coastal dunes (NPS, Parsons, pers. comm. 2019b). No other ranch activities would affect the species.
Marin dwarf flax	*Hesperolinon congestum*	T	NLAA	Some levels of grazing and soil disturbance may benefit the species (USFWS 2002b). Moderate livestock grazing on rare plant populations growing on serpentine soils can maintain native diversity, restrict competition from non-native grasses, and limit thatch and nitrogen accumulation (Weiss 1999; Fenn et al. 2010; Beck et al. 2015).
Showy Indian clover	*Trifolium amoenum*	E	NLAA	Although some historic locations of species may have been eliminated due to livestock, cattle currently graze half of the introduced population. It is unclear if herbivory might benefit the species by disturbing areas and reducing competition from non-native plants (USFWS 2012b), but preliminary studies have suggested that grazing could increase the species' reproduction (Jeffery 2016).
Sonoma alopecurus	*Alopecurus aequalis* var. *sonomensis*	E	LAA	Grazing reduces competition from nearby plants and may be beneficial to the species (USFWS 1998b, Ryan and Parsons 2015), but individual plants could be impacted by too little or too much grazing during certain stages of growth.
Sonoma spineflower	*Chorizanthe valida*	E	LAA	Grazing is beneficial to the species overall due to a reduction of competitive plants (Davis and Sherman 1992); however, damage from increased grazing or trampling may increase seedling mortality (USFWS 1998b).
Tiburon paintbrush	*Castilleja affinis* ssp. *neglecta*	E	NLAA	Incidental consumption of flowers and fruits by cattle could potentially negatively affect reproduction; however, cattle grazing is beneficial in keeping invasive annual grasses low (USFWS 2012a). Moderate livestock grazing on rare plant populations growing on serpentine soils can maintain native diversity, restrict competition from non-native grasses, and limit thatch and nitrogen accumulation (Weiss 1999; Fenn et al. 2010; Beck et al. 2015).

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Tidestrom's lupine	*Lupinus tidestromii*	E	NLAA	Cattle have been excluded from coastal dunes where approximately 85% known occurrence are found. Under the proposed action, cattle will be excluded from the remaining 15% of known occurrence with a new 67-acre resource protection exclusion area on the F ranch.

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

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

TABLE 9-2: EFFECT DETERMINATIONS FOR FEDERALLY THREATENED AND ENDANGERED WILDLIFE, AND DESIGNATED/PROPOSED CRITICAL HABITAT THAT ARE KNOWN OR EXPECTED TO OCCUR IN THE ACTION AREA

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
California red-legged frog	*Rana draytonii*	T	LAA	Continued cattle grazing would serve to maintain stock ponds via reduced encroachment of annual grasses and emergent vegetation that support the majority of breeding in the action area (USFWS 2002b). Excessive livestock use can remove too much emergent vegetation for species' habitat needs; nutrient loading associated with livestock use may have negative impacts on water quality; livestock trampling could crush all life stages of species (USFWS 2002b, Ford et al. 2013). Pond Restoration could result in short term impact but would preserve breeding habitat over the long term. Upland activities including livestock diversification and application of fertilizers or herbicides (IPM) could result in adverse impacts by reducing water quality or introducing contaminants. Measures to protect aquatic resources including the implementation of the Resource Protection subzone would reduce adverse impacts to this species.
California red-legged frog Critical Habitat	N/A	N/A	LAA	See above under "California red-legged frog."
Western snowy plover	*Charadrius alexandrines nivosus*	T	LAA	Ranching could potentially have indirect effects by supporting higher numbers of predatory species, especially common ravens that prey upon snowy plover eggs and chicks. Potential direct effects could result from trampling and disturbance of nesting or overwintering plovers by unauthorized livestock escaping pasture fences.
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	E	LAA	Study conducted in the park found nectar source plants were not affected and may be improved by cattle grazing; grazing effects on larval host plants is unclear. The species is found more frequently in grazed areas; livestock trampling may be a minor threat (Adams 2004, USFWS 2009b).

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
California freshwater shrimp	*Syncaris pacifica*	E	NLAA	Potential effects from ranch activities indirectly affecting water quality via nutrient loading and sedimentation. There are no direct effects from livestock because they are excluded from Olema and Lagunitas Creeks where shrimp are known to occur (USFWS 2002b).

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

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

10.0 NEED FOR REASSESSMENT BASED ON CHANGED CONDITIONS

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

11.0 LIST OF PREPARERS

Prepared by: Phil Baigas, M.S.
Joe Dalrymple, M.S.

Senior Reviewer: Spence Smith, M.A.
Rudi Byron, MURP

12.0 LITERATURE CITED

Adams, D. B.

2004 "Habitat Assessment of the Endangered Myrtle's Silverspot Butterfly." Master's Thesis. San Francisco State University.

Adams, D., M. Koenen, K. Peterlein, D. Press, and S. G. Allen

2014 *Snowy Plover Monitoring Protocol for Point Reyes National Seashore*. Version 7.1 Natural Resource Report. NPS/SFAN/NRR – 2014/850. National Park Service, Fort Collins, Colorado.

Barry, S., L. Bush, S. Larson, and L. D. Ford

2015 *Understanding Working Rangelands: The Benefits of Grazing – Livestock Grazing: A Conservation Tool on California's Annual Grasslands*. ANR Publication 8517. April 2015. Accessed February 20, 2019. http://cesonoma.ucanr.edu/files/225913.pdf

Bartolome, J. W., W. E. Frost, N. K. McDougald, and J. M. Connor

2006 *California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands*. University of California Division of Agricultural Natural Resources Rangeland Management Series Publication 8092 (Revised). 8 pp. http://anrcatalog.ucdavis.edu/Details.aspx?itemNo=8092

Bartolome, J., M. Hammond, P. Hopkinson, and F. Ratcliff

2015 *1987-2014 Residual Dry Matter Analysis Report and Updated Rangeland Monitoring Guidelines for Livestock Grazed Grasslands within Point Reyes National Seashore and Golden Gate National Recreation Area*. University of California, Berkeley, Range Ecology Lab Department of Environmental Science, Policy, and Management. Point Reyes National Seashore (PORE) Project Phase 1: CESU Task Agreement # P11AC91045. August 30, 2015. Accessed January 4, 2019. https://www.nps.gov/pore/getinvolved/upload/planning_ranch_cmp_background_report_ucberkeley_residual_dry_matter_analysis_150830.pdf

Basor, B.

2002 "Emergence, Survival, and Fecundity of the Endangered Annual *Layia carnosa* (Asteraceae)." Master's Thesis. Humboldt State University.

Beck, J. J., D. L. Hernández, J. R. Pasari, and E. S. Zavaleta

2015 "Grazing Maintains Native Plant Diversity and Promotes Community Stability in an Annual Grassland." *Ecological Applications* 25(5):1259–1270.

Becker, B., D. Press, S. Kraft, R. Foss and D. Voeller

2019 "Rationale, Workflow, and Examples for the Forage Package." Unpublished NPS Report.

Benson, S.

2004 "Draft Management Plan for Federally Endangered Beach Layia*, Layia carnosa*." Prepared for Point Reyes National Seashore, National Park Service. March 30, 2004.

Black, S. H., and D. M. Vaughan

2005 "Species Profile: *Speyeria zerene myrtleae*." In *Red List of Pollinator Insects of North America*, edited by M. D. Shepherd, D. M. Vaughan, and S. H. Black. CD-ROM Version 1 (May 2005). Portland, OR: The Xerces Society for Invertebrate Conservation. Accessed February 1, 2019. http://www.xerces.org/wp-content/uploads/2008/09/speyeria_zerene_myrtleae.pdf

Brinegar, C. and S. Baron

2008 "Molecular Phylogeny of the Pungentes subsection of Chorizanthe with Emphasis on the *C. pungens/C. robusta* Complex." Unpublished report submitted to the US Fish and Wildlife Service, Region 8, Ventura, California.

California Department of Pesticide Regulation

2006 *Notes on the Stipulated Injunction and Order for Protection of California Red-Legged Frog*. Endangered Species Program. Department of Pesticide Regulation. http://www.cdpr.ca.gov/docs/endspec/rl_frog/crlf_order.pdf

Carson, R.

2013 *Tomales Bay Wetlands Restoration and Monitoring Program 2007-2012 Final Water Quality Technical Report and Program Summary*. Tomales Bay Watershed Council Foundation prepared for California State Water Resources Control Board SRF Project No. C-06-6926-110.

CDFW (California Department of Fish and Wildlife)

2018 *State and Federally Listed Endangered, Threatened, and Rare Plants of California*. Dated August 6, 2018. Accessed October 4, 2018. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390

CNPS (California Native Plant Society)

2018 "Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39)." Accessed October 5, 2018. http://www.rareplants.cnps.org

Cox, C. and M. Surgan

2007 "Unidentified Inert Ingredients in Pesticides: Implications for Human and Environmental Health." *Environmental Health Perspectives* 114(12):1803–6. January 2007. Accessed August 2018. https://www.researchgate.net/publication/6615710_Unidentified_Inert_Ingredients_in_Pesticides_Implications_for_Human_and_Environmental_Health

Dangremond, E. M., E. A. Pardini, and T. M. Knight

2010 "Apparent Competition with an Invasive Plant Hastens the Extinction of an Endangered Lupine." *Ecology* 91(8):2261–2271.

Davis, H., and R. J. Sherman

1992 "Ecological Study of the Rare Chorizanthe valida (Polygonaceae) at Point Reyes National Seashore California." *Madroño* 39:271–280.

D'Antonio, C. M., S. Bainbridge, C. Kennedy, J. Bartolome, and S. Reynolds

2001 Ecology and restoration of California grasslands with special emphasis on the influence of fire and grazing on native grassland species. Unpubl. report to David and Lucille Packard Foundation, 62 pp. Accessed June 4, 2019. https://ucanr.edu/sites/BayAreaRangeland/files/252884.pdf

Fellers, G. M., and P. M. Kleeman

2007 "California Red-Legged Frog (Rana draytonii) Movement and Habitat Use: Implications for Conservation." *Journal of Herpetology* 41(2):276–286.

Fellers, G. M., and G. Guscio

2002 *Red-legged Frog Surveys at Giacomini Wetlands, Point Reyes National Seashore.* National Park Service Report, Point Reyes, CA.

Fellers, G. M., P. M. Kleeman, D. A. W. Miller, and B. J. Halstead

2017 "Population Trends, Survival, and Sampling Methodologies for a Population of *Rana draytonii*." *Journal of Herpetology* 51(4):567–573.

Fellers, G. M., R. A. Cole, D. M. Reinitz, and P. M. Kleeman

2017 "Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) in coastal and montane California, USA Anurans." *Herpetological Conservation and Biology* 6(3):383–394.

Fenn, M. E., E. B. Allen, S. B. Weiss, S. Jovan, L. H. Geiser, G. S. Tonnesen, R. F. Johnson, L. E. Rao, B. S. Gimeno, F. Yuan, T. Meixner, and A. Bytnerowicz

2010 "Nitrogen Critical Loads and Management Alternatives for N-impacted Ecosystems in California." *Journal of Environmental Management* 91:2404–2423.

Fleischner, T. L.

1994 "Ecological Costs of Livestock Grazing in Western North America." *Conservation Biology* 8(3): 629–644.

Fong, D.

1999 *California Freshwater Shrimp (Syncaris pacifica) Survey, Marin Co., Golden Gate National Recreation Area and Point Reyes National Seashore*. Prepared for the USFWS, Portland Regional Office. http://www.krisweb.com/biblio/marinsonoma_nps_fong_2000_99shrimp.pdf

Ford, L. D., P. A. Van Hoorn, D. R. Rao, N. J. Scott, P. C. Trenham, and J. W. Bartolome

2013 *Managing Rangelands to Benefit California Red-legged Frogs and California Tiger Salamanders*. Livermore, CA: Alameda County Resource Conservation District. http://www.rangelandconservation.com/Documents/ManagingRangelandsCRLF_CTS.pdf

Ford, L., and G. F. Hayes

2007 "Northern Coastal Scrub and Coastal Prairie." In *Terrestrial Vegetation of California*, 3rd edition, edited by M. G. Barbour, T. Keeler-Wolf, and A. Schoenherr, 180–207. Berkeley: University of California Press.

Fowler, R. C., and G. M. Fellers

1984 *Rare Plants of Point Reyes National Seashore*. Technical Report 22, Cooperative National Park Studies Unit, U.C. Davis, CA. 117 pp.

Gennet, A. S.

2004 "Experimental Introductions of the Endangered Grass Sonoma Alopecurus (*Alopecurus Aequalis Var. sonomensis*) at Point Reyes National Seashore, Marin County, CA. M.S. Thesis. University of California, Berkeley.

George, M. R., R. D. Jackson, C. S. Boyd, and K. W. Tate

2011 "A Scientific Assessment of the Effectiveness of Riparian Management Practices." In Conservation Benefits of Rangeland Practices, edited by D. D. Briske. United States Department of Agriculture Natural Resources Conservation Service. pp. 213–252.

Gong, P., G. Biging, Q. Yu, and N. Clinton

2005 *Object-Oriented Vegetation Classification at Peninsular National Parks in California with Airborne High Resolution Imagery: DAIS*. Center for Assessment and Monitoring of Forest and Environmental Resources, College of Natural Resources, University of California, Berkeley. Berkeley, CA. Accessed May 15, 2018. https://irma.nps.gov/DataStore/DownloadFile/609509

Halstead, B. J., and P. M. Kleeman

2017 "Frogs on the Beach: Ecology of California Red-Legged Frogs (*Rana draytonii*) in Coastal Dune Drainages." *Herpetological Conservation and Biology* 12:127–140. Accessed April 30, 2019. http://www.herpconbio.org/Volume_12/Issue_1/Halstead_Kleeman_2017.pdf

Huntsinger, L. J., W. Bartolome, and C. M. D'Antonio

2007 "Grazing Management on California's Mediterranean Grasslands." In California Grasslands: Ecology and Management, edited by J. Corbin, M. Stromberg, and C. D'Antonio, 223–253. Berkeley: University of California Press. https://www.researchgate.net/profile/Lynn_Huntsinger/publication/281603841_Grazing_Management_on_California%27s_Mediterranean_Grasslands/links/5624fae508aea35f268719e0/Grazing-Management-on-Californias-Mediterranean-Grasslands.pdf?origin=publication_detail

Igwe, A.

2018 *The Best of Both Soils: Plant-Microbe Interactions in Serpentine and Nonserpentine Environments.* Accessed December 12, 2018. http://cnps-scv.org/images/stories/scholarship/scholarship-igwe-plant-microbe-soil.pdf

Imper, D.

2014 *Summary Report of Beach Layia (Layia carnosa) Life History Study 2012.* October 2014.

Jeffery, D.

2016 *Final Performance Report [Showy Indian Clover Coastal Ecotype Project]*. Report on activities at Point Reyes National Seashore to US Fish & Wildlife Service.

Kelly, J. P.

2001 "Abundance and Distribution of the Common Raven and American Crow in the San Francisco Bay Area, California: The Birds." Audubon Canyon Ranch's Annual Journal, *The Ardeid* 2001:8–10.

Kelly, J. P., K. L. Etienne, and J. E. Roth

2002 "Abundance and Distribution of the Common Raven and American Crow in the San Francisco Bay Area, California." *Western Birds* 33:202–107.

Launer, A. E., D. D. Murphy, J.M. Hoekstra, and H. R. Sparrow

1992 "The Endangered Myrtle's Silverspot Butterfly: Present Status and Initial Conservation Planning." *Journal of Research on the Lepidoptera* 31(1-2):132–146.

Lewis, D. J., D. Voeller, T. L. Saitone, and K. W. Tate

2019 "Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters." *Sustainability* 11(5516): doi:10.3390/su11195516.

Line, D. E.

2003 "Changes in a Stream's Physical and Biological Conditions Following Livestock Exclusion." *Trans. ASAE* 2002, 46:287–293.

Line, D. E., W. A. Harman, G. D. Jennings, E. J. Thompson, and D. L. Osmond

2000 "Nonpoint-Source Pollutant Load Reductions Associated with Livestock Exclusion." *Journal of Environmental Quality* 29:1882–1890. doi:10.2134/jeq2000.00472425002900060022x.

Lobianco, R. M., and D. Fong

2003 "California Freshwater Shrimp (*Syncaris pacifica*) Surveys within Point Reyes National Seashore and Golden Gate National Recreation Area." NPS report for the San Francisco Bay Area Inventory and Monitoring Network (NPS) and the US Fish and Wildlife Service, Golden Gate National Recreation Area, San Francisco, CA. 35 pp.

Mack, R. N., D. Simberloff, W. M. Lonsdale, H. Evans, M. Clout, and F. A. Bazzaz

2000 *Biotic Invasions: Causes, Epidemiology, Global Consequences, and Control*. Ecological Applications 10:689–710.

Marin County

2014 *Marin County Housing Element 2015–2023.* Prepared by the Marin County Community Development Agency. Adopted by the Marin County Board of Supervisors December 9, 2014. https://www.marincounty.org/-/media/files/departments/cd/planning/housing/housing-element/marincountyhousingelement_2015_2023_certified.pdf?la=en

McClosky, W.

2015 *Plant Community Monitoring in San Francisco Bay Area National Parks.* San Francisco Bay Area Network Inventory and Monitoring Program. January 2015. Accessed April 30, 2019. https://irma.nps.gov/DataStore/DownloadFile/520918.

MMWD (Marin Municipal Water District)

2011 *Lagunitas Creek Stewardship Plan Marin Municipal Water District Final – June 2011.* 99 pp. Corte Madera, CA. https://www.marinwater.org/DocumentCenter/View/174

Murphy, D. D., and A. E. Launer

1992 *Report on the 1992 Status of Myrtle's Silverspot Butterfly, Speyeria zerene myrtleae, at the Proposed Marin Golf Ranch Site and in Surrounding Areas*. Center for Conservation Biology, Department of Biological Sciences, Stanford University.

NMFS (National Marine Fisheries Service)

2004 "Biological Opinion on the Continued Issuance of Grazing Leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California." Submitted by the R. R. McInnis, Acting Regional Administrator of National Marine Fisheries Service, Southwest Region, to D. L. Neubacher, Superintendent of Point Reyes National Seashore. April 5, 2004. Prepared by the Southwest Region Office, Long Beach, California.

NPS (National Park Service)

1980 *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan*. September 1980. Accessed September 19, 2018. https://parkplanning.nps.gov/document.cfm?parkID=303&projectID=15075&documentID=65697

1990a *Range Management Guidelines, Point Reyes National Seashore*. National Park Service—US Department of Interior. March 1990.

1990b *Range Management Handbook, Point Reyes National Seashore*. National Park Service—US Department of Interior. December 1990.

2001 *Biological Assessment on the Renewal of Livestock Grazing Permits in Point Reyes National Seashore and the North District of Golden Gate National Recreation Area, Marin County, California.* 65 pp.

2004 *Final Fire Management Plan Environmental Impact Statement for Point Reyes National Seashore and North District of Golden Gate National Recreation Area*. National Park Service. July 2004.

2006 *Management Policies 2006*. US Department of the Interior, National Park Service, Washington, DC.

2007 *Habitat Assessment of Myrtle's Silverspot Butterfly at Point Reyes National Seashore*. Pacific Coast Science and Learning Center Research Project Summary. August 2007. https://www.nps.gov/pore/learn/management/upload/rps_myrtlessilverspot_070816.pdf

2009 *Abbotts Lagoon Area Dune Restoration Plan Environmental Assessment. Point Reyes National Seashore*. January 2009.

2015a *Coastal Dune Restoration Environmental Assessment for Point Reyes National Seashore. Point Reyes National Park*. January 2015.

2015b Geographic Information Systems Data Provided by NPS. January 01, 2019.

2018 "Western Snowy Plover Breeding Summary 2017." Internal report prepared by Lau, M., T. King, and D. Press. Point Reyes National Seashore. 2 pp.

2019a "Beach layia status at Point Reyes National Seashore." U.S. Government Memorandum from Lorraine Parsons, NPS, to US Fish and Wildlife Service, Recovery Branch. May 2, 2019. 20 pp.

2019b Personal communication via comments on first internal draft EIS from L. Parsons, National Park Service, Point Reyes National Seashore, CA, to Louis Berger, Denver, CO, regarding federally listed plants. July 16, 2018.

2019c *A Natural Resource Condition Assessment for Point Reyes National Seashore*. Natural Resource Report. NPS/PORE/NRR—2019/1895. National Park Service. Fort Collins, CO.

2019d "Threatened and Endangered Vascular Plant Species Activities within the Golden Gate National Recreation Area Calendar Year 2018." Prepared by M.R. Chassé, A. Forrestel, S. Bennett, M. Burkett, and L. Stringer, for U.S. Fish & Wildlife Service, Sacramento and Ventura Offices. UPermit #: TE-036499-9 February 26, 2019.

2019e GIS data for threatened and endangered species." Received from NPS on May 8, 2019.

2019f *San Francisco Bay Area Inventory & Monitoring Network*. Accessed April 30, 2019. https://www.nps.gov/im/sfan/index.htm

2019g *Landbird Monitoring.* Accessed April 30, 2019. https://www.nps.gov/im/sfan/landbirds.htm.

2019h Personal communication via comments on first internal draft EIS from P. M. Kleeman, National Park Service, Point Reyes National Seashore, CA, regarding federally listed species. April 23, 2019.

2019i "Western Snowy Plover Breeding Summary 2019." Internal report prepared by Lau, M., T. King, and D. Press. Point Reyes National Seashore. 2 pp.

2020 Draft in Prep. *Monitoring Western Snowy Plovers at Point Reyes National Seashore, Marin County, California, 2019 Annual Report.* Prepared by M. Lau, National Park Service, Point Reyes National Seashore, Point Reyes Station, CA. March 2020.

National Oceanic and Atmospheric Administration (NOAA Fisheries)

2014 *Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices. Agronomy Technical Note No. 9*. February 2014. https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=34828.wba

Pardini, E. A., and T. M. Knight

n.d. Unpublished Data. (not seen, as cited in NPS 2015a). Point Reyes National Seashore, Point Reyes Station, CA.

Parsons, L.

2018 *Annual Report 2017 Tidestrom's Lupine (Lupinus tidestromii).* USFWS Permit TE018180-2. Point Reyes National Seashore, Marin County, California. April 2018.

2019 *Annual Report 2018 Tidestrom's Lupine (Lupinus tidestromii).* USFWS Permit TE018180-2. Point Reyes National Seashore, Marin County, California. April 2019.

Parsons, L., and A. Ryan

2018a *Annual Report 2017 Sonoma Alopecurus (Alopecurus aequalis var. sonomensis).* USFWS Permit TE018180-4. Point Reyes National Seashore, Marin County, California. March 2018.

2018b *Annual Report 2017 Sonoma Spineflower (Chorizanthe valida).* USFWS Permit TE018180-4. Point Reyes National Seashore, Point Reyes Station, CA. March 2018.

2019a *Annual Report 2018 Sonoma Alopecurus (Alopecurus aequalis var. sonomensis).* USFWS Permit TE018180-4. Point Reyes National Seashore, Marin County, California. April 2019.

2019b *Annual Report 2018 Sonoma Spineflower (Chorizanthe valida).* USFWS Permit TE018180-4. Point Reyes National Seashore, Point Reyes Station, CA. April 2019.

Pawley, A., and M. Lay

2013 *Coastal Watershed Assessment for Golden Gate National Recreation Area and Point Reyes National Seashore.* Natural Resource Report NPS/PWR/NRR—2013/641. National Park Service, Fort Collins, CO. Accessed February 2, 2018. https://irma.nps.gov/DataStore/Reference/Profile/2194043

Rilla, E., and L. Bush

2009 *The Changing Role of Agriculture at Point Reyes National Seashore.* June 2009. Revised December 2009. Accessed October 4, 2018. https://ucanr.edu/sites/uccemarin/files/31000.pdf

Robison, R.A., and S. Morey

1992 *Report to the Fish and Game Commission on the Status of Marin Dwarf Flax (Hesperolinon congestum)*. Status Report 92-2. Natural Heritage Division, California Department of Fish and Game. Sacramento, CA.

Roche, L. M., L. Kromschroeder, E. R. Atwill, R. A. Dahlgren, and K. W. Tate

2013 "Water Quality Conditions Associated with Cattle Grazing and Recreation on National Forest Lands." PLOS ONE. https://doi.org/10.1371/journal.pone.0068127

Roth, J., J. Kelly, W. Sydeman, M. Parker, and S. Allen

1999 *Ecosystem-Level Management of Common Ravens on the Point Reyes National Seashore*. Report to the Point Reyes National Seashore. Point Reyes Station, CA.

Roth, J. E., J. P. Kelly, W. J. Sydeman, and M. A. Colwell

2004 "Sex Differences in Space Use of Breeding Common Ravens in Western Marin County, California." *The Condor* 106:529–539.

Russell, W. H, and J. R. McBride

2003 "Landscape Scale Vegetation-type Conversion and Fire Hazard in the San Francisco Bay Area Open Spaces." *Landscape and Urban Planning* 64:201–208.

Ryan, A. B., and L. Parsons

2015 *Improving Habitat Management for Sonoma Alopecurus: Developing the Optimal Grazing Regime*. National Park Service Report. Point Reyes National Seashore, Point Reyes Station, CA.

2016 *Sonoma Alopecurus aequalis var. sonomensis*. USFWS Permit TE018180-4: Annual Report 2014-2015. December 2016. Point Reyes National Seashore, Point Reyes Station, CA.

2019 *Sonoma Alopecurus aequalis var. sonomensis*. USFWS Permit TE018180-4: Annual Report 2018. April 2019. Point Reyes National Seashore, Point Reyes Station, CA.

San Francisco Bay RWQCB (San Francisco Regional Water Quality Control Board)

2014 Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Improving Habitat Management for Sonoma Alopecurus: Developing the Optimal Grazing Regime." Plan. Staff Report. June 2014. Prepared by Mike Napolitano. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/lagunitascrksediment/LagunitasSedimentHabitat%20StaffReportPublicReviewDraft.pdf

2017 Clean Water Act Section 303(d) and 305(b) 2016 Integrated Report for the San Francisco Bay Region. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/303dlist.html

2018 "Renewal of Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay Watershed (Tomales Bay, Lagunitas Creek, Walker Creek, and Olema Creek) in the San Francisco Bay Region." Resolution No. R2-2018-0046. Accessed March 1, 2019. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/agriculture/grgrazi/tomalesbay_grazing.html

Schirokauer, D., T. Keller-Wolf, J. Meinke, and P. van der Leeden

2003 *Plant Community Classification and Mapping Project Final Report. Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks*. Point Reyes National Seashore, National Park Service.

Segawa, R., C. Ando, A. Bradley, J. Walters, R. Sava, C. Gana, and K. Goh

2001 *Dissipation of Off-Site Movement of Forestry Herbicides in Plants of Importance in California Tribes*. California Department of Pesticide Regulation. Sacramento, CA.

Serpa, L.

2016 *The California Freshwater Shrimp (Syncaris pacifica) in Salmonid Winter Habitat Enhancement Areas of Lagunitas Creek Watershed, Marin County, California*. Prepared for Marin Municipal Water District. 13 pp. Corte Madera, California.

Shaffer, H. B., G. M. Fellers, S. R. Voss, C. Oliver, and G. B. Pauley

2010 "Species Boundaries, Phylogeography, and Conservation Genetics of the Red-Legged Frog *(Rana attrora draytonii)* Complex." *Molecular Ecology* 13:2667–2677.

SWRCB (State Water Resources Control Board)

2010 *2010 Integrated Report (Clean Water Act Section 303(d) List/305(b) Report)*. Accessed February 13, 2015. http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

2019 *Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California—Bacteria Provisions and a Water Quality Standards Variance Policy*. February 19, 2019. 9pp. Accessed June 9, 2020. https://www.waterboards.ca.gov/bacterialobjectives/docs/bacteria.pdf

Stebbins, R. C.

2003 *A Field Guide to Western Reptiles and Amphibians.* Boston: Houghton Mifflin Company.

USDA-NRCS (US Department of Agriculture Natural Resources Conservation Service)

2014 *Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices.* Agronomy Technical Note No. 9, February 2014. Accessed January 3, 2019. https://directives.sc.egov.usda.gov/opennonwebcontent.aspx?content=34828.wba

USFWS (US Fish and Wildlife Service)

1998a *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area.* CA. Elam, D.R., D.H. Wright, and B. Goettle. Sacramento Fish and Wildlife Field Office, US Fish and Wildlife Service, Sacramento, CA. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/980930c_v2.pdf

1998b *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly.* Portland, Oregon. USFWS Region 1. Portland, OR. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/980930d.pdf

1998c *Recovery Plan for the California Freshwater Shrimp* (*Syncaris pacifica* Holmes 1895). USFWS, Portland, Oregon. 94 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/980731a.pdf

2002a *Recovery Plan for the California Red-legged Frog (Rana aurora draytonii)*. USFWS, Portland, Oregon. 173 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/020528.pdf

2002b "Formal Consultation [Biological Opinion] on the Grazing Permit Renewal Program, Point Reyes National Seashore and the Golden Gate National Recreation Area, Marin County, California." September 25, 2002. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Acting Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2001-F-0310 (formerly 1-1-01-F-310).

2006 *5-Year Review Short Form Summary for the Pacific Coast Population of Western Snowy Plover (Charadrius alexandrines nivosus)*. US Fish and Wildlife Service, Arcata Fish and Wildlife Office. Accessed March 29, 2019. https://ecos.fws.gov/docs/five_year_review/doc770.pdf

2007a *Species Account – Showy Indian Clover, Trifolium amoenum*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. Accessed October 2, 2018. https://www.fws.gov/sacramento/es_species/Accounts/Plants/Documents/showy_indian_clover.pdf

2007b *Showy Indian Clover (Trifolium amoenum*) *5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc1876.pdf

2007c *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (Charadrius alexandrinus nivosus)*. Sacramento Fish and Wildlife Field Office, US Fish and Wildlife Service, Sacramento, CA. 274 pp. Accessed September 19, 2018. https://ecos.fws.gov/docs/recovery_plan/070924.pdf

2007d *California Freshwater Shrimp (Syncaris pacifica) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc1862.pdf

2007e "Biological Opinion and Conference Opinion on the Giacomini Restoration Project at Point Reyes National Seashore in Marin County, California." September 24, 2007. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 1-1-07-F-0357.

2008 "Biological Opinion on the Kehoe Springs Development Project at Point Reyes National Seashore, Marin County, California." May 12, 2008. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Acting Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2008-F-1217.

2009a *Lupinus tidestromii (Clover lupine) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. November 2009. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc3210.pdf

2009b *Myrtle's Silverspot Butterfly (Speyeria zerene myrtle) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. January 2009. Accessed October 2, 2018. http://ecos.fws.gov/docs/five_year_review/doc2394.pdf

2009c "Formal Consultation [Biological Opinion] on the Abbotts Lagoon Area Dune Restoration at Point Reyes National Seashore in Marin County, California." June 15, 2009. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2009-F-0846.

2010a *Chorizanthe valida (Sonoma spineflower) 5-Year Review: Summary and Evaluation.* US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. August 2010. Accessed October 2, 2018. https://ecos.fws.gov/docs/five_year_review/doc3558.pdf

2010b *Biological Opinion for the Chicken Operation at Point Reyes National Seashore in Marin County, California*. April 28, 2010. Memorandum to John DiGregoia, Acting Park Superintendent, Point Reyes National Seashore, National Park Service, from Acting Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2010-F-0634.

2011a *Layia carnosa (Beach layia) Draft 5-Year Review: Summary and Evaluation.* US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3961.pdf

2011b *Hesperolinon congestum (Marin dwarf-flax) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Arcata Fish and Wildlife Office. Arcata, CA. November 2011. https://ecos.fws.gov/docs/five_year_review/doc3972.pdf

2011c *Alopecurus aequalis var. sonomensis (Sonoma alopecurus) 5-Year Review: Summary and Evaluation.* US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3898.pdf

2011d *California Freshwater Shrimp (Syncaris pacifica) 5-Year Review: Summary and Evaluation*. US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. September 2011. Accessed December 3, 2018. https://esadocs.cci-dev.org/ESAdocs/five_year_review/doc3890.pdf

2012a *Castilleja affinis spp. neglecta (Tiburon paintbrush) 5-Year Review: Summary and Evaluation.* US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. June 2012. https://ecos.fws.gov/docs/five_year_review/doc4019.pdf

2012b *Trifolium amoenum (Showy Indian Clover) 5-Year Review: Summary and Evaluation.* US Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. Sacramento, CA. June 2012. https://ecos.fws.gov/docs/five_year_review/doc4018.pdf

2014 "Section 7 Informal Consultation on the Proposed Point Reyes National Seashore Road Improvement and Maintenance Projects, Marin County, California." September 24, 2014. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Assistant Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 08ESMF00-2014-I-0609-1.

2015 "Formal Consultation on the AT&T Dune Restoration Project, Marin County, California." October 14, 2015. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 08ESMF00-2015-F-0502.

2018a "Information for Planning and Conservation (IPaC)." Accessed April 9-18, 2018. https://ecos.fws.gov/ipac/

2018b "Critical Habitat Geospatial Data." Accessed April 2018. https://ecos.fws.gov/ecp/report/table/critical-habitat.html

2018c "Formal Consultation on the Lagunitas Floodplain and Riparian Enhancement Project in Marin County, CA." August 3, 2018. Memorandum to Cicely Muldoon, Superintendent, Point Reyes National Seashore, National Park Service, from Jennifer Norris, Field Supervisor, US Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 08ESMF00-2018-F-0922.

Voeller, D., D. Lewis, B. Becker, K. W. Tate, and T. Saitone

2018 "Olema Creek Watershed Water Quality Analysis and Condition Assessment." May 31, 2018.

Wallitner, K.

2013 *Freshwater Quality Monitoring in the San Francisco Bay Area Network: 2011–2012 Biennial Report*. Natural Resource Technical Report NPS/SFAN/NRTR—2013/801. National Park Service, Fort Collins, CO.

2016 *Freshwater Quality Monitoring in the San Francisco Bay Area: 2013–2014 Biennial Report*. Natural Resource Report. NPS/SFAN/NRR—2016/1188. National Park Service. Fort Collins, CO.

Wallitner K., and A. Pincetich

2017 *Freshwater Quality Monitoring in the San Francisco Bay Area: Biennial Report on Water Years 2015 and 2016*. Natural Resource Report. NPS/SFAN/NRR—2017/1471. National Park Service. Fort Collins, CO.

Weiss, S. B.

1999 "Cars, Cows, and Checkerspot Butterflies: Nitrogen Deposition and Management of Nutrient-Poor Grasslands for a Threatened Species." *Conservation Biology* 13:1476–1486.

Yap, T. A., M. S. Koo, R. F. Ambrose, and V. T. Vredenburg

2018 "Introduced Bullfrog Facilitates Pathogen Invasion in the Western United States." *PLoS ONE* 13(4). https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0188384

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Attachment A: Figures

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

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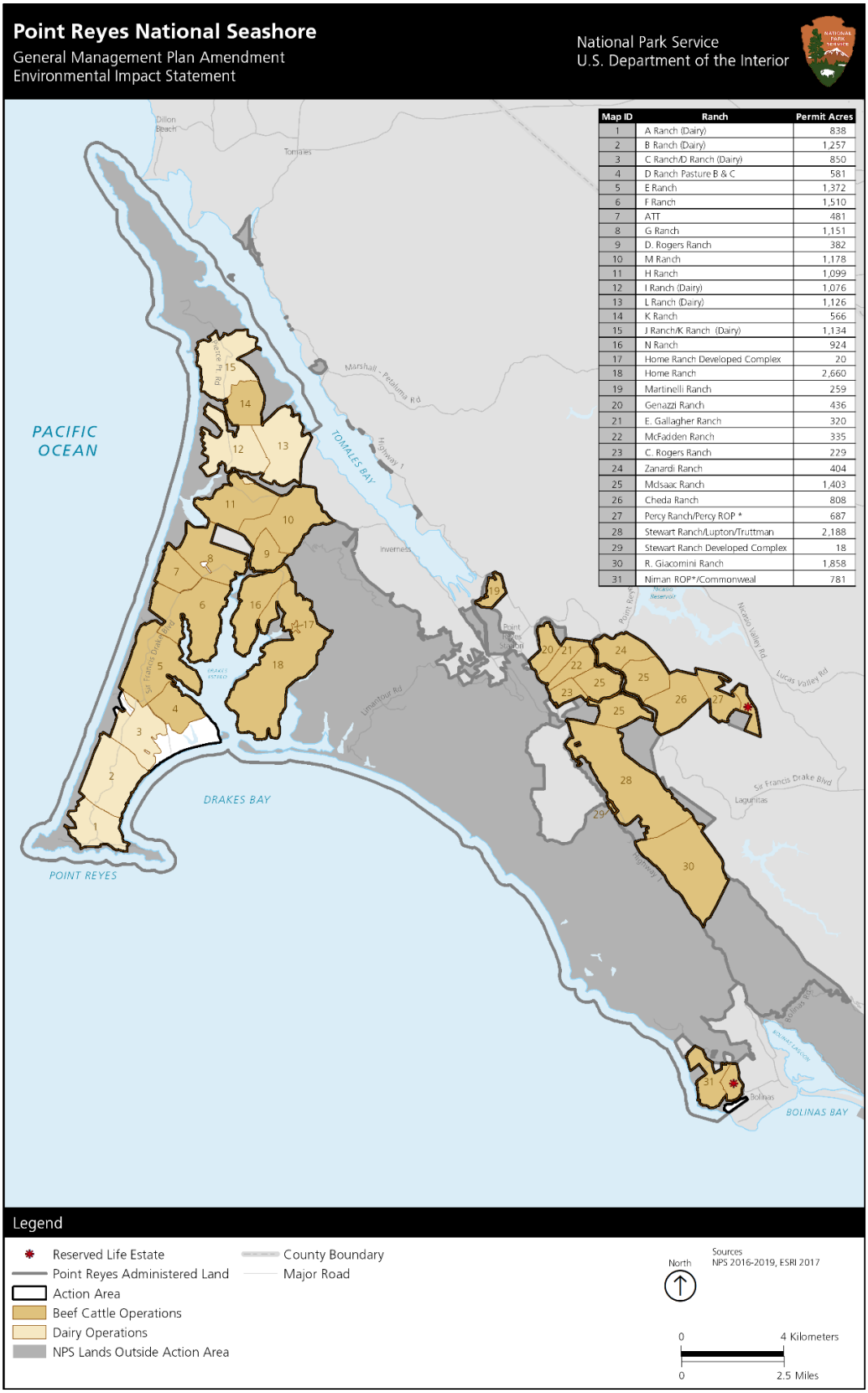
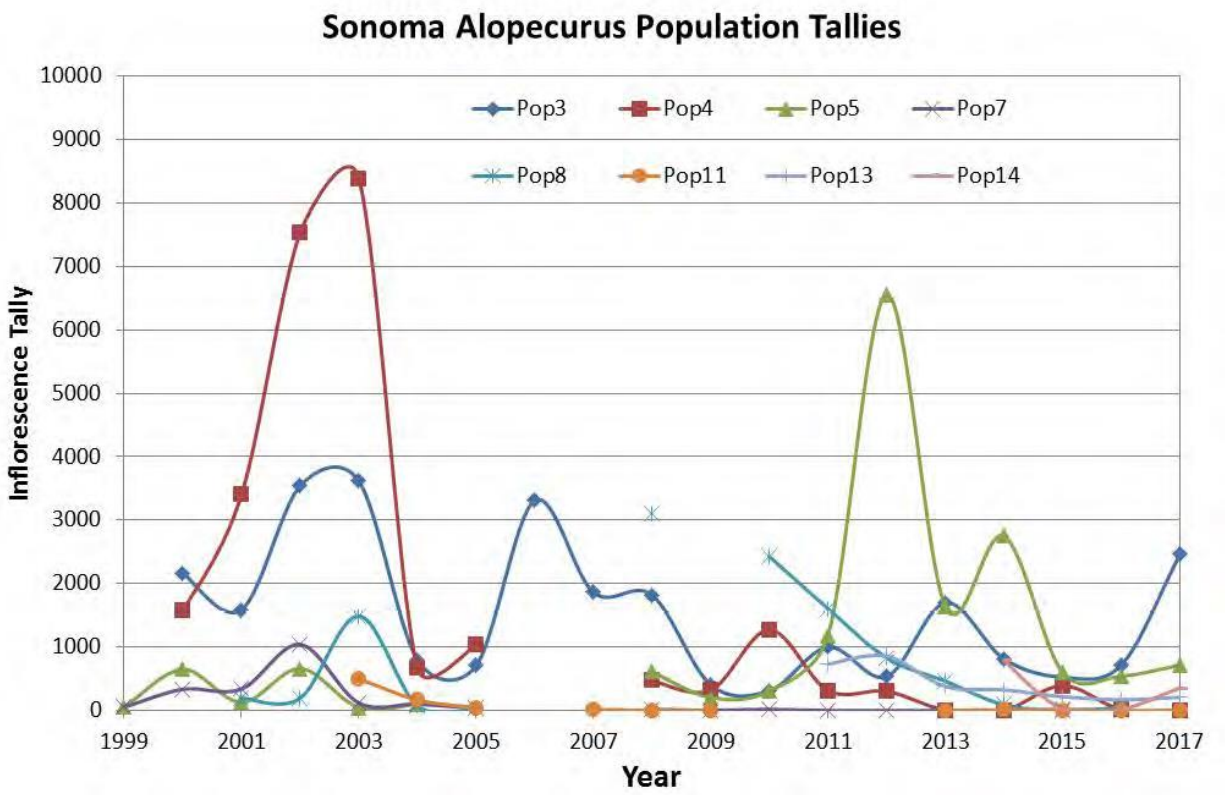
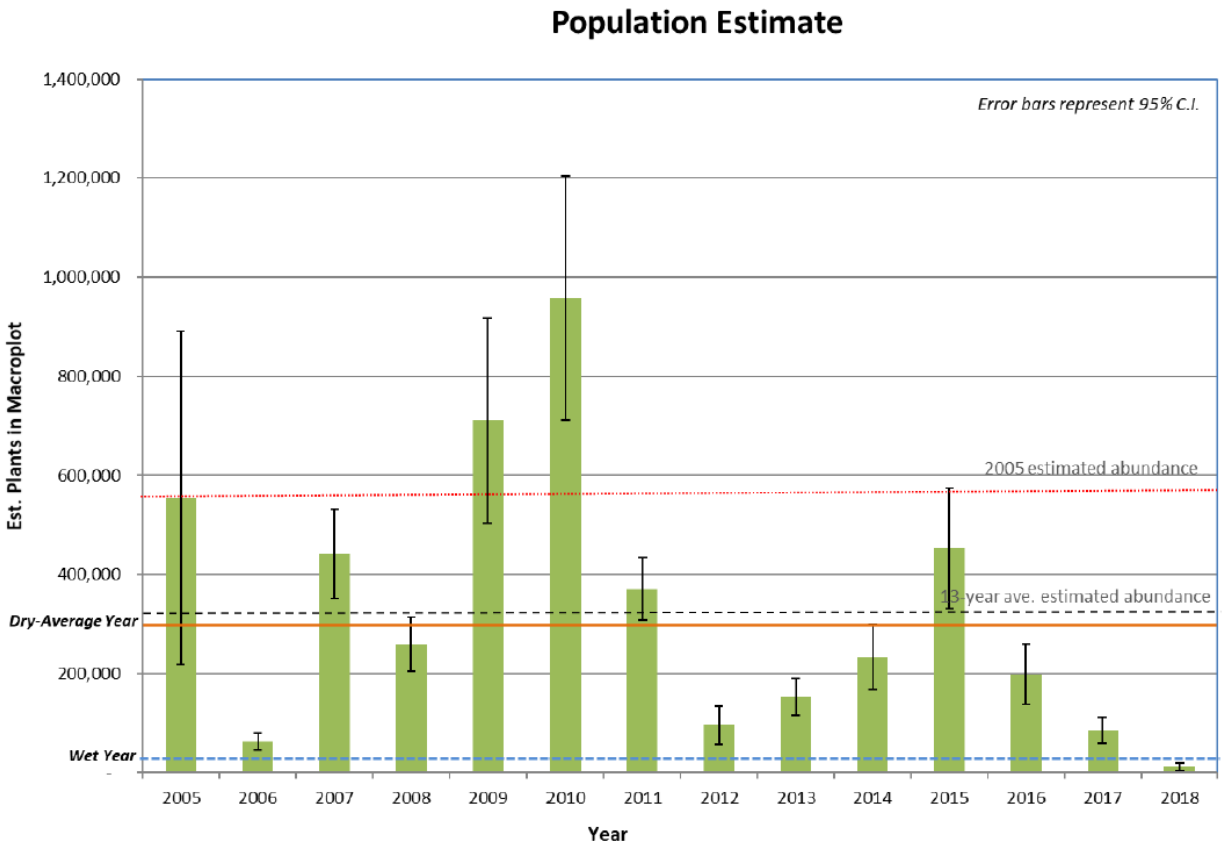


Figure 1: Map of beef and dairy ranches in the action area



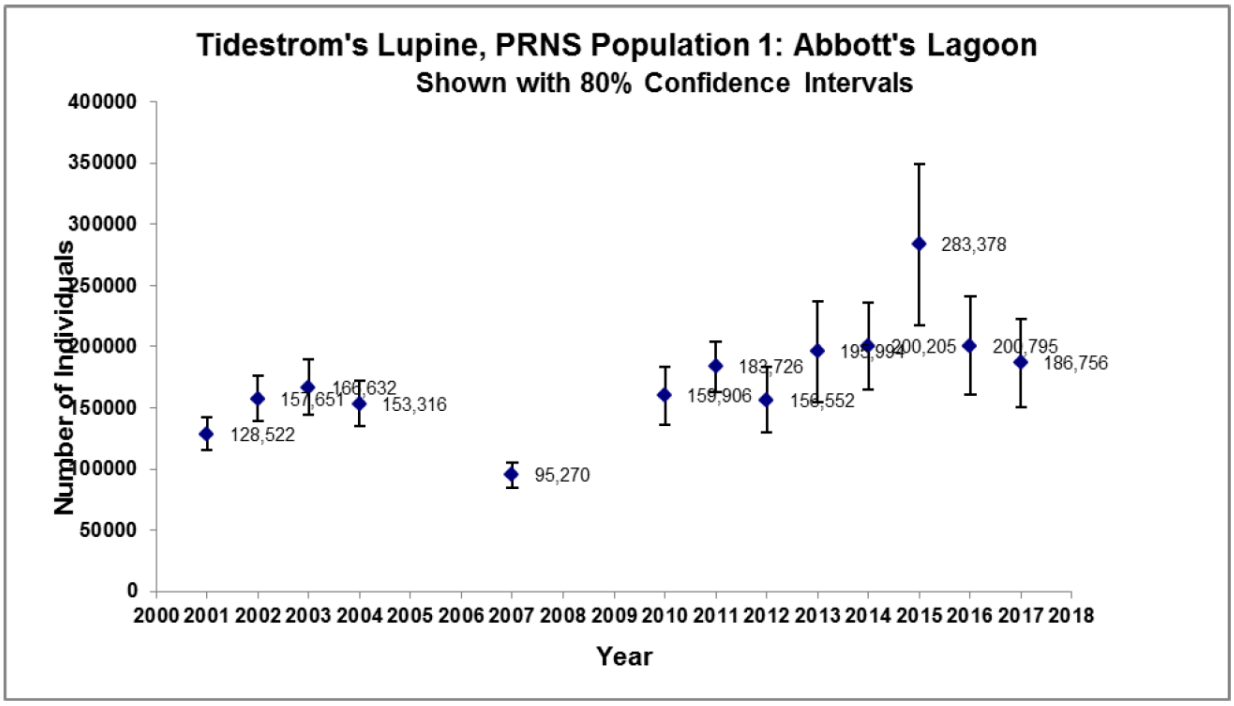
Source: Parsons and Ryan (2019a)

Figure 5: Sonoma alopecurus inflorescence tallies by population between 1999 and 2016



Source: Parsons and Ryan (2019b)

Figure 7: Estimated population abundance of Sonoma spineflower, with 95% CI, in the microplot during monitoring of the main wild population on the G ranch, from 2005 to 2018



Source: Parsons (2019)

Figure 9: Estimated number of individual Tidestrom's lupine plants in Population 1 (Abbotts Lagoon), the largest population in the action area

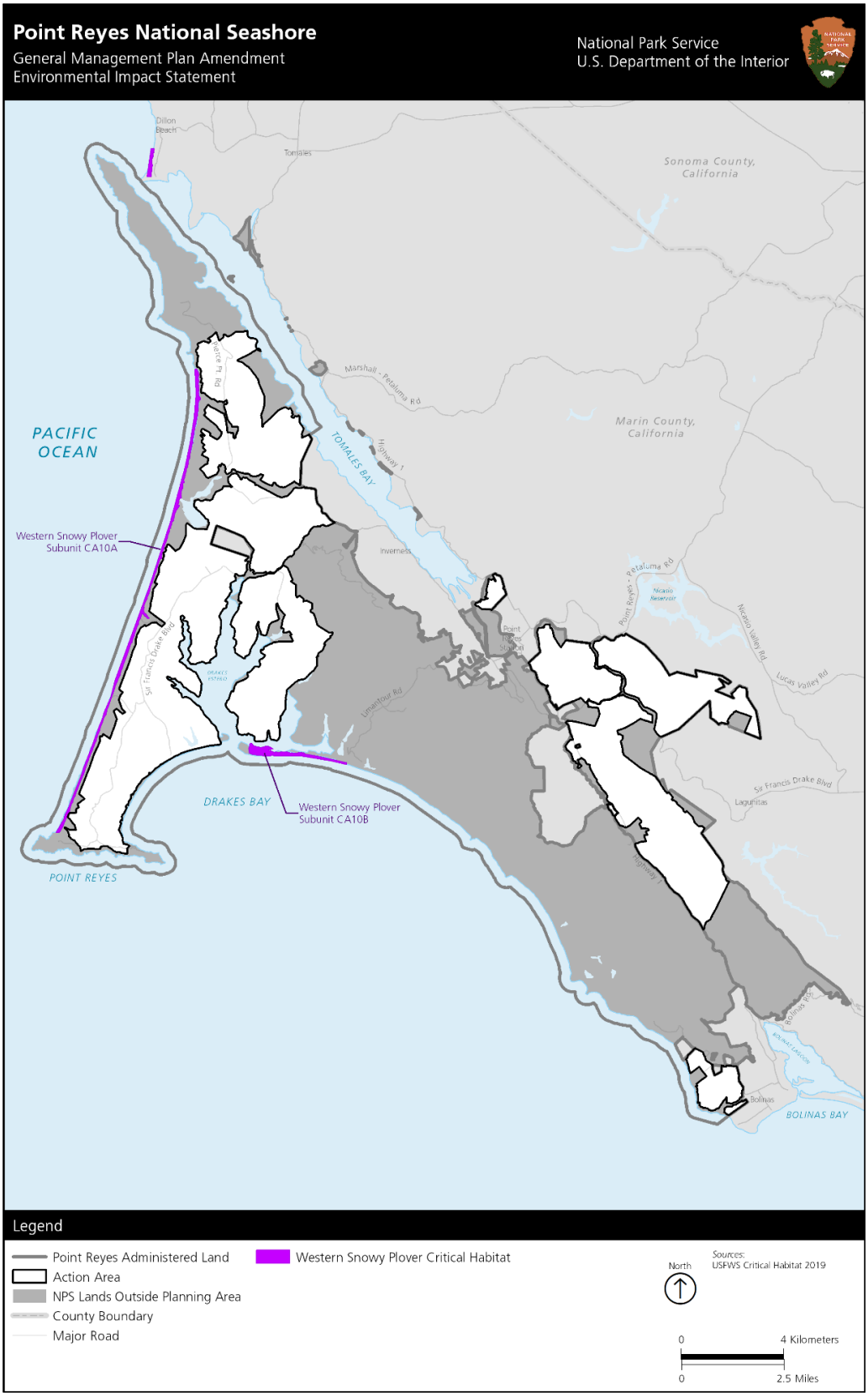


Figure 11: Western snowy plover critical habitat in the action area

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Attachment B: USFWS Information for Planning and Conservation Report

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

IPaC resource list

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

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

Location

Marin County, California

Local office

Sacramento Fish And Wildlife Office

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

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

Endangered species

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

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

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

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

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

Listed species

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

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

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

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

Birds

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

Reptiles

NAME	STATUS
Green Sea Turtle Chelonia mydas No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby Eucyclogobius newberryi There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Myrtle's Silverspot Butterfly Speyeria zerene myrtleae No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6929	Endangered
San Bruno Elfin Butterfly Callophrys mossii bayensis There is **proposed** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3394	Endangered

Crustaceans

NAME	STATUS
California Freshwater Shrimp Syncaris pacifica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7903	Endangered

Flowering Plants

NAME	STATUS
Baker's Larkspur *Delphinium bakeri* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5031	Endangered
Beach Layia *Layia carnosa* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6728	Endangered
Clover Lupine *Lupinus tidestromii* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4459	Endangered
Marin Dwarf-flax *Hesperolinon congestum* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5363	Threatened
Robust Spineflower *Chorizanthe robusta var. robusta* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/9287	Endangered
Showy Indian Clover *Trifolium amoenum* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6459	Endangered
Sonoma Alopecurus *Alopecurus aequalis var. sonomensis* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/557	Endangered
Sonoma Spineflower *Chorizanthe valida* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7698	Endangered
Tiburon Paintbrush *Castilleja affinis ssp. neglecta* No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2687	Endangered
Yellow Larkspur *Delphinium luteum* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3578	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
California Red-legged Frog Rana draytonii https://ecos.fws.gov/ecp/species/2891#crithab	Final
Marbled Murrelet Brachyramphus marmoratus https://ecos.fws.gov/ecp/species/4467#crithab	Final
Northern Spotted Owl Strix occidentalis caurina https://ecos.fws.gov/ecp/species/1123#crithab	Final
Tidewater Goby Eucyclogobius newberryi https://ecos.fws.gov/ecp/species/57#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act [1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be

found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Oystercatcher Haematopus bachmani This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15

Black Scoter Melanitta nigra — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Skimmer Rynchops niger — Breeds May 20 to Sep 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5234

Black Swift Cypseloides niger — Breeds Jun 15 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8878

Black Turnstone Arenaria melanocephala — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Black-chinned Sparrow Spizella atrogularis — Breeds Apr 15 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9447

Black-legged Kittiwake Rissa tridactyla — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black-vented Shearwater Puffinus opisthomelas — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Bonaparte's Gull Chroicocephalus philadelphia — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Brown Pelican Pelecanus occidentalis — Breeds Jan 15 to Sep 30
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/6034

Burrowing Owl Athene cunicularia — Breeds Mar 15 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9737

California Spotted Owl Strix occidentalis occidentalis — Breeds Mar 10 to Jun 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/7266

Clark's Grebe Aechmophorus clarkii — Breeds Jan 1 to Dec 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Loon gavia immer — Breeds Apr 15 to Oct 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4464

Common Murre Uria aalge — Breeds Apr 15 to Aug 15
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Common Tern Sterna hirundo — Breeds May 10 to Sep 10
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4963

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Double-crested Cormorant phalacrocorax auritus — Breeds Apr 20 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/3478

Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Herring Gull *Larus argentatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 20 to Aug 31
Lawrence's Goldfinch *Carduelis lawrencei* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9464	Breeds Mar 20 to Sep 20
Least Tern *Sterna antillarum* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 20 to Sep 10
Lewis's Woodpecker *Melanerpes lewis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Long-billed Curlew *Numenius americanus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Marbled Godwit *Limosa fedoa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere

Mountain Plover Charadrius montanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3638

Northern Fulmar Fulmarus glacialis — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Northern Gannet Morus bassanus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Parasitic Jaeger Stercorarius parasiticus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Pink-footed Shearwater Puffinus creatopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Pomarine Jaeger Stercorarius pomarinus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red Phalarope Phalaropus fulicarius — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-breasted Merganser Mergus serrator — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-necked Phalarope Phalaropus lobatus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-throated Loon Gavia stellata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Ring-billed Gull Larus delawarensis — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Scripps's Murrelet Synthliboramphus scrippsi — Breeds Feb 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

South Polar Skua Stercorarius maccormicki — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Spotted Towhee Pipilo maculatus clementae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4243	Breeds Apr 15 to Jul 20
Surf Scoter Melanitta perspicillata This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Tricolored Blackbird Agelaius tricolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3910	Breeds Mar 15 to Aug 10
Whimbrel Numenius phaeopus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9483	Breeds elsewhere
White-winged Scoter Melanitta fusca This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wrentit Chamaea fasciata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10
Yellow Rail Coturnicops noveboracensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9476	Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Allen's Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

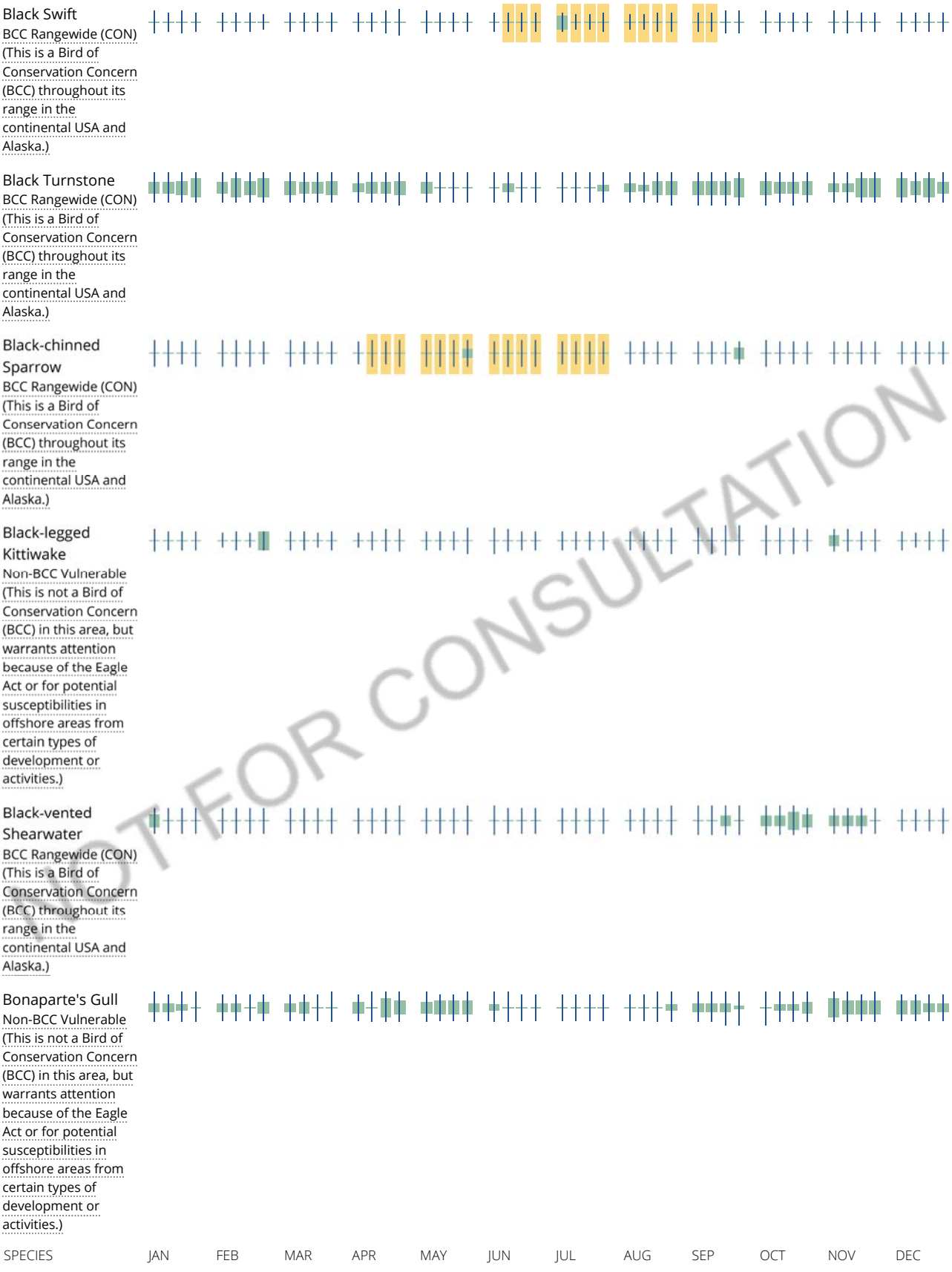
Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for *potential* susceptibilities in offshore areas from certain types of development or activities.)

Black Oystercatcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

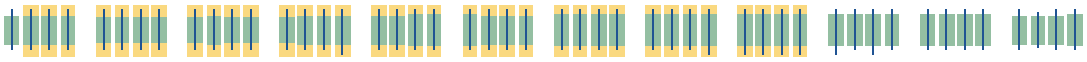
Black Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Black Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

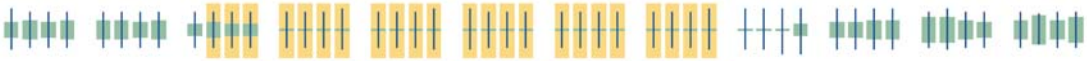
Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Brown Pelican
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

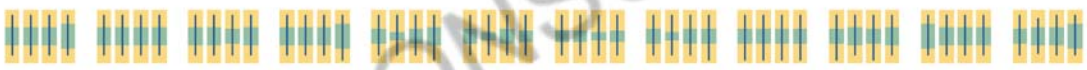


Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



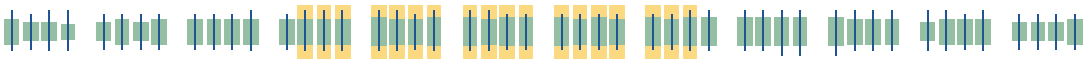
California Spotted Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

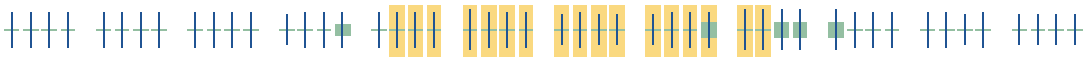


Common Loon
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

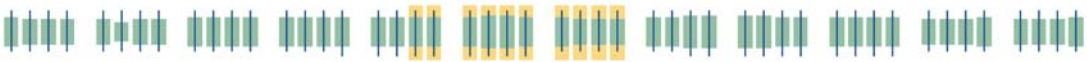
Common Murre
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



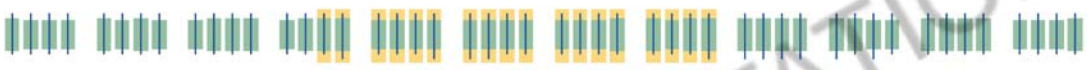
Common Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

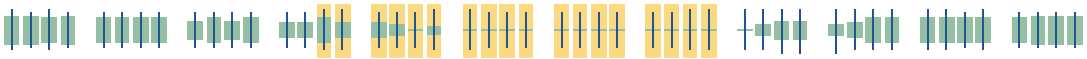


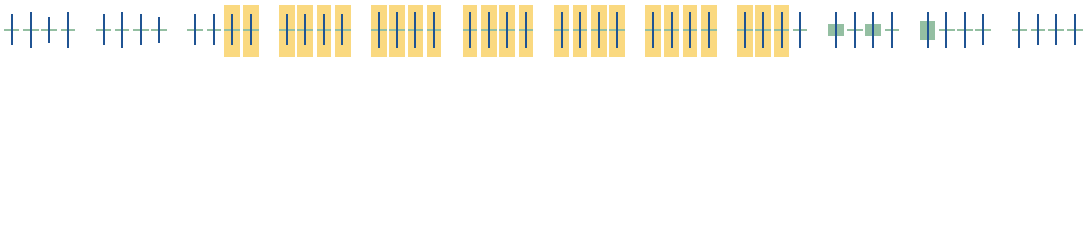
Double-crested Cormorant
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

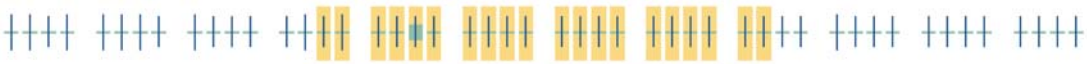
Herring Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)





Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

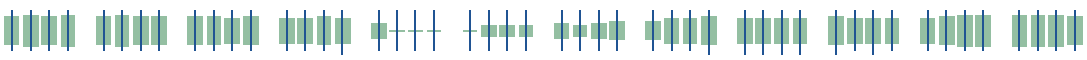


Least Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-tailed Duck
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Mountain Plover
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Northern Fulmar
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Northern Gannet
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Parasitic Jaeger
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Pink-footed Shearwater
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

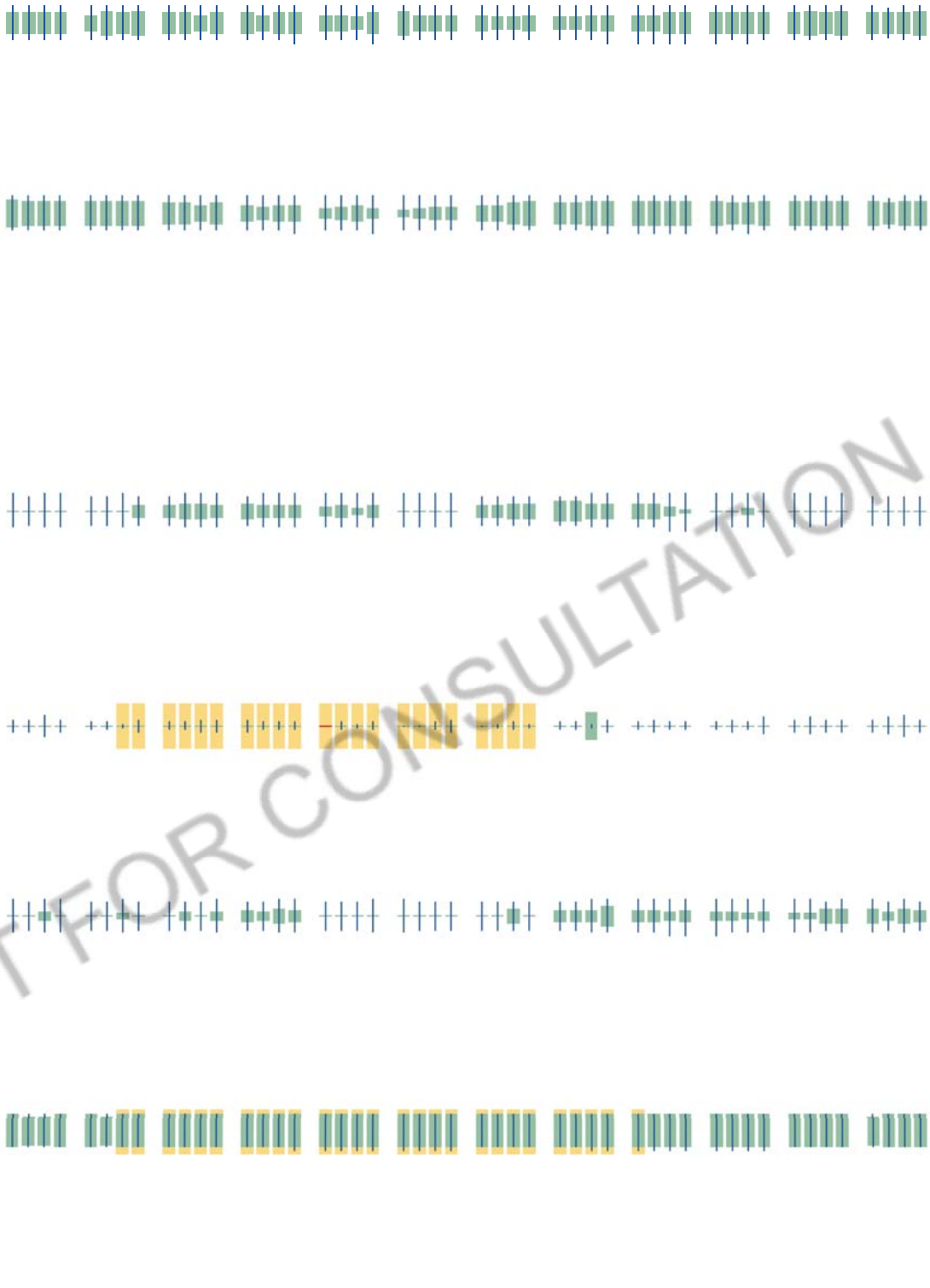
SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Pomarine Jaeger
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red Phalarope
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red-breasted Merganser
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red-necked Phalarope
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Red-throated Loon
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Ring-billed Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Scripps's Murrelet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

South Polar Skua
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Surf Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

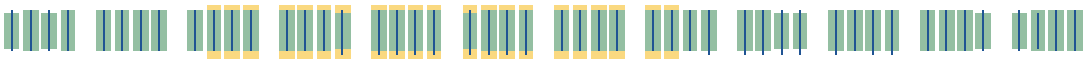
Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

White-winged Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Yellow Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey

effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE DEEPWATER

E1UBL

ESTUARINE AND MARINE WETLAND

E2USN

E2EM1N
E2EM1/USN
E2EM1P
E2USP

FRESHWATER EMERGENT WETLAND

PEM1C
PEM1A
PEM1Fh
PEM1Ch
PEM1R
PEM1Ah
PEM1/USCh
PEM1T
PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

PFOC
PSSC
PSSA
PSSCh
PFOA
PSSR
PSSB

FRESHWATER POND

PUBHh
PUBFh
PUSCh
PABHh
PUBF
PUBH
PAB/UBHh

LAKE

L1UBH

RIVERINE

R4SBC
R5UBF
R2UBH
R3UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX O—BIOLOGICAL ASSESSMENT – NATIONAL MARINE FISHERIES SERVICE

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National Park Service
U.S. Department of the Interior

POINT REYES NATIONAL SEASHORE

GENERAL MANAGEMENT PLAN AMENDMENT ENVIRONMENTAL IMPACT STATEMENT

BIOLOGICAL ASSESSMENT

Prepared for:
National Marine Fisheries Service

September 2020

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TABLE OF CONTENTS

LIST OF TABLES

ATTACHMENTS

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AU	animal unit
AUE	animal unit equivalent
BA	biological assessment
BMP	best management practice
BO	biological opinion
CC	California Coastal (Chinook salmon ESU)
CCC	Central California Coast (coho salmon DPS and steelhead trout DPS)
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
DO	dissolved oxygen
DPS	Designated Population Segment
EIS	environmental impact statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FR	*Federal Register*
GMP	general management plan
IPM	integrated pest management
mg/L	milligrams per liter
MMWD	Marin Municipal Water District
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
north district of Golden Gate	North District of Golden Gate National Recreation Area
NPS	National Park Service
park	Point Reyes National Seashore and North District of Golden Gate National Recreation Area
Point Reyes	Point Reyes National Seashore
RDM	residual dry matter
ROA	ranch operating agreements
San Francisco Bay RWQCB	Regional Water Quality Control Board

SFAN	San Francisco Area Network
SPAWN	Salmon Protection and Watershed Network
SWRCB	State Water Resources Control Board
TMDL	total maximum daily load
UC	University of California
U.S.C.	United States Code
USDA	US Department of Agriculture
USDA-NRCS	US Department of Agriculture, Natural Resources Conservation Service
USEPA	US Environmental Protection Agency
USFWS	US Department of the Interior, Fish and Wildlife Service

1.0 INTRODUCTION

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

1.1 Purpose of this Biological Assessment

This biological assessment (BA) has been prepared to complete consultation with NMFS under section 7 of the ESA for the NPS's 2019 Environmental Impact Statement (EIS) for a General Management Plan (GMP) Amendment for Point Reyes National Seashore (Point Reyes) and north district of Golden Gate National Recreation Area (north district of Golden Gate) (collectively referred to as the park). This BA analyzes the potential effects of the proposed action in sufficient detail to determine to what extent the proposed activities may affect species listed under the ESA as threatened, endangered, or proposed species, and their critical habitat. This BA addresses the federally listed plant and animal taxa and their critical habitat under the jurisdiction of NMFS, meeting the following criteria:

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

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

1.2 Current Management Direction

The *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980) designates a "Pastoral Lands" zone "to permit the continued use of existing ranchlands for ranching and dairying purposes." In 1990, NPS adopted the *Range Management Guidelines* (NPS 1990a) in response to countywide concerns about flooding and large-scale erosion control in the early 1980s. NPS has updated and adapted authorizations based on this guidance and other best available science. Recently, NPS contracted with the University of California (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.

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. RDM monitoring is conducted annually. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review and update the RDM monitoring program. The UC report (Bartolome et al. 2015) analyzed 25 years of park RDM monitoring data and concludes that the minimum 1,200 pounds/acre standard is appropriate based on the RDM guidelines developed by UC researchers for coastal prairie (Bartolome et al. 2006), but the report also notes that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. Bartolome et al. (2015) also recommend expanded use of visual RDM mapping across pastures to better inform overall management of the ranched lands. Updated monitoring protocols based on the UC Berkeley Range Ecology Lab review have been in place since 2015. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available as appendix E of the EIS.

In addition to RDM, 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. NPS has also established forage productivity plots on a subset of ranches that are monitored in spring to aid in determination of stocking rates.

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

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

- ESA of 1973, as amended
- Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended
- 1916 NPS Organic Act
- NPS General Authorities Act of 1978

- *NPS Management Policies* 2006 (NPS 2006)
- National Environmental Planning Act (NEPA)
- Taylor Grazing Act of 1943
- *1980 Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan* (NPS 1980)
- *Recovery Strategy for California Coho Salmon* (CDFW 2004)
- *Recovery Plan for the Evolutionarily Significant Unit of Central California Coast Coho Salmon* (NMFS 2012)
- *Coastal Multispecies Final Recovery Plan: California Coastal Chinook Salmon Evolutionarily Significant Unit (ESU), Northern California Steelhead Trout Designated Population Segment (DPS) and Central California Coast Steelhead Trout DPS* (NMFS 2016a)
- *Pacific Coast Salmon Fishery Management Plan* (Pacific Fishery Management Council 2016)
- *Steelhead Trout Restoration and Management Plan for California* (CDFW 1996)

2.0 CONSULTATION HISTORY

The NPS has consulted with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act. The Draft BA was transmitted to NMFS on August 8, 2019, with the release of the draft EIS. On August 22, 2019, NMFS requested additional information from the park. The park hosted a site visit for NMFS staff on September 12, 2019, and responded to the information request on September 20, 2019. On October 25, 2019, the NMFS informed the NPS that they were initiating Technical Assistance/Pre-consultation on the NPS request and that they would initiate formal consultation once the final proposed action is submitted.

As part of the planning process, park ranchers requested applicant status under Section 7 of the Endangered Species Act. In coordination with the USFWS and NMFS, the NPS hosted a Rancher Applicant meeting at the park headquarters on January 23, 2020. The purpose of the meeting was to provide rancher applicants an update regarding the agency Technical Assistance/Pre-consultation phase, process for USFWS and NMFS consultation, and what the applicant's role would be during that consultation process.

3.0 DESCRIPTION OF THE PROPOSED ACTION

3.1 Location and Background

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

The detailed history of agricultural land in the park is described in chapter 1 of the EIS. Currently, approximately 18,000 acres (20%) of Point Reyes and 10,000 acres (60%) of the north district of Golden Gate are used for beef and dairy ranching under agricultural lease/permits. Twenty-four families hold lease/permits for beef cattle and dairy operations, and approximately 2,400 animal units (AU) of livestock

on beef ranches and 3,325 dairy animals are currently authorized under existing lease/permits (attachment A, figure 1). Eighteen lease/permits include residential uses specific to on-site ranch operations.

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-ranging 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, the Settlement Agreement preserves NPS's right to give full consideration to other potential action alternatives. It also allows NPS to consider agricultural diversification, increased operational flexibility, promotion of sustainable operational practices, succession planning, and similar ranch management practices as part of any action alternative except the no ranching alternative.

NPS prepared an EIS for the GMP Amendment that evaluates the potential impacts of agricultural diversification, increased operational flexibility, ranch and dairy succession planning, and similar ranch management practices as part of several action alternatives. The purpose of the EIS is to establish guidance for the preservation of natural and cultural resources and the management of infrastructure and visitor use in the action area. In this context, the EIS addresses the future management of leased ranchlands and tule elk in the action area.

3.2 Proposed Action

Alternative B is identified as the NPS preferred alternative in the final EIS and is the proposed action for the BA. The following text provides an overview of the proposed action. See chapter 2 of the EIS for a complete description of all elements.

3.2.1 General Description and Zoning

Under the proposed action, NPS would amend the 1980 GMP by adopting a new zoning framework and new programmatic management direction for the action area. NPS would allow for continued multi-generational ranching and establish a population threshold for management of the Drakes Beach tule elk herd.

NPS would apply two new management zones, the Ranchland zone and the Scenic Landscape zone, to the action area. This new zoning would amend the 1980 GMP by replacing the Special Use-Pastoral Lands and Pastoral Landscape Management zones in the action area with these zones (figure 7 in appendix A of the EIS). New opportunities and improvements to facilitate public use and enjoyment in the action area would be implemented in both the Ranchland and Scenic Landscape zones. NPS would also establish a new framework for managing visitor capacity that establishes indicators and thresholds for the action area.

Like the Special Use-Pastoral Lands and Pastoral Landscape Management zones from the 1980 GMP, multi-generational ranching activities would be considered an appropriate use in the Ranchland zone. Ranching activities would only be authorized in the Ranchland zone. NPS would implement a subzoning framework that would authorize specific activities based on resource management goals and objectives as

described in the "Ranch Operations" section below. Continued occupancy and use of existing lease/permit areas for multi-generational ranching would occur according to the management strategies identified in table 3-1 for ranchlands and in support of desired conditions. Of the 28,700 acres in the action area, 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. These areas would be rezoned from the Natural Environment, Special Use, and Deferred Acquisition zone and the Natural Landscape Management zone to the new Ranchland zone. This zoning change is consistent with longstanding use patterns. These lands have been actively ranched before and after their acquisition by NPS and since the completion of the 1980 GMP. In total, 28,100 acres would be allocated to the Ranchland zone; however, not all 28,100 acres would be under lease/permit.

The Scenic Landscape zone would apply to 600 acres that are in the action area but not part of any existing ranch lease/permit, including the primary range of the Drakes Beach herd. These lands had been zoned as part of the Pastoral Lands zone in the 1980 GMP.

Beef and dairy cattle operations would continue to operate in the Ranchland zone as described in the "Ranching Overview" section in chapter 2 of the EIS. NPS would issue lease/permits with up to 20-year terms to the existing families to continue ranching operations on approximately 26,100 acres (see figure 8 in appendix A of the EIS). Each ranch would be managed pursuant to an agricultural lease/permit and associated ranch operating agreement (ROA), which would be an exhibit to the lease/permit. The ROA would identify ranch-specific operational details and requirements associated with (1) beef or dairy ranching (as applicable); (2) authorized diversification activities; and (3) maintenance requirements.

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. Elements specific to the proposed action are described below.

3.2.2 Preservation of Area Resources

GMPs are required to articulate measures for the preservation of an area's resources. Table 3-1 outlines the detailed management strategies that NPS would adopt to achieve the desired conditions related to the preservation of park resources in the action area. For each desired condition, the table outlines management strategies that NPS would adopt for all lands in the action area; additional management strategies taken on lands in the Ranchland zone; and additional management strategies taken on lands in the Scenic Landscape zone. Some of these strategies could require further 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 action area. Only those desired conditions that have implications for species and habitats included in this BA are described.

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TABLE 3-1: STRATEGIES FOR THE PRESERVATION OF AREA RESOURCES

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
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, and 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 on ecological functions.	Range, Pasture, and Ranch Core subzone* ▪ Incorporate applicable US Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Practice Standards and mitigation measures from appendix F 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. ○ Monitoring data would facilitate adaptive management to protect valued resources. ▪ Incorporate management actions that promote habitat heterogeneity, connectivity, and species that are considered ecosystem engineers into individual ROAs as appropriate. Resource Protection subzone* ▪ Identify disturbance regimes that may need to be maintained by management. ○ Targeted Grazing could be used to maintain rare and endangered habitat and species. ○ May require increased effort in management, early detection, and additional IPM strategies. *For definitions of subzones, please see “Subzoning Framework” section, below.	▪ 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. ○ Use Targeted Grazing to maintain rare and endangered habitat and species. Future implementation planning may be needed to determine specific locations. ▪ Increase effort in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.
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 action area. Use monitoring data to target areas for improvement. Implement practices to reduce impacts on 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. ○ Reduce and shield artificial light sources to protect natural night skies and minimize human-caused intrusions to natural soundscapes. ○ Locate and design visitor use improvements to minimize contributions to air, water, and noise pollution. ○ Monitor and minimize noise/unnatural sounds that adversely affect action area resources or values or visitors’ enjoyment of them. ○ Consider noise pollution in the procurement and use of equipment.	▪ Incorporate USEPA, state, and Regional Water Quality Control Board requirements into individual ROAs, including implementation of water quality improvement practices, monitoring, Manure and Nutrient Management, and grazing management. Regulations include total maximum daily loads and associated grazing waivers in the Tomales Bay watershed, as well as waste discharge requirements or waivers of discharge requirements for confined animal facilities. ▪ Evaluate lighting on all ranch buildings and noise from farm machinery and equipment to determine best practices and incorporate relevant mitigation measures from appendix F 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. ○ Monitoring data would facilitate adaptive management to protect valued resources. ○ RDM monitoring would be used to ensure the vegetation cover necessary to minimize soil erosion. ▪ Continue to seek funding and partnerships to implement water quality improvement projects on grazing lands.	▪ Prioritize implementation of water quality improvement practices, water monitoring, and restoration to mitigate for ongoing water quality impacts associated with historical ranch operations.

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
▪ Conduct operations in compliance with federal, state, and local air quality regulations and minimize air quality pollution emissions associated with operations in the action area.		
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 action 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 using 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.	Range, Pasture, and Ranch Core subzone* ▪ 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. Resource Protection subzone* ▪ Implement management actions such as Targeted Grazing, which benefit species in the absence of grazing. **For definitions of subzones, please see “Subzoning Framework” section, below.	▪ Implement management actions such as Targeted 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. ▪ Maintain a viable population of free-ranging tule elk in Point Reyes. 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.	▪ Identify disturbance regimes that may need to be maintained by management. ▪ Implement management actions such as Targeted Grazing and stock pond maintenance, which benefit species in the absence of ranching. ▪ Increase efforts in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.

Management Strategies on All Lands in the Action Area	Additional Management Strategies in the Ranchland Zone	Additional Management Strategies in the Scenic Landscape Zone
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.		
▪ Use Early Detection and Rapid Response to prevent introductions of non-native species. Monitoring by ranchers, NPS staff, partners, and volunteers 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. ▪ Use 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 action area.	▪ Ranchers and their employees would comply with individual ROAs to prevent accidental introductions and manage non-native species of concern.	▪ Increase efforts in management and early detection and adapt IPM strategies for areas where ranching is no longer occurring.

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3.2.3 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 action 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. The approaches identified in this section are applicable to both the Ranchland zone and the Scenic Landscape zone. Adopting these strategies and actions would amend the 1980 GMP by providing revised guidance and management direction for visitor use for the action area.

Many of the specific strategies and project recommendations described below would be accomplished over time and would be subject to available funding. Development proposals, including but not limited to, new trail connections and parking improvements would occur over the next 20 years and would require additional site-specific review and compliance, including NEPA and NHPA compliance and cost estimates before project implementation could occur.

3.2.3.1 Development of Trails and Trail-Based Recreation

NPS would strive to improve hiking, biking, and equestrian access in the action area through enhanced trail connections. Lands in the action 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 action area would be on expanding access for multi-use trails. Trail-based recreation opportunities offering more solitude exist outside the action area in wilderness areas of the park. However, individual trails in the action area could 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 and on methods to ensure minimal disruption to ranch operations (e.g., self-closing or spring-loaded swing gates with simple signage that would help ensure that gates are closed once people pass through). NPS would 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 action 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 explore opportunities to facilitate larger, regional trail connections to the action area from outside the park and improve trail connectivity for

pedestrians, equestrians, and bicyclists. Examples of opportunities include connecting the Cross Marin Trail to routes through the park.

Appendix H of the EIS: 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).

3.2.3.2 Development to Support Day Use and Overnight Accommodations

NPS would look for opportunities to expand day use and overnight accommodations in the action area, with a focus on previously developed areas, such as former ranch complexes, and would prioritize the adaptive use of historic buildings to support these uses 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. Potential day use and overnight opportunities that NPS would consider in the action 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 and hike-in camping sites with limited services and amenities
- 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)
- 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 use at the RCA Receiving Station

3.2.3.3 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 action area and would collaborate with ranchers and other park partners, such as Point Reyes National Seashore Association or park concessioners, on interpretive messaging, programs, and other techniques to share the story of multi-generational ranching in the park. As ranch operations diversify and engage in additional public serving activities, NPS would collaborate with ranchers to identify opportunities to integrate interpretive and educational messaging and programming. Selected waysides could 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 consider establishing a trailhead on Sir Francis Drake Boulevard and use of 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.

3.2.3.4 Development Related to Shuttles and Parking

NPS would continue to maintain the existing basic transportation network in the action area. No new roads or significant changes to circulation patterns are envisioned. Marin County and the State of California would continue to serve as leads for roads within their respective jurisdictions in the action area. NPS would

continue to work with Marin County on maintenance and improvements for Pierce Point Road and Sir Francis Drake Boulevard and would similarly work with the State of California for State Route 1.

NPS may continue to use shuttle or other operational strategies to manage traffic and crowding issues at various locations in the park and 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.

3.2.4 Ranch Operations

3.2.4.1 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 28,100-acre Ranchland zone that would define the Resource Protection, Range, Pasture, and Ranch Core subzones. This subzoning framework was developed based on analysis of topography and existing sensitive resource information. By implementing a subzoning framework, NPS can better ensure resource protection by identifying the most appropriate locations for ranch activities. Appendix J of the EIS provides the methods used to develop the initial mapping estimates for each subzone. The area of each subzone would differ by ranch, based on site topography and the presence of wetlands, rare plants, and other sensitive resources. Ranch-specific subzoning maps are provided in figures 9 through 32 in appendix A of the EIS. NPS may make technical revisions to the zone maps based on additional monitoring, surveys or on-the-ground field verification efforts (see appendix J of the EIS). These maps would also continue to be refined in collaboration with ranchers, including delineating the clear boundary of each Ranch Core subzone. Section 3.2.4.5 identifies specific diversification activities that would be authorized in the Pasture and Ranch Core subzones.

Resource Protection Subzone. The Resource Protection subzone includes lands containing sensitive resources, such as creeks and riparian areas, some threatened and endangered species habitat, and archeological sites. No ranching activities would be authorized in this subzone; however, limited Management Activities, including Targeted Grazing, may be authorized to meet NPS resource management goals and objectives. Under the proposed action, the Resource Protection subzone would encompass approximately 2,000 acres comprising approximately 800 acres within current lease/permit boundaries but already excluded from ranching and an additional 1,200 acres that would be excluded from ranching.

Range Subzone. The Range subzone is identified as lands where grazing is compatible with resource protection objectives, but more intensive activities would not be allowed because of the documented presence of sensitive resources, including rare plants, native grasslands, wetlands, riparian/stream/pond habitats, forested areas, and threatened and endangered species habitat or habitat necessary for critical components of threatened and endangered species' life cycles. 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 Mowing 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 areas 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. Existing levels of Manure and Nutrient Management on dairies (approximately 2,500 acres) and Forage Production (approximately 1,000 acres) would be authorized in the Pasture subzone. Under the proposed action, some diversification activities would be authorized in the Pasture subzone as described in section 3.2.4.5, below. Generally, construction of permanent buildings would not be authorized in the Pasture subzone.

Ranch Core Subzone. The Ranch Core subzone includes the developed complex of buildings and structures and up to 2.5 acres of disturbed lands located immediately adjacent to the developed complex that do not

contain or have the potential to affect sensitive resources. The 2.5 acres would be sited in the most appropriate location on each eligible ranch to minimize adverse impacts. Diversification activities and new infrastructure could be authorized in this subzone on the 18 residentially occupied ranch complexes that are identified in figure 8 in appendix A of the EIS. Geographic constraints could limit Ranch Core subzone activities on individual ranches. Approximately 220 acres (less than 1%) of the area under lease/permit would be identified as Ranch Core subzone. The exact location of the Ranch Core subzone would be defined in each ROA.

3.2.4.2 Agricultural Lease/Special Use Permits

NPS would issue agricultural lease/permits with up to 20-year terms to continue multi-generational ranching operations on approximately 26,100 acres. When the two remaining life estates expire, other members of the immediate family would be offered a 20-year lease/permit, consistent with other ranches in the action area. 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 ranching operations.

Ranch Operating Agreements. The lease/permit would require each rancher to enter into an ROA to continue ranching. The ROA would identify ranch-specific operational details and requirements associated with (1) beef or dairy ranching (as applicable), (2) authorized diversification activities, and (3) maintenance requirements. The ROA would also identify Natural Resources Conservation Service (NRCS) Practice Standards and mitigation measures that apply to authorized Management Activities (see appendix F of the EIS). Maps identifying the subzones within each ranch would be attached to the ROA to guide the location of the authorized activities. ROAs would be developed with each rancher and reviewed during an annual meeting with NPS staff. If no changes are made, the existing ROA would be recertified for the following year of the lease term. If NPS approves changes to operational practices or requirements, the ROA would be revised accordingly (subject to applicable compliance as described below) and signed by both parties.

Because the EIS analyzes some ranch Management Activities at a detailed level and others at a conceptual level, only actions analyzed in detail in the EIS would be authorized in a ranch's initial ROA. For future years of their lease term, ranchers could submit proposals to conduct activities analyzed conceptually in the EIS. Such proposals would be subject to additional review and compliance. Depending on the proposal, other types of compliance and permitting requirements could also apply (e.g., NHPA, ESA, building permits, San Francisco Bay Regional Water Quality Control Board [San Francisco Bay RWQCB permits]). If approved by NPS following the conclusion of all compliance and permitting processes, the proposed Management Activity would be included in a revised ROA for the ranch.

Animal Units. Each ranch would continue to have a maximum number of AU or dairy animals allowed to graze at one time. AU or dairy animals allowed under a lease/permit would continue to be managed to meet the 1,200 pounds per acre RDM standard and other NPS management objectives. NPS would determine annual adjustments to AU or dairy animals based on the use of a rangeland forage production model (see appendix K of the EIS), monitoring data, NPS range program manager and rancher expertise, historical information, US Department of Agriculture (USDA) guidelines, and variation in ground conditions and weather/climate. All dairy ranch lease/permits would be permitted based on the number of dairy animals. Annually, NPS and ranchers would review performance measures, including RDM, to identify grazing levels that would ensure site conditions are maintained to meet the minimum RDM standard. RDM performance standards would remain as described for alternative A. Under the proposed action approximately 2,400 AU of beef cattle and 3,115 dairy animals would be authorized, reflective of current reported dairy operations.

Ranch operators would be authorized to have a limited number of livestock and conduct other activities common within a typical ranch complex (e.g., small family garden, non-breeding pigs, horses for personal use) as an accessory use and defined in the ROA as long as the intent is not for commercial or diversification purposes. The type of livestock that would be allowed for this purpose would be consistent with those authorized in the EIS. If located in the Pasture subzone, the animal unit equivalent (AUE) of these animals would be part of the overall AU, not in addition to the authorized AU. Any confinement of these species would be required to meet the San Francisco Bay RWQCB regulations for waste management and any other applicable regulations.

Succession. In the event an existing rancher decides to discontinue ranching, NPS would follow the Succession Policy to determine future use of the ranch.

3.2.4.3 Range Management and Monitoring

NPS manages ranching in the action 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, applicable regulations, and other best available science. In addition, NPS contracted with the UC Berkeley Range Ecology Lab to review existing ranch management practices and make recommendations that NPS could consider as part of this planning process. Collectively, these guidelines set forth standards and 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.

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 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 representative 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. RDM monitoring is conducted annually. In 2015, NPS worked with the UC Berkeley Range Ecology Lab to review and update the RDM monitoring program. The UC report (Bartolome et al. 2015) examined 25 years of RDM monitoring data and concluded that the minimum 1,200 pounds/acre standard remains appropriate based on the RDM guidelines developed by UC researchers for coastal prairie (Bartolome et al. 2006), but the report also noted that site-specific conditions and management goals may call for adjusting the minimum standard for particular sites. Bartolome et al. (2015) also recommended expanded use of visual RDM mapping across pastures to better inform overall management of the ranched lands. Updated monitoring protocols based on the UC Berkeley Range Ecology Lab review have been in place since 2015. A summary of visual mapping and monitoring data collected from 2015 to 2019 is available in appendix E of the EIS.

In addition to RDM, 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 2019c) evaluates this data set. Currently, vegetation composition monitoring using the 1990 guidelines protocol is limited because the methodology is under review. NPS has also established forage productivity plots on a subset of ranches, which are monitored in spring to aid in determination of stocking rates.

Other range management activities include planning, implementation, and monitoring to improve resource conditions, protect water quality, and maintain infrastructure integral to ranch operations. To date, more than 170 activities to improve resource conditions have been implemented in the action area in partnership with USDA-NRCS, San Francisco Bay RWQCB, the Marin Resource Conservation District, ranch operators, and others (figure 4 in appendix A). These activities have been implemented on a case-by-case basis with some variations in required mitigation measures and BMPs. A majority of the activity types implemented are described in detail in appendix F of the EIS.

Regular monitoring of ranches is conducted to ensure compliance with lease/permit conditions and regulatory requirements, and to assess changes that may affect resource conditions (e.g., early detection of invasive species, identification of new areas of erosion). Periodic monitoring is also conducted in association with the

implementation of projects, restoration activities, or other requirements. Types of monitoring include water quality, vegetation (including rare plants and invasive species), riparian condition, and infrastructure condition. Riparian restoration and invasive species management are also performed on a routine basis.

Under the proposed action NPS authorization would continue to be required before ranchers implement any range improvements beyond routine maintenance. Typical activities include changes to cattle management infrastructure (e.g., fencing, watering systems, roads), erosion control measures, and land treatments to manage vegetation. Types of Management Activities are described in more detail below. Many of these activities also require regulatory review by other agencies, including the San Francisco Bay RWQCB, US Army Corps of Engineers, USFWS, National Marine Fisheries Service (NMFS), and the California Coastal Commission. They may also require consultation with the State Historic Preservation Officer and the Federated Indians of Graton Rancheria. Regulatory review would be conducted as needed. NPS currently manages compliance and permit coordination for authorization of an average of 9 ranch activities per year (actual numbers have ranged anywhere from 1 to 24 activities in a given year). NPS would also work with the San Francisco Bay RWQCB to ensure ranches in the Tomales Bay watershed meet all applicable requirements.

The expectations and requirements for authorized range Management Activities would be incorporated into each ROA and updated and revised as new information becomes available. Additional monitoring requirements specific to authorized activities would also be included in each ROA.

3.2.4.4 Management Activities and Practice Standards

The EIS groups common ranch Management Activities into Activity Types. Activity Types are organized into three broad categories throughout the document: Ranch Infrastructure and Water Control Management, Vegetation Management, and Other Management Activities. Review and compliance of all Management Activities are conducted on a case-by-case basis. Reviews are typically linked to a specific proposal or funded project, which can include more than one Management Activity.

Ranchers seeking to undertake a Management Activity would submit a proposal to NPS that would be discussed as part of the ROA process. For authorized Management Activities, the ROA would require ranchers to adhere to the established USDA-NRCS Practice Standards for that activity. These Practice Standards are technical guidelines for the conservation of soil, water, air, and related plant and animal resources and are described beginning on page F-8 of appendix F of the EIS. In addition to Practice Standards, specific mitigation measures were developed to avoid or minimize impacts from all ranch Management Activities and are mandatory unless otherwise noted in an ROA. These mitigation measures are listed in tables F-11 through F-13 of the appendix to the EIS where they are cross-referenced with their associated Practice Standards.

In addition to the established guidance from USDA-NRCS, appendix F of the EIS incorporates mitigation measures and standards from other environmental compliance documents, such as the Marin Resource Conservation District Permit Coordination Program (which was established to streamline permitting for many of the activity types listed herein), previous NEPA compliance reviews for park-specific projects, and previous biological opinions (BOs) from USFWS and NMFS. The Management Activities, Practice Standards, and mitigation measures described in appendix F and analyzed in the EIS were developed to ensure protection of natural and cultural resources and streamline the compliance review for common ranch management activities.

No additional NEPA analysis would be required as long as a covered Management Activity authorized in an ROA is conducted in accordance with all applicable Practice Standards, size limitations, and mitigation measures. Some activities may nevertheless still require additional permitting and review by other agencies before incorporation into an ROA.

Practice Standards and mitigation measures may be revised in the future as new information becomes available that would result in better protection of park resources or as a result of changes in law, policy, or regulatory agencies' standards.

A general description of Management Activities is provided below, and additional detail is provided in appendix F of the EIS. The analysis assumes a total number of individual projects that would occur over the 20-year lease/permit term as well as in any given year, when applicable.

Ranch Infrastructure and Water Control Management. Ranch Infrastructure and Water Control Management Activities, including Road Upgrade and Decommissioning, Infrastructure Improvements, Fencing, Livestock Water Supply, Pond Restoration, Waterway Stabilization, and Stream Crossing are part of the regular management and maintenance of ranch operations. 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.

Road Upgrade and Decommissioning. The purpose of Road Upgrade and Decommissioning 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 several Road Upgrade and Decommissioning activities in the action area; however, a number of roads still have erosion issues and/or are no longer actively used or maintained. NPS assumes 20 Access Road projects, up to 10 Trail and Walkways, 40 Structures for Water Control, and 5 Road Closure and Treatment projects would be implemented over the 20-year lease/permit term. NPS anticipates up to 3 Road Update and Decommissioning projects annually.

Infrastructure Improvements. The purpose of these activities is to protect areas that are heavily used by ranch operations to (1) prevent erosion or degradation of critical infrastructure, (2) separate clean runoff from potential pollutant sources, and (3) 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 high-intensity-use areas such as corrals in the ranch complex to direct clean rainwater away from these areas. NPS assumes 10 Roof and Covers projects would be implemented over the 20-year lease/permit term, with additional roof runoff structures developed as needed, associated with all buildings. Heavy use area protections are a regular practice associated with troughs and feeding areas, as well as corrals and heavily travelled lanes in the ranch complex.

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

Fencing. The purpose of this activity is to help accomplish management goals and objectives by controlling the movement of animals, people, and 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 action area include barbed wire livestock fencing, electric fencing, and rail fencing. Removal of abandoned fencing would continue to occur on ranchlands. New fencing would continue to require NPS authorization, and NPS would work with ranchers to ensure that new fence installations and replacements consider wildlife-friendly designs. NPS would require the removal of abandoned fence on ranchlands to address wildlife and visitor safety. Construction of temporary fencing (i.e., electric fencing) would be authorized following NPS approval. Approximately 20% of the 340 miles of existing fencing would be replaced, 24 miles of fence would be installed for the Resource Protection subzone, and an additional 35 miles of new fence would be constructed to improve livestock management over the 20-year lease/permit term. NPS anticipates up to 5 Fencing projects annually.

Livestock Water Supply. The purpose of developing alternative water sources is to help address potential impacts of unrestricted livestock access to streams and wetlands and to provide cleaner, more reliable, and

well-distributed drinking water to animals. 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. Troughs would require wildlife escape ramps. Redevelopment of existing water sources and associated distribution infrastructure would be authorized following NPS review and approval. Establishment of new water sources (e.g., new wells) would require separate environmental review. NPS assumes up to 25 Spring Developments, 40 Livestock Pipelines, 30 Watering Facilities, and 24 Pumping Plants would be authorized over the 20-year lease/permit term.

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 accumulated silt to restore a pond's original storage capacity. This activity does not include new instream ponds or activities that would increase the original storage capacity of a pond. NPS has worked with ranchers in the action area to maintain functioning stock ponds and the habitat they provide for wildlife such as the California red-legged frog (*Rana aurora draytonii*). NPS assumes up to 25 Pond Restoration projects would occur over the 20-year lease/permit term.

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 action area in coordination with ranchers to prevent erosion and protect resources. NPS assumes up to 40 Grade Stabilization Structure (headcut repair) and 20 Lined Waterway projects (drainage ditch stabilization) would occur over the 20-year lease/permit term. NPS anticipates up to 4 Waterway Stabilization projects annually.

Stream Crossing. 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). Sites would be evaluated to determine if a Stream Crossing is necessary and to account for habitat requirements for wildlife species present. Work could include modifications to, or removal of existing crossings. Many Stream Crossings in the action 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. NPS assumes up to 16 Stream Crossing projects would occur over the 20-year lease/permit term. NPS anticipates up to 3 Stream Crossing projects annually.

Vegetation Management. Vegetation Management activities described below could be implemented after inclusion in a rancher's approved ROA.

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) to restore, enhance, or create desired plant communities and fish and wildlife habitats; protect soils, control erosion, reduce sediment, and improve water quality; improve accessibility, quantity, and quality of forage and browse for livestock and wildlife; improve air quality; sequester carbon; and improve soil health. Vegetation Management activities may include seeding, planting container plants or cuttings, maintenance of historic windbreaks, mulching, and minor grading or digging to remove roots and prepare the area for planting. Protection measures may include plant shelters, wire mesh, weed-free mulching around the plant base to inhibit grass and weed growth, temporary erosion control, or preventing wildlife or cattle from accessing newly planted areas until vegetation is successfully established. A plans and specifications document would detail species and equipment used, as well as monitoring and maintenance requirements, such as regular inspections for invasive species. Seeding would be limited to hand broadcast and no-till seed drill using an NPS approved seed mix in the Pasture and Ranch Core subzones. Seeding would also continue to be authorized for Forage Production on 1,000 acres (see below). Requests for aeration would only be allowed if a need is demonstrated (e.g., via soil test). Up to 40 Critical Area Planting projects, 50 Riparian Forest Buffers, and up to 24 Windbreak/Shelterbelt Establishments would occur over the 20-year lease/permit term. Range planting would be evaluated on a site-specific basis in the range subzone.

Mowing. 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 of the EIS). 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. Mowing undesirable species as a form of weed treatment would be authorized in the Pasture and Ranch Core subzones once reviewed by NPS. There would be no limit to the amount of Mowing, but Mowing would be approved on an individual basis and incorporated into ROAs. NPS anticipates between four to eight Brush Management and Herbaceous Weed Treatment requests annually.

Brush Management would generally be considered in the Pasture and Ranch Core subzones. NPS would consider proposals for Brush Management in the Range subzone under limited circumstances. Brush Management authorizations in any subzone would be conducted outside the bird nesting season. If authorization for Brush Management were granted, ranchers would be responsible for maintenance of desired conditions for the treated area.

Integrated Pest Management. IPM is a decision-making process that coordinates knowledge of pest biology, the environment, and cost-effective available technology to prevent unacceptable levels of pest damage while posing the least possible risk to people, resources, and the environment. IPM is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies.

NPS addresses pest issues on a case-by-case basis following an IPM policy that helps determine the combination of procedures that are most effective for each pest situation. The decision to incorporate a chemical, biological, or bioengineered pesticide into a management strategy is based on a determination that a product is necessary, and other available options are either not acceptable or not feasible.

The park's IPM Coordinator reviews proposals for the use of a pesticide, herbicide, biological control agent, or genetically modified organism (also known as Pesticide Use Proposals) on a case-by-case basis considering site-specific conditions. In the case of ranching operations in the action area, requests have been made to NPS to treat non-native, invasive weeds with herbicide. NPS must approve a Pesticide Use Proposal before a product can be purchased or applied. Under NPS policy, pesticide applications can only be performed by or under the supervision of a certified or registered applicator who is licensed under the procedures of a federal or state certification system. All pesticide applications would continue to be reported to NPS annually.

IPM related to Vegetation Management would be authorized in the Pasture and Ranch Core subzones as appropriate. Site-specific management for weed treatments would also be allowed in the Range subzone, depending on rancher requests, park vegetation management goals, and extent of infestation. Manual removal of invasive vegetation would also be considered, where appropriate, in areas where listed species are present. IPM is ongoing and would continue annually based on presence of species and site-specific evaluation.

Targeted Grazing. Targeted Grazing prescriptions optimize the timing, frequency, intensity, and selectivity of grazing (or browsing) in combinations that purposely exert grazing/browsing pressure on specific plant species or portions of the landscape. Targeted Grazing differs from traditional grazing management in that the goal of Targeted Grazing is to apply defoliation or trampling to achieve specific resource management objectives, whereas the goal of traditional livestock grazing management is generally the production of livestock commodities (Bailey et al. 2019).

Targeted 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 Targeted Grazing to maintain and enhance rare plant species populations, ensure adequate vegetative cover in riparian areas, and control weeds. Targeted Grazing would be authorized as necessary to meet NPS management goals and objectives.

Other Management Activities. The following types of Other Management Activities, completed in accordance with the associated Practice Standards and mitigation measures identified in appendix F of the

EIS, could be implemented after inclusion in a rancher's approved ROA. Forage Production and Manure and Nutrient Management activities would only be applicable on ranches where these activities are currently authorized.

Manure and Nutrient Management. The purpose of Manure and Nutrient Management is to protect water and air quality and to improve soil conditions. These activities apply specifically to dairies because they are required under San Francisco Bay RWQCB regulations to manage waste generated from operations. 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. 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 22560–22565 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 the proposed action, dairies would continue to produce large quantities of manure waste that ranchers would be required to manage consistent with state and federal regulations to avoid impacts on water quality and sensitive resources. Application of animal manure and compost generated in the action area would be allowed on up to six dairies annually in the Pasture and Ranch Core subzones with an approved nutrient management plan and would remain at a level consistent with existing conditions (approximately 2,500 acres, including approximately 715 acres of dairy Forage Production areas, with some pastures not treated every year). Spreading of compost would be restricted to the Pasture and Ranch Core subzones of operations that have generated it on site. Compost would only be spread on the ranch where it originated. Application of commercially produced compost and fertilizer would not be authorized. Waste transfer projects are assumed at up to 12 projects annually.

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. Forage Production includes harvest mowing to produce silage, haylage, or hay. Silage is cut earlier in the season than haylage and is wetter; hay is drier and cut later 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.

Approximately 1,000 acres on four ranches (two beef and two dairy) would continue to be authorized for Forage Production under the proposed action (see table 1 of the EIS). This Forage Production would continue, consistent with lease/permit language updated as necessary to reflect current USDA-NRCS Conservation Practices or other site-specific considerations under an approved plan. Forage Production would be authorized in the Pasture subzone. Should ranchers discontinue Forage Production in permitted areas, those acres would be returned to grazing, and the total acreage of Forage Production in the action area would be reduced. Forage and Biomass Planting, Forage Harvest Management, and Residue and Tillage management would occur on up to 1,000 acres annually where authorized.

3.2.4.5 Diversification

New diversification activities could be allowed in specified subzones with the use of required mitigation measures specific to each activity (see appendix F of the EIS, table F-14). Diversification of ranching activities could include new types of livestock, crops, horse boarding, ranch tours and farm stays, and small-scale processing and sale of dairy, meat, and agricultural products produced in the action area. Diversification

activities listed in table 3-2 would not require additional NEPA compliance provided they are consistent with the prescribed size and location and use all relevant mitigation measures described in appendix F of the EIS. Proposals for other types of diversification activities would be subject to additional review and compliance. Ranchers would be required to submit a detailed proposal in writing to NPS for review and consideration. All diversification activities would be required to be incorporated into the individual ROA prior to implementation.

Existing diversification activities on ranches would need to conform with the guidance under the proposed action (e.g., scale, location, and applicable mitigation measures). Ranchers would not be allowed to harm or harass wildlife or predators to protect crops or livestock. Livestock guardian animals (i.e., dogs, llamas, donkeys) would be allowed with the use of established mitigation measures and a requirement to report any wildlife and visitor conflicts to NPS (see appendix F of the EIS, table F-14).

Diversification activities would only be authorized on the 18 ranches with a ranch complex. The six grazing-only operations that do not include a developed complex or authorized residential use of buildings would not be authorized to conduct diversification activities (F Ranch, Martinelli Ranch, Genazzi Ranch, E Gallagher Ranch, McFadden Ranch, and C. Rogers Ranch).

Ranch Core Subzone. In addition to cattle, livestock species that are analyzed in detail in the EIS and could be allowed in the Ranch Core subzone include chickens, sheep, and goats, as described in table 3-2. Any confinement of these species would be required to meet the San Francisco Bay RWQCB regulations for confined animal facilities and any other applicable regulations.

Up to 2.5 acres of crops could be allowed in the Ranch Core subzone. NPS, together with the rancher, would identify the most appropriate location in the Ranch Core subzone to minimize adverse impacts. Ranchers would be allowed to fence the 2.5 acres of crops to exclude wildlife. Crops that have the potential to escape or become invasive (e.g., fennel) would not be authorized.

NPS would consider farm stays and ranch tours that are limited to adaptive use of existing structures and in compliance with applicable codes. Ranch tours could originate in the Ranch Core subzone but could occur in all subzones.

Ranch-specific proposals for small-scale processing of products produced in the action area, additional animals (e.g., species consistent with the EIS), horse boarding, and irrigated crops in the Ranch Core subzone would be considered on a case-by-case basis and would require additional environmental review. Although NPS would not consider proposals for species dismissed in the EIS (ducks, geese, turkeys, and rabbits), other species not analyzed in the EIS would be considered on a case-by-case basis and would require additional review and compliance. In addition, proposals that exceed the limits for sheep, goats, and chickens in table 3-2 would also be considered on a case-by-case basis and would require additional review and compliance. Ranchers would be required to submit detailed proposals to NPS and document that resources (e.g., water) are available to support new operational requirements prior to NPS conducting additional review and compliance.

Pasture Subzone. Sheep, goats, and chickens are analyzed in detail in the EIS and could be allowed in the Pasture subzone, as described in table 3-2. Pasture diversification activities should be located in the vicinity of the occupied Ranch Core subzone on authorized ranches. Construction of permanent infrastructure associated with diversification activities would not be allowed in the Pasture subzone; however, temporary electric fencing would be approved.

TABLE 3-2: DIVERSIFICATION ACTIVITIES

Activity	Size/Scale[a]	Subzones Where Authorized[b]
Chickens	▪ Up to 500 chickens with up to 3 associated mobile huts. ▪ Huts would be of a limited height and in a color that minimizes visual impacts on the landscape and would be moved regularly.	▪ Ranch Core and Pasture
Sheep or Goats	▪ Up to 50 sheep or up to 66 goats (10% of authorized AU or not to exceed 10 AU if authorized AU is greater than 100).[c] ▪ This allocation is part of permitted AU, not in addition. Cattle AU would be reduced to accommodate sheep and goats.	▪ Ranch Core and Pasture
Crops	▪ Up to 2.5 acres, not requiring irrigation[d].	▪ Ranch Core
Farm stays/ Ranch tours[e]	▪ Limited to adaptive use of existing structures.	▪ Ranch Core[e]

[a] All activities must follow applicable mitigation measures provided in appendix F.

[b] Diversification activities are only authorized on the 18 ranches with a developed complex.

[c] For grazing purposes, sheep and goats have AU equivalents of 0.2 and 0.15 AU, respectively (USDA-NRCS 2006a)

[d] Consistent with the agricultural lease/permit, ranchers are not allowed to establish new water rights, but NPS would recognize valid existing water rights.

[e] Ranch tours are anticipated to originate in the Ranch Core subzone but could occur on Ranch Core, Pasture, and Range subzones.

3.2.4.6 Ranch Complexes

Ranchers would continue to use residential units, barns, and other structures. Occupancy of residential units in the 18 developed complexes would be limited to family members of lease/permit holders, employees of that ranch (and their family), and, with NPS approval, employees of other park ranches. As a condition of the lease/permit, all ranch worker housing would be maintained in a safe and sanitary condition to ensure the health and well-being of occupants.

Use of Ranch Complexes. NPS and its partners would strive to preserve and maintain the significant physical attributes or character-defining features that contribute to the integrity of the historic districts in the action 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 collaborate with the ranchers to preserve the ranch complexes in the action area (by including maintenance and upkeep requirements in the ROAs), which could include support from the Point Reyes Historic Preservation Crew, and other NPS stewardship and preservation programs. Appendix G of the EIS provides a list of preservation and maintenance guidelines for ranch buildings under lease/permit. Adaptive use 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 review and approve all proposed new uses and associated modifications to ranch complexes and structures to ensure conformance with the EIS and the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Maintenance. Maintenance is an important ongoing activity that would continue to be accomplished in collaboration between NPS and ranchers. Ranchers would continue to maintain ranch complex infrastructure, including all water, sewer, and electrical systems, as well as most ranch service roads in a safe condition, using Practice Standards and mitigation measures that limit impacts on sensitive resources; no new roads or trails would be established without prior written permission from NPS. Maintenance activities that are not

analyzed in the EIS would require additional environmental review. Maintenance on ranch buildings would be a requirement for ranchers and would occur annually.

The overall condition of historic structures is poor to fair (see EIS "Chapter 3: Cultural Landscapes, Historic Districts, and Historic Structures"). A substantial level of investment is needed to address the deferred maintenance needs on many of these structures and to bring them up to a maintainable state. Completion of these one-time investments would then make it easier for ranchers to fulfill ongoing maintenance needs for these facilities.

New Development/Infrastructure Improvements and Alterations. The proposed action allows for improvements and alterations of existing structures, upgrades to worker housing, and new development and infrastructure in compliance with the subzoning framework of this alternative. All such work would be the responsibility of the rancher at their own cost, would require prior written approval from NPS through the ROA process, and would be done in accordance with applicable laws. All worker housing would comply with local building codes and safety standards. New development would require site-specific review and compliance once a detailed proposal is submitted to NPS. Approved projects would be authorized in an individual ROA. Except in very limited circumstances, development of new structures and minor additions would only be considered in the Ranch Core subzone.

3.2.5 Elk Management

The management of free-ranging elk under the proposed action would allow elk in the Point Reyes portion of the action 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. A new herd would consist of a group of elk that split from either the Drakes Beach or Limantour herds to occupy a distinctly new home range and where the juveniles and adult females in the splinter group have limited interaction with, or do not return to, their herd of origin. Adult males may move between herds without constituting a new herd.

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. In the event of an unforeseen circumstance that causes the herds to completely move from long-established core use areas to other locations in the action area, NPS would reevaluate the impacts and management approaches set forth in this alternative as needed to ensure maintenance of a viable free-ranging elk population in Point Reyes, which may result in the need for further environmental review.

3.2.5.1 Population Level Management and Geographic Extent

NPS would actively manage the free-ranging elk herds in the Point Reyes portion of the action area. NPS would manage the herds to remain in Point Reyes, in coordination with the California Department of Fish and Wildlife (CDFW). At Tomales Point, NPS would continue to maintain the elk fence that serves as the northern boundary to the action area, and any elk that leave the reserve would be returned to the reserve. The elk at Tomales Point would continue to be managed as a fenced population in accordance with the 1998 Tule Elk Management Plan/EA.

No new herds would be allowed to establish on the areas under lease/permit in the action area. A graduated response would be taken to deter establishment of new herds. First, NPS staff would try to haze elk back to their original location. If unsuccessful, NPS would employ more aggressive hazing techniques such as firing bean bag shots at the elk. If hazing does not work, lethal removal of a few individuals, particularly the lead female if she can be identified, could be tried. As a last resort, NPS would move forward with complete elimination of the new herd through lethal removal.

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 and viable population level, consistent with desired conditions for the action area. 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 K of the EIS). 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, and no reproductively active females or bulls would be lethally removed during the calving and rut seasons. The population threshold is not anticipated to change unless there are long-term or permanent changes to existing conditions. In the event of such a change, NPS would revise the population threshold consistent with the goal to maintain a viable free-ranging elk population, which may result in the need for further environmental review. 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. CDFW's comment letter in response to the draft GMP Amendment, dated September 23, 2019, reads in part, "Translocation of elk out of PRNS [Point Reyes] is not a viable option for population management due to the potential for translocation of diseases, short and long-term costs, risk to staff or contractors, and risk to animals." 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 for population management 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 12 to 18 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.

Because the elk herd consisted of 138 animals in late 2019 and more calves will be born in spring 2020, initial implementation would require removing more than 18 elk. The total number of elk that would initially need to be removed to reach 120 would depend on the size of the herd at the time of implementation and may take more than one year depending on the resources available to conduct the removals. 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, 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 action area using the graduated response noted above. 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 consistent with desired conditions for the action area. While male elk would continue to be present on ranchlands, areas of high elk concentration would be monitored and managed in response to localized resource impacts. In these cases, the graduated management response described above would be implemented, including standard and aggressive hazing techniques and the potential for lethal removal of individual elk. NPS would not allow new female groups to become permanently established on lands under lease/permit in the action area. NPS would also take management actions if new Limantour female groups from the wilderness area begin spending considerable time on lands under lease/permit in the action area, particularly during the rut and calving seasons (figure 2 in appendix A of the EIS). Female groups would be hazed back to the wilderness area, and lethal removal may be needed to prevent the permanent establishment of new herds on lands under lease/permit in the action area.

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 tule elk in Point Reyes and to manage with minimal intrusion to regulate population size, where possible, as part of natural ecosystem processes.

3.3 Avoidance, Minimization, and Mitigation Measures

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

Table 3-3 summarizes the mitigation measures that would be implemented to ensure the protection of federally listed species under the jurisdiction of NMFS. These measures are discussed further as they pertain to specific threatened and endangered species in “Section 8.0, Effects to Evaluated Species and Determinations.”

TABLE 3-3: MITIGATION MEASURES TO BE IMPLEMENTED UNDER THE PROPOSED ACTION THAT WOULD AVOID OR MINIMIZE PROJECT EFFECTS ON LISTED SALMONIDS, AND THEIR CRITICAL HABITAT, IN THE ACTION AREA

Mitigation Measure	Activity Types	Subzone
Site-specific design plans shall show the maximum extent of grading and include requirements to protect sensitive natural and cultural resources during construction and maintenance activities, including erosion control measures.	All	All
Use of heavy machinery shall be performed by experienced operators and heavy machinery shall: ▪ avoids steep slopes (20%), slopes vulnerable to landslides, and uneven or rocky terrain ▪ be kept at least 10 feet from any cliffs or steep banks ▪ only allowed based on daily fire danger rating ▪ avoid woody material larger than the machine is intended for and, otherwise, conform to the machine's user's manual ▪ avoid significant wildlife habitat and plant communities except where deemed necessary by NPS to address resource protection needs ▪ avoid waterbodies and riparian zones unless specifically required and approved by NPS as critical to the project objective (e.g. Pond Restoration, Waterway Stabilization, Stream Crossing) ▪ avoids lands designated by USDA-NRCS, as "highly erodible lands," compactable soils, and minimize soil disturbance to the greatest extent possible	All	All
A spill prevention and clean-up plan, Stormwater Pollution Prevention Plan, or similar document shall be prepared and implemented for all construction projects to address polluted runoff and spill prevention policies, erosion control materials required to be available on site in case of rain or a spill (e.g., straw bales, silt fencing), clean-up and reporting procedures, and locations of refueling and minor maintenance areas. Petroleum products, chemicals, silt, fine soils, and any substances deleterious to fish, amphibian, plant, or bird life are prohibited from passing into, or being placed where they can pass into the waters of the state. Equipment operators shall have emergency spill clean-up gear (spill containment and absorption materials), dry cleanup methods (i.e., absorbent materials, and/or rags), and fire equipment available on site at all times. Petroleum-powered equipment shall be stored and operated in a manner to prevent the potential release of petroleum materials into waters of the state and follow precautionary	All	All
Vehicles and equipment shall be restricted to one principal access route, preferably one that has been used for past activities. All vehicles and equipment shall be staged on roads, in NPS-specified staging areas, or on existing disturbed ranch operation sites.	All	All
Erosion control and sediment detention measures must be available on site at all times and in place at all locations where the likelihood of sediment input exists prior to the onset of rain to detain sediment-laden water on site and minimize fine sediment and sediment/water slurry input to flowing water. Dispose of sediment collected in the structures away from the collection site in an upland area where it cannot enter a waterway. When required by NPS or project regulators, NPS staff or a qualified designee shall inspect in-stream habitat and the performance of erosion and sediment control devices during construction to ensure the devices are functioning properly.	All	All

Mitigation Measure	Activity Types	Subzone
Conduct any grading and other earth-disturbing activities, including in-stream and riparian activities (other than native vegetation planting or erosion control activities on disturbed sites without mechanized equipment) during the dry season, generally June 1 through October 31; exceptions may be made by the NPS in cases such as catastrophic failure due to a large storm or other event that causes water quality or public safety concerns, or project-specific recommendations from regulators or NPS suggest an alternative work window to avoid impacts on special-status species. Work that would disturb waterways or sensitive riparian habitats outside the June through October time frame must be approved in advance by the NPS and project regulators.	All	All
For project areas located in habitats with known presence of special-status species or critical wildlife corridors, install temporary wildlife exclusion fencing around the project perimeter. Exclusion fencing must be highly visible, and installation overseen by the project biologist. Openings shall be restricted to areas of construction site access. Note: the purpose of the temporary fencing is to preclude animals from entering the work area and prevent debris and workers from entering adjacent habitats	All	All
Do not begin work in and around streams that support anadromous fish populations or California freshwater shrimp until August 1 and complete work by October 15. Note: work prior to June 15 or beyond October 15 may be authorized on a site-specific basis with approval from the NPS and project regulators. Channel-spanning bridges, bottomless arch culverts with natural streambed substrates, or other fish-friendly solutions are required in salmonid streams.	All	All
In-stream crossings shall not be designed for placement within 300 feet of known spawning or breeding areas of listed species. Stream crossings in a salmonid-bearing stream must be a minimum of 1,500 meters (4,921 feet) apart. Crossings in a non-fish bearing stream must be at least 100 feet apart.	All	All
Design culverts to minimize habitat fragmentation and barriers to aquatic movement. Design all structural crossings of low and high flows to provide passage for as many different aquatic species and age classes as possible. Culverts that require Section 401/404 permits shall be designed and stamped by a licensed engineer, geologist, landscape architect or a qualified NRCS engineer.	All	All
Implement measures to minimize concentrated flow from roads, roofs, and paved surfaces into stables, such as rolling dips for roads, and/or to prevent concentrated flow from causing erosion, such as roof gutter downspouts with energy dissipaters, and French drains. Divert rainfall and runoff away from high-use areas with animal waste, such as stalls, manure piles, paddocks, and arenas, using methods such as guttered roofs, manure bins, and grassed waterways to keep such areas as dry as possible during the rainy season.	Other Livestock, Horse Boarding, and Crop Diversification	Ranch Core
Route water from horse wash areas to a filter strip or into a plumbing system or outlet this water as sheet flow to a large, well-vegetated grassy area away from drainages and wetlands. Minimize the amount of water used by using sponges or hoses equipped with shut-off or low-flow nozzles; and the amount of soap used, especially soap with surfactants.	Other Livestock, Horse Boarding, and Crop Diversification	Ranch Core

Mitigation Measure	Activity Types	Subzone
As part of any crop proposal, identify whether a crop rotation sequence with different crops grown in a recurrent sequence over a given number of years is appropriate. Use straw mulch (2 tons per acre) in areas where crop residue or cover crops are not present in the spring or late fall and use certified weed-free straw if purchased from outside the park or from a different ranch. Incorporate structural erosion control systems to intercept and diffuse water flow to prevent excess sediment from entering streams and encourage infiltration into row crop design (i.e., drop inlets with sediment traps, daylight underground outlets to vegetated swales, energy dissipaters, sediment basin). Store harvested crops in enclosed structures (i.e., buildings, barrels, crates). If wildlife control is needed, only non-lethal management methods are permitted (i.e., scarecrows or decoys and control garden debris). Lethal control of wildlife is explicitly prohibited.	Other Livestock, Horse Boarding, and Crop Diversification	Ranch Core
Plant cover crop or cover soils with mulch and use at least 30% cover in fallow crop areas throughout the rainy season.	Other Livestock, Horse Boarding, and Crop Diversification	Ranch Core
For crop diversification, conclude tilling activities row crop areas, such as ripping, disking, or harrowing, before the first rains or November 1, whichever comes later	Other Livestock, Horse Boarding, and Crop Diversification	Ranch Core

4.0 ACTION AREA DESCRIPTION

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

The action area consists of gently rolling to hilly uplands with basement rocks that include the granitic spines of northern Inverness Ridge and Point Reyes proper and the broad sweep of marine sandstones and shales that lie between. Elevations range from the beaches at sea level to 600 feet on Inverness Ridge. Most of the rangeland lies between 100 and 200 feet. Slopes range from nearly level on the ridgetops and sandy flats to 50% on the steeper hillsides. Average hillslopes and drainage sides are about 40%.

Salmon and steelhead migrate from the ocean into freshwater streams in the park to spawn, and juveniles develop in freshwater before smoltification and outmigration to the ocean. Lagunitas and Olema Creeks are the two major drainages in the action area that are most important for anadromous fish (see attachment A, figure 1). The Lagunitas and Olema Creek watersheds support the southernmost wild (no current hatchery influence) population of coho salmon along the Pacific Coast. Olema Creek is the largest undammed watershed in coastal Marin County, California (Carlisle, Reichmuth, and McNeill 2018). Steelhead use other coastal streams in the Drakes Estero watershed. Overwintering habitat for juvenile fish was listed as a primary limiting factor for coho salmon in Lagunitas Creek (Stillwater Sciences 2008; Prunuske Chatham, Inc. 2010). No ranches in the action area are in the Pine Gulch Creek watershed.

Riparian areas of low-gradient streams in the Lagunitas and Olema Creek watersheds are characterized by shrub communities dominated by arroyo willow (*Salix lasiolepis*) and/or red alder (*Alnus rubra*) (CDFW 2003). The Point Reyes peninsula consists of small first- and second-order intermittent streams that drain directly to Drakes Estero, Abbotts Lagoon, or the Pacific Ocean. Many are low-gradient streams on sandy soils, which generally do not support tree species, and instead are dominated by shrubs and understory wetland vegetation such as Juncus species. A few perennial streams (e.g., North Schooner Creek and Home Ranch Creek) along the eastern portion of grazed lands support willow and/or red alder stands and provide habitat for endangered salmonids (Aoyama et al. 2018).

The action area is surrounded by Drakes and Limantour Esteros and Abbotts Lagoon, which are among the last estuaries remaining in a mostly natural state along the California coast, and are considered to have high ecological importance as waterfowl habitat, as a nursery for numerous marine fish and invertebrate species, and as a protected retreat for harbor seals. Abbotts Lagoon is ecologically important for migratory and resident waterfowl, shorebirds, and other avian species. Numerous minor wetlands and riparian areas exist throughout the action area and are locally important for wildlife habitat. Streams in the action area are generally small, and their tributaries are frequently ephemeral. Many streams flow through steep, narrow canyons through the coastal mountains as they flow from their headwaters toward the coast. Many ranch units border the Pacific Ocean beaches and one extends to Tomales Bay.

Vegetation in the action area is characterized by approximately 60% grassland, 18% coastal scrub, 14% forest, with the remaining portion composed mostly of wetlands, coastal dunes, and riparian forests/shrublands. Most of the upland plateaus and ridgetops in Point Reyes were cleared of shrubs and patches of forest in the past to put the land into cultivation for various crops and hay or for improved

livestock pasture. Chapter 3 of the EIS also provides further detail about the vegetation communities in the action area, in the "Vegetation, including Federally Listed Species" section.

Soils are described in detail in the "Soils" section of chapter 3 in the EIS. Generally, rangeland soils are deep, productive, well-drained loams and sandy loams. However, many range soils are identified as having limitations such as susceptibility to compaction and slippage, seasonal high-water table, low available water capacity, and a high erosion hazard. The loss of the soil surface layer results in a severe decrease in forage productivity. In steeper units, the slope restricts access by livestock and promotes increased grazing pressure on the less sloping areas.

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

5.0 PRE-FIELD REVIEW OF LISTED SPECIES

A list of federally listed species and designated critical habitat in the action area was obtained from NMFS (2018), shown in table 5-1 below. Park staff further confirmed that this list identified only those species that would potentially be affected by actions being considered in the EIS, based on knowledge of species occurrences in the park and prior consultation with NMFS regarding livestock use in the park (NMFS 2004; NPS 2001). None of the marine species managed by NMFS would be affected by the proposed action and were eliminated from further analysis in this BA.

5.1 Species Considered and Evaluated

Table 5-1 indicates whether the federally listed species under the jurisdiction of NMFS that could occur are known or expected to occur in the action area. Any critical habitat for these species in the action area is indicated, in addition to their general habitat preferences. No additional proposed or candidate species for listing under the ESA are expected to occur in the action area.

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

Species Common and Scientific Names	Status[a]	Potential to Occur	Critical Habitat	Habitat Preferences
Central California Coast coho salmon (*Oncorhynchus kisutch*)	E	Yes	Yes	Coastal, low-gradient streams with abundant pools formed by large woody debris
Central California Coast steelhead trout (*Oncorhynchus mykiss*)	T	Yes	Yes	Ocean and freshwater streams with high water quality, natural shade cover, and submerged rocks and vegetation
California coastal Chinook salmon (*Oncorhynchus tshawytscha*)	T	Yes	Yes	Ocean and freshwater streams with high water quality, natural shade cover, and submerged rocks and vegetation

Source: NMFS (2018)

[a] Status Codes: E – federally listed endangered; T – federally listed threatened

5.2 Critical Habitat in the Action Area

Critical habitat is a term defined in section 3 of the ESA and refers to areas that contain habitat features that are essential for the survival and recovery of a listed species, and which may require special management considerations or protections. The ESA defines critical habitat as "(1) the specific areas within the

geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time it is listed…that…are essential for the conservation of the species (16 U.S.C. 1532(5)(A))." In other words, critical habitat represents the habitat essential for the species' recovery.

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

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

The proposed action could affect three anadromous fish—Central California Coast (CCC) steelhead trout, CCC coho salmon, and Chinook salmon—that have designated critical habitat in the action area (USFWS 2018a). Section 6.1 presents further detail about this critical habitat.

6.0 EVALUATED SPECIES INFORMATION

6.1 Species Status and Biology

Coho salmon, steelhead trout (steelhead), and Chinook salmon are anadromous fish species, which means they spend a portion of their life cycle in marine waters and a portion, specifically spawning and rearing, in fresh waters. All three species occur in the action area within the Lagunitas/Olema Creek areas of the Tomales Bay watershed. Steelhead have also been documented in the action area in some of the drainages in the Drakes Estero watershed (attachment A, figure 1).

All three species select gravelly sections of streams for spawning, where water flow between gravel keeps the eggs and embryos well-oxygenated and facilitates fry emergence. Water temperatures and dissolved oxygen (DO) influence the survival, growth rate, and swimming ability of developing salmonids. Higher stream temperatures can lead to increased heat shock protein expression, which reduces juvenile growth and development. Low levels of DO decrease the rate of metabolism, swimming speed, growth rate, food consumption rate, efficiency of food utilization, behavior, and ultimately the survival of the juveniles (NMFS 2004; NPS 2007). Juvenile salmon and steelhead prefer well-shaded pools with dense overhead cover; abundant submerged cover composed of undercut banks, logs, roots, and other woody debris; cooler water temperature; adequate DO levels; and adequate water velocities (USEPA 2004). Preferred rearing habitat has little or no turbidity and high aquatic invertebrate forage production. As they grow larger and their habitat preferences change, juveniles move away from stream margins and begin to use deeper water areas with slightly faster water velocities, but they continue to use available cover to minimize the risk of predation and reduce energy expenditure. As water temperatures decrease in the fall and winter, fish stop or reduce feeding

because of the lack of food or in response to colder water triggering slower growth rates. From December to February, winter rains result in increased stream flows and by March, following peak flows, fish again feed heavily on insects and crustaceans, and their growth rate increases. In the spring, as yearlings, salmon and steelhead undergo a physiological process that prepares them for living in the marine environment. They begin to migrate downstream in late March and early April with peak outmigration occurring in mid-May. Emigration timing is correlated with peak upwelling currents along the coast, when river or estuary productivity is sufficient for juvenile survival and growth (NMFS 2004). Differences occur between coho salmon, steelhead, and Chinook salmon life cycles, and are described further below.

6.1.1 Central California Coast Coho Salmon—Endangered

6.1.1.1 Legal Status

The CCC coho salmon evolutionarily significant unit (ESU) (i.e., Pacific salmon designated population segment [DPS]) was listed as threatened in 1996 (61 FR 56138) and reclassified as endangered, including hatchery stocks, in 2005 (70 FR 37160). In 2012, NMFS published the *Recovery Plan for the Evolutionarily Significant Unit of Central California Coast Coho Salmon* (NMFS 2012). NMFS conducted a five-year status review of the ESU in 2016 and recommended that the ESU remain listed as endangered (NMFS 2016b). The ESU was listed as endangered in 2005 under the California Endangered Species Act (CESA) (CDFW 2018a).

6.1.1.2 Species and ESU/DPS Description

Coho salmon are smaller than Chinook salmon, with spawning adults typically measuring around 16 to 28 inches and weighing from 6 to 13 pounds. Spawning males are characteristically dark red on the sides, with a dark green head and back and gray to black belly. Females are paler than males (CalFish 2018a; CDFW 2018b).

The CCC coho salmon ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California, south to and including the San Lorenzo River in central California, as well as populations in tributaries to San Francisco Bay.

6.1.1.3 Habitat Requirements/Ecology

Coho salmon are typically associated with small to moderately sized coastal streams characterized by heavily forested watersheds; perennially flowing reaches of cool, high-quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates (NMFS 2004). Most spawning males are characterized by a hooked jaw and slightly humped back. Coho salmon generally follow a three-year life cycle in which they spend the first year of life in their natal freshwater stream followed by nearly two years in the ocean before returning to their natal stream to spawn (NPS 2001). However, they do express variations to this life history. In freshwater streams, coho salmon require adequate, year-round stream flows, cold water, streamside shade, instream and off-stream shelter and pools, and access to spawning gravels with a low fine sediment component. Spawning typically occurs at the tail of pools or head of riffles, where substrate, depths, velocities, and streamside cover are adequate. Rearing habitat can widely vary, depending on flow levels and what is available. Stream habitats are associated with interstitial voids of gravels, cobbles, and boulders; large woody material that either has fallen in the channel or is growing along the banks; or undercut banks (NMFS 2012).

6.1.1.4 Critical Habitat in the Action Area

Critical habitat for the CCC coho salmon ESU was designated in 1999 (64 FR 24049) and includes all accessible river reaches from Punta Gorda in northern California, south to the San Lorenzo River in central California. Designated critical habitat for coho salmon in the action area includes all accessible estuarine and stream areas, except areas above longstanding, naturally impassable barriers or above Peter's Dam on the main stem of Lagunitas Creek and Seeger Dam on Nicasio Creek (NPS 2007). Through this designation, NMFS identified 10 essential features of critical habitat including: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. Many streams in the action area in the Lagunitas and Olema Creek

watersheds would provide essential features of designated critical habitat for coho salmon, but specific stream reaches are not designated as critical habitat. Figure N-2 in attachment A shows the watersheds in the action area that contain critical habitat for CCC coho salmon.

6.1.1.5 Status in the Vicinity of the Action Area

Coho salmon occur year-round in the action area as watersheds known to contain coho salmon and designated critical habitat are Tomales Bay and Lagunitas Creek, including Olema Creek, which support all life stages of these fish. While the Drakes Estero watershed includes designated critical habitat, NPS has not documented coho salmon in this system. In the 1996 federal listing of CCC coho salmon population (61 FR 56138), the Lagunitas watershed, including Olema Creek, was documented to support 10% of the remaining population. The coho salmon population in the Lagunitas Creek watershed is the largest population south of the Noyo River and may represent a much larger percentage of the remaining wild coho in the ESU than the 10% quoted in the 1996 listing (NPS 2001). Historical and current data on coho salmon and steelhead populations for Lagunitas and Olema Creek watersheds have been gathered as part of the Coho Salmon and Steelhead Monitoring Program and the NPS Inventory and Monitoring program. Through this program, NPS has monitored multiple stages of coho salmon life history in the action area since 1998, performing escapement surveys of spawning adults, outmigration smolt trapping, and surveys of juveniles during summer. Historical records show coho salmon from at least 31 small coastal streams in Marin County. Coho salmon have recently been observed in 17 (55%) of these streams, most of which are tributaries to Lagunitas Creek (Moyle, Israel, and Purdy 2008). Coho salmon are found consistently in Lagunitas Creek, as well as in Olema Creek, Devil's Gulch, and San Geronimo Creek and its tributaries, but less consistently in other smaller tributaries to Lagunitas Creek and Olema Creek (CDFW 2004). Although coho salmon are declining throughout the ESU, the Lagunitas Creek population, including fish spawning in the tributary streams of Olema Creek, San Geronimo Creek, and Devil's Gulch, is considered persistent and moderately abundant (NMFS 2012). Two of the major tributaries on ranch lands, John West Fork Creek and Cheda Creek, support coho salmon (attachment A, figure 2).

According to CDFW (2004), the primary problems facing coho salmon in the watersheds in the action area "are the permanent loss of access to spawning and rearing habitat above Peters Dam (Kent Lake) on Lagunitas Creek and above Seeger Dam on Nicasio Creek, fish passage barriers at road crossings, high fine sediment loads, low summer streamflow, high summer water temperature, a shortage of cover in the form of large woody debris, and loss of riparian vegetation." A study of the Lagunitas Creek watershed documented winter habitat as a major limiting factor for coho salmon because they experience substantial annual population declines between fall and spring (Stillwater Sciences 2008).

During the past three years of monitoring spawning adult coho salmon in the Lagunitas Creek watershed, Marin Municipal Water District (MMWD) reported 292 coho redds and 537 live coho salmon during 2015–2016; 170 coho salmon redds and 499 live coho salmon during 2016–2017; and 110 coho salmon redds and 463 live coho salmon during 2017–2018 (MMWD 2016, 2018, 2019). During monitoring in 2017–2018, MMWD (2019) reported 60% of observed coho spawning in Lagunitas Creek, where 72 redds were observed (MMWD 2019).

In the Olema Creek watershed, 56 adult coho salmon and 33 redds were observed on the Olema Creek mainstem during 2015–2016 monitoring. An additional 29 coho salmon adults and 16 redds were observed on John West Fork (Carlisle et al. 2018). During monitoring in 2017–2018, 84 live coho salmon and 8 redds were observed on the Olema Creek mainstem (McNeill, Reichmuth, and Iwaki 2020). No adults or redds were observed on John West Fork during 2017–2018 monitoring. No adult coho salmon or spawning activity was observed during surveys on Horse Camp Creek, Boundary Gulch, and Quarry Gulch during the last three years of monitoring (Carlisle et al. 2018; McNeill, Reichmuth, and Iwaki 2020).

6.1.2 Central California Coast Steelhead—Threatened

6.1.2.1 Legal Status

The CCC steelhead DPS was listed as a federally threatened species in 1997, a finding that was reaffirmed in 2006 (71 FR 834). NMFS (2016c) conducted a five-year status review of the CCC steelhead DPS and recommended that the DPS remain listed as threatened. Steelhead are not listed under the CESA (CDFW 2018a). The recovery plan for CCC steelhead was completed in 2016 (NMFS 2016a).

6.1.2.2 Species and ESU/DPS Description

Steelhead may be resident, freshwater fish (i.e., nonmigratory, referred to as rainbow trout) or may migrate to the open ocean (anadromous). Steelhead are indistinguishable from rainbow trout during the three-year period they typically spend in freshwater.

The CCC steelhead DPS includes all naturally spawned populations of steelhead (and their progeny) in California streams from the Russian River to Aptos Creek and drainages of San Francisco and San Pablo.

6.1.2.3 Habitat Requirements/Ecology

Steelhead found in park streams are referred to as "winter steelhead" because their timing of upstream adult migration for spawning occurs during winter when stream flows are highest and water temperatures are lowest. Mainstems, tributaries, and intermittent streams may be used for spawning. Steelhead exhibit great variation in life history, but in California, they usually live in freshwater for one to two years, then typically spend two to four years in the ocean before returning to their natal stream to spawn (Moyle, Israel, and Purdy 2008).

Unlike other anadromous species of the *Oncorhynchus* genus (i.e., salmon), steelhead may spawn more than one season before dying. Eggs develop in well-oxygenated gravel and hatch after approximately 20 to 80 days. Fry typically emerge from the gravel two to three weeks after hatching. Upon emerging from the gravel, fry rear in edge water habitats and move gradually into pools and riffles as they grow larger. Because rearing juvenile steelhead reside in freshwater all year, adequate flow and temperature are important to the population at all times. Juvenile steelhead also require adequate cover such as woody debris and undercut stream banks for hiding, which also promotes important food resources in the form of terrestrial insects (NMFS 2004). Large woody debris creates winter habitat for steelhead just as it does for coho salmon, scouring out deep pools and providing cover (NMFS 2004). In the spring, after roughly two years rearing in freshwater, the same physiological change that triggers smoltification in coho salmon is initiated in steelhead. From a combination of genetic and environmental factors, this process prepares the fish for saltwater and induces the steelhead to begin the migration toward the ocean. CCC steelhead are highly dependent on estuaries at the mouths of streams for growth and survival where they can acclimate to saltwater prior to entering the ocean as smolts (NMFS 2016a). Steelhead may spend several years in the ocean before returning to spawn and may make several spawning migrations (NPS 2001). Steelhead are generally first observed in Lagunitas Creek in late December or early January and continue spawning through April or even into May (MMWD 2019).

6.1.2.4 Critical Habitat in the Action Area

Critical habitat for CCC steelhead was designated in 2005 (70 FR 52488) and includes all river reaches and estuarine areas accessible to listed steelhead in coastal river basins from the Russian River to Aptos Creek, California (inclusive), and the drainages of San Francisco and San Pablo Bays. In the Tomales Bay watershed, critical habitat does not include areas upstream of Peters Dam, Seeger Dam, and Soulajule Dam (NMFS 2019). Designated critical habitat for steelhead includes many of the streams in the park, particularly Olema and Lagunitas Creeks. Tributaries of Drakes Estero within the action area that are designated as critical habitat for steelhead include Home Ranch Creek, East Schooner Creek, and the tributary to Creamery Bay. It should be noted that NPS has not documented habitat for or presence of steelhead within the Creamery Bay watershed. Figure 3 in attachment A shows designated critical habitat for CCC steelhead in the action area.

6.1.2.5 Status in the Vicinity of the Action Area

CCC steelhead have declined rangewide over the past 70 years that researchers and agencies have monitored populations (NMFS 2016c). As described above for coho salmon, winter habitat in the Lagunitas Creek watershed is a limiting factor (Stillwater Sciences 2008). Streams in the action area that are known to support steelhead include the Tomales Bay watershed (Lagunitas and Olema Creeks and tributaries) and the Drakes Estero watershed (East and North Schooner, Home Ranch Creek in the action area, as well as Glenbrook, Muddy Hollow, and Laguna Creeks outside the action area). The steelhead population in Lagunitas Creek is considered to be an essential population for the recovery of steelhead in central California (NMFS 2016c). Abundance estimates for these waters are low but stable, and individual run sizes are 500 adult steelhead or fewer (NMFS 2004).

During the past three years of monitoring spawning adult steelhead in the Lagunitas Creek watershed, MMWD reported 120 steelhead redds and 43 live steelhead during 2015–2016; 35 steelhead redds and 23 live steelhead during 2016–2017; and 166 steelhead redds and 204 live steelhead during 2017–2018 (MMWD 2016, 2018, 2019). The large steelhead run during 2017–2018 translated into one of the largest juvenile steelhead populations on record (MMWD 2019).

In the Olema Creek watershed, 5 adult steelhead and 12 redds were observed on the Olema Creek mainstem during 2015–2016 monitoring. Two additional steelhead adults and 4 redds were observed on John West Fork (Carlisle et al. 2018). During monitoring in 2017–2018, 27 live adult steelhead and 27 redds were observed on the Olema Creek mainstem (McNeill, Reichmuth, and Iwaki 2020). No adults or redds were observed on John West Fork during 2017–2018 monitoring. No adult steelhead or spawning activity was observed during surveys on Horse Camp Creek, Boundary Gulch, and Quarry Gulch during the last three years of monitoring (Carlisle et al. 2018; McNeill, Reichmuth, and Iwaki 2020).

6.1.3 California Coastal Chinook Salmon—Threatened

6.1.3.1 Legal Status

The California Coastal (CC) Chinook salmon ESU (i.e., a Pacific salmon DPS) was listed as a threatened species in 1999 (64 FR 50394). In 2005, NMFS issued a final determination that the CC Chinook salmon ESU continues to warrant listing as a threatened species, reaffirming the threatened status and ESU boundaries of CC Chinook salmon (70 FR 37160). The CC Chinook salmon ESU is not listed under the CESA (CDFW 2016). The recovery plan for the CC Chinook salmon ESU was completed in 2016 (NMFS 2016a). A five-year status review of the ESU was also conducted in 2016, recommending no change in status (NMFS 2016d).

6.1.3.2 Species and ESU/DPS Description

Chinook salmon, also referred to as king salmon, are the largest Pacific salmon species. On average, spawning adult Chinook salmon grow to be 3 feet long and approximately 30 pounds but can reach more than 5 feet long and more than 100 pounds. In the ocean, Chinook salmon are blue-green on the head and back and silver on the sides and irregular black spots on the fish's tail, back, and upper fin. During the mating season, male Chinook salmon have a distinctive hooked nose at the top of the mouth and a ridged back. Both sexes develop a reddish tint around their back fins and tail (CalFish 2018b).

Although the Chinook salmon in the action area are referred to as CC Chinook salmon, NMFS has not formally extended the ESU boundary to include these populations (NMFS 2016a) at this time. According to the recovery plan for CC Chinook salmon, half of the Chinook salmon in the action area are most closely genetically related to the Central Valley Fall Chinook salmon ESU to the north, while the other half are related to CC Chinook salmon (NMFS 2016a). Even though Chinook salmon were historically planted in the Lagunitas Creek watershed, the present-day fish are believed to be strays from the Russian River population of the California Coastal ESU because of the ecological similarities between Lagunitas Creek and other coastal basins (NPS 2007). Researchers recommend that Chinook salmon in the Tomales Bay watershed and other populations between the Russian River and the Golden Gate be placed in the California Coastal ESU (NMFS 2016d). Because of the proximity of these fish to the southern boundary of the ESU, NMFS has previously treated the action area as part of the CC Chinook salmon ESU for the purposes of previous ESA

consultation (e.g., NMFS 2004). During the 2016 status review, it was determined that there was no new information for including the watersheds of the action area into the ESU because of the rare Chinook salmon presence (NMFS 2016d).

6.1.3.3 Habitat Requirements/Ecology

Chinook salmon have variable life histories that allow them to take advantage of different types of spawning conditions. Migration to freshwater occurs at different times for different spawning runs of adult Chinook salmon, and the different life-histories are named for the season when most of the adults enter freshwater to spawn. The CC Chinook salmon ESU historically comprised 38 populations that included 32 fall-run populations and 6 spring-run populations, but the spring-run component is thought to be extirpated (CDFW 2016). The migration period of the fall-run Chinook salmon in the ESU ranges from October to April, during the rainy season, peaking in December. Chinook salmon have a three- to five-year life history. Most young Chinook salmon migrate to the ocean during the first few months after emergence, but some may remain in freshwater and migrate a few months later. Smolts spend a variable amount of time in estuarine habitat before transitioning to saltwater. They will spend a few years feeding in the ocean, then return to their natal streams or rivers to spawn. Chinook salmon sexually mature between the ages of two and seven but are typically three or four years old when they return to spawn. Chinook salmon have similar spawning requirements to those described above for coho salmon, requiring cool, swift, well-oxygenated stream habitat. They spawn in either mainstem portions of rivers and creeks or tributaries. Because they are larger, they prefer to spawn in the largest channel sizes of all Pacific salmon, which, in the action area, only includes Lagunitas Creek. Prior to spawning, they stage in large, deep pools and use the largest substrate for spawning of any California salmonids (Moyle 2002; CalFish 2018b; CDFW 2018c).

6.1.3.4 Critical Habitat in the Action Area

The action area does not contain critical habitat for Chinook salmon. Critical habitat for the CC Chinook salmon ESU was designated in 2005 (70 FR 52488) and includes many watersheds on the northern California coastline, extending down to the Russian River watershed, but does not extend as far south as the action area (i.e., Tomales Bay) (NMFS 2016a).

6.1.3.5 Status in the Vicinity of the Action Area

Chinook salmon are not likely to occur year-round in the action area because they migrate out during their first year as smolts by early summer; however, they are more likely to occur during spawning and migration events. Adult and juvenile Chinook salmon have been observed in the action area in Lagunitas Creek in recent years. These Chinook salmon may be part of the CC Chinook salmon ESU because of the proximity of Lagunitas Creek to the range of this ESU (MMWD 2011). Chinook salmon do not occur in any other creek in the action area. Recent monitoring efforts in Lagunitas Creek have identified the presence of Chinook salmon since 2000. MMWD documented Chinook salmon during 12 of 17 years of monitoring, with 2005 being one of the most successful years to date with 105 estimated Chinook salmon (MMWD 2005). The increasing frequency of Chinook salmon in Lagunitas Creek suggests the development of a self-sustaining population, but NMFS (2004) was uncertain whether that would occur. Chinook salmon were not observed in the Lagunitas Creek watershed from 2007 to 2012 (MMWD 2013). During winter 2013–2014, 11 adult Chinook salmon were observed in Lagunitas Creek and 23 Chinook salmon redds were observed during the following survey season (MMWD 2014). Chinook salmon were nearly absent in 2015–2016, with only two redds and four live Chinook observed in upper Lagunitas Creek (MMWD 2016) monitoring. However, in 2016, 32 Chinook salmon redds and 82 live Chinook were observed in Lagunitas Creek (n=27) and San Geronimo Creek (n=5), which appeared to exceed steelhead spawning for the first time in 20 years of conducting surveys. Above average numbers of Chinook smolts were also observed in 2017, indicating that many Chinook redds and fry survived the record-high stream flows of the previous winter (MMWD 2018). Devil's Gulch, the only drainage for which long-term Chinook salmon monitoring data are available in the action area, has experienced a sharp decline in numbers (NPS 2004). There were 27 live Chinook salmon and 22 Chinook salmon redds reported during 2017–2018 (MMWD 2018).

7.0 ENVIRONMENTAL BASELINE

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

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

7.1 Salmonid Habitat in the Action Area

Lagunitas and Olema Creeks are the primary perennial streams that provide habitat for federally listed aquatic species in the Tomales Bay watershed. Within the action area, nearly all perennial stream segments either do not have adjacent grazing or have been fenced with vegetated buffers to exclude cattle. Since the mid-1990s, NPS has worked with ranchers to exclude cattle from approximately 780 acres of riparian habitat which have been removed from lease/permits and are not in action area. Additionally, within the action area, approximately 800 acres have been fenced to exclude cattle from sensitive resources, but these acres are not reflected in current authorizations.

Coho salmon habitat in the action area occurs in the Lagunitas Creek and Olema Creek watersheds, which are approximately 53,150 and 9,390 acres, respectively. Chinook salmon habitat is only found in the Lagunitas Creek watershed. Ranches in the action area comprise approximately 6% (3,540 acres) and 56 % (5,300 acres) of the Lagunitas and Olema Creek watersheds, respectively (NPS 2019b). However, in the Lagunitas Creek watershed, ranches in the action area comprise a larger percentage of the watershed potentially occupied by salmon and steelhead because dams on Lagunitas and Nicasio Creeks block fish movement into most of the watershed upstream. Steelhead habitat is also found in the Lagunitas and Olema Creek watersheds. In addition, steelhead are found in several creeks draining into Drakes Estero, including Home Ranch, East and North Schooner Creek in the action area as well as Laguna, Muddy Hollow, and Glenbrook Creek outside the action area. Ranches in the action area comprise approximately 47% (8,200 acres) of the 17,500-acre Drakes Estero watershed.

Table 7-1 summarizes the length of streams potentially supporting coho salmon, steelhead, and Chinook salmon, totaling approximately 24.5 linear miles of perennial or intermittent streams[1] within ranch boundaries. Livestock have limited access to most streams known to support coho salmon, steelhead, or Chinook salmon, but they occasionally breach exclusion fencing. Some stream reaches could experience indirect effects from livestock grazing and ranch activities in nearby uplands. Because of the minor degree of potential impacts of livestock to most streams in the action area, NMFS (2004) previously determined that any adverse effects of livestock grazing would be minimized or avoided to the degree that they are insignificant or discountable.

Upstream of the action area, MMWD operates four reservoirs on the main stem of Lagunitas Creek and a fifth reservoir on Nicasio Creek. MMWD releases water from Kent Lake to ensure year-round minimum stream flows in Lagunitas Creek. In addition, MMWD releases periodic "upstream migration flows," which are intended to facilitate passage of anadromous fish through shallow areas in the creek and are required on November 15, December 1, January 1, and February 1 in the absence of a natural storm event preceding those dates (MMWD 2018).

[1] Stream reaches are defined as "perennial" or "intermittent" according to the National Hydrography Dataset (USGS 2018).

TABLE 7-1: LENGTH OF PERENNIAL AND INTERMITTENT STREAM REACHES[a] POTENTIALLY SUPPORTING COHO SALMON, STEELHEAD, AND CHINOOK SALMON IN THE ACTION AREA

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

Sources: USGS (2018), USFWS (2018a)

[a] Stream reaches are defined as "perennial" or "intermittent" according to the National Hydrography Dataset (USGS 2018).

[b] Grazing occurs in the watersheds listed in table 7-1 but not necessarily within all streams due to resource protection buffers and exclusion areas.

[c] Does not include any reaches of Lagunitas Creek because it is not within ranch boundaries. Also does not include the lower reaches of Cheda Creek that are not within ranch boundaries. The action area does not encompass any portions of Nicasio Creek, Jewell Creek, Tomasini Creek, or other subwatersheds that potentially support salmon or steelhead in the Lagunitas Creek watershed.

[d] Does not include any reaches designated as steelhead Critical Habitat on Lagunitas Creek or Cheda Creek because those reaches are not within ranch boundaries.

[e] Does not include any reaches of Olema Creek because it is not within ranch boundaries.

[f] Does not include the majority of East Schooner Creek that is not within ranch boundaries, as well as portions of Home Ranch Creek and North Schooner Creek. Also, the action area does not encompass any portions of Laguna Creek or Glenbrook Creek, or any other subwatersheds that potentially support steelhead in the Drakes Estero watershed.

[g] Includes the lower reaches of Home Ranch Creek, East Schooner Creek, and the tributary to Creamery Bay.

7.2 Critical Habitat in the Action Area

Sections 6.1.1.4 and 6.1.2.4 describe critical habitat for the CCC coho and the CCC steelhead trout, respectively. Figures 2 and 3 in attachment A show critical habitat for CCC coho salmon and CCC steelhead in the action area. The action area does not contain critical habitat for CC Chinook salmon, as described above in section 6.1.3.4.

7.3 Previous Consultations with NMFS in the Action Area

In 2001, NPS evaluated the effects of the proposed renewal of livestock grazing permits in the park and prepared a BA as part of the consultation process with NMFS. The action area of NPS 2001 BA encompassed most of the same lands and waters affected by this proposed action. Table 7-2 summarizes the effects determinations from the 2001 NPS BA and the subsequent NMFS BO (NMFS 2004).

TABLE 7-2: DETERMINATIONS OF EFFECTS OF GRAZING ON LISTED SPECIES BY NPS BIOLOGICAL ASSESSMENT AND NMFS BIOLOGICAL OPINIONS

Species	Listing Status[a]	NPS (2001) BA Determination[b]	NMFS (2004) BO Determination[b]
Central California Coast coho salmon (*Oncorhynchus kisutch*)	T	NLAA	LAA, No Jeopardy[c]
Central California Coast steelhead trout (*Oncorhynchus mykiss*)	T	NLAA	LAA, No Jeopardy[c]
California coastal Chinook salmon (*Oncorhynchus tshawytscha*)	T	No Determination	No Determination

Source: NMFS (2018)

[a] ESA determinations: NLAA – "may affect, not likely to adversely affect"

[b] Status Codes: T - Federally listed threatened

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

Table 7-3 summarizes the NMFS determinations for all recently completed section 7 consultations that have occurred between NPS and NMFS.

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

Project	Park Unit	Type of Project	Species Addressed	NMFS Determination[a]	Date
Riparian Restoration Projects (NMFS 2016e)	Point Reyes National Seashore	Floodplain and Riparian Enhancement	Central California Coast coho salmon (*Oncorhynchus kisutch*) Central California Coast steelhead trout (*Oncorhynchus mykiss*)	LAA, No Jeopardy[b]	June 14, 2016
Road Projects (NMFS 2014)	Point Reyes National Seashore	Potential improvements to 12 miles of Sir Francis Drake Boulevard	Central California Coast coho salmon (*Oncorhynchus kisutch*) Central California Coast steelhead trout (*Oncorhynchus mykiss*)	LAA, No Jeopardy[b]	August 18, 2014

[a] ESA determinations: LAA = May affect, likely to adversely affect.

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

7.4 Monitoring Programs

7.4.1 Salmonid Monitoring

The NPS San Francisco Bay Area Network Inventory and Monitoring program (SFAN) monitors populations of coho salmon and steelhead in some park watersheds including Olema Creek, Bear Valley Creek, and Pine Gulch Creek. The watersheds supporting salmon and steelhead in the action area are among the most intensively monitored watersheds in the CCC ESU. Though a relatively small geographic area, the coastal Marin County watershed supports a significant proportion of coho salmon in the ESU (Carlisle, Reichmuth, and McNeill 2018).

Formal salmonid monitoring has been conducted at Point Reyes since the late 1990s. In 1998, the SFAN program and its partners began monitoring coho salmon and steelhead in the park to track trends in their distribution and abundance at key life stages in creeks known to be inhabited. Monitoring was also designed to identify changes in salmon and steelhead habitat and to determine trends in fish fitness (e.g., length, weight) at key life stages. Annual monitoring, is conducted according to the 2010 salmonid monitoring protocol for the San Francisco Bay Area Network (Reichmuth et al. 2010) and includes:

- adult escapement surveys, which document the number of adult salmonids that successfully "escape" ocean fisheries and return to their natal streams to spawn, as well as the number of redds (gravel nests where salmonids lay their eggs) created;
- outmigrant smolt trapping, where the number of smolts (at least year-old juvenile salmonids that have undergone changes to cope with a marine environment) are captured, measured, and counted as they make their way towards the ocean; and
- basin-wide juvenile coho surveys and summer index reach monitoring that seek to quantify the number of juvenile salmonids present in the watersheds during the summer.

Through SFAN monitoring efforts, significant information has been documented regarding coho salmon behavior, life history, distribution, and population trends. The scope of this life-cycle monitoring program allows for characterization of regional patterns observed in the CCC ESU (Carlisle, Reichmuth, and McNeill 2018). In addition to SFAN monitoring in the park, which is supported through funding by CDFW and administered through Point Reyes National Seashore Association and in partnership with the Watershed Stewards Program, MMWD conducts extensive monitoring on stream reaches affected by reservoirs that it manages, including Lagunitas Creek, Devils Gulch, and the main stem of San Geronimo Creek. MMWD's annual salmonid monitoring data (2013, 2014, 2016, and 2018) are incorporated into a network of Salmonid Life Cycle Monitoring Stations along the California coast. The Salmon Protection and Watershed Network (SPAWN) monitors salmonids in six tributaries of San Geronimo Creek (MMWD 2018). NPS submits salmonid monitoring data to CDFW under the state's Coastal Monitoring Program. The Coastal Monitoring Program is based on redd count surveys of stream reaches using a statistically valid sampling design expanded to adult estimates based on spawner:redd ratios. The program is now informing NMFS's five-year status reviews and provides a substantially better basis for assessing status compared to previous status reviews (NMFS 2016f).

7.4.2 Water Quality Monitoring

Small, spring-fed streams and many ephemeral tributaries flow through the grasslands, shrublands, and forests of the action area and drain into Tomales Bay, the Pacific Ocean, or Drakes Bay and Drakes Estero. These streams and other natural and engineered water sources are ecologically important because they transport nutrients, sediment, and oxygen through the watershed and provide habitat for coho salmon and steelhead. NPS has conducted water quality monitoring in the Lagunitas Creek watershed (including Olema Creek) since 1999. A number of stations in the Abbotts Lagoon, Kehoe, and Drakes Estero watersheds were also monitored starting around this time and continued until 2013. Over the period of record, monitoring has included different objectives, sites, and regimes, including targeted monitoring to search for potential pollutant sources, often coupled with implementation of water quality improvement projects, some of which included monitoring before and after implementation. A long-term data set exists for six primary Olema

Creek monitoring sites, where monthly water quality monitoring was formalized under the SFAN Freshwater Quality Monitoring Program beginning in fall 2006 (Wallitner 2016). SFAN also monitors two sampling sites in the Lagunitas Creek watershed on the rotating two-year cycle described below. Point Reyes monitored two additional tributaries of Olema Creek and one of the Lagunitas sites for approximately eight years ending in 2014, collecting only core parameter and fecal indicator bacteria data. Data from these secondary sites has not been analyzed.

The SFAN program has produced biennial summary reports of water quality monitoring results (Skancke and Carson 2009; Booth 2013; Wallitner 2013; Wallitner 2016; Wallitner and Pincetich 2017). Ketcham (2001) summarizes the initial monitoring effort conducted from 1999 to 2001. Details regarding a number of these data collection efforts and subsequent analyses are discussed below for the action area.

The San Francisco Bay RWQCB listed Tomales Bay and major Tomales Bay tributaries, including Lagunitas Creek and Olema Creek, as impaired for nutrients, pathogens, and sedimentation/siltation under section 303(d) of the Clean Water Act (SWRCB 2010). In 2006, the San Francisco Bay RWQCB adopted a total maximum daily load (TMDL) for pathogens in the Tomales Bay watershed. NPS has conducted fecal coliform sampling.

NPS will continue to follow the SFAN water quality monitoring program to assess current aquatic conditions and identify pollution sources, including problems associated with livestock operations in the action area. Exceedance of the thresholds will require discussion between NPS and NMFS to determine if consultation is needed, and NPS will inform NMFS and investigate the cause of exceedance. If the sediment and turbidity levels are directly related to livestock operations (for example, a muddy field draining directly to a stream), NPS will inform NMFS of the measures that will be taken to avoid and/or minimize sediment entry to the stream.

7.5 Water Quality in the Action Area

The main sources of water quality degradation in the action area are bacteria and nutrient loading from nonpoint sources associated with ranches, dairies, septic systems, and stormwater runoff (Wallitner 2013; Pawley and Lay 2013). Chapter 3 of the EIS identifies general water quality conditions in the action area and specifically the Lagunitas and Olema Creek watersheds. Sediment loading from erosion and degradation associated with natural processes, ranch and dairy activities, land development and disturbance, stream channel alteration, and stormwater runoff have also affected many of the surface waters. Nutrients, pathogens, and contaminants are often bound to suspended or settled sediment particles in rivers, streams, or lakes and could constitute additional pollutant sources (Pachepsky and Shelton 2011; Thompson and Goyne 2012; Walling, Webb, and Russell 1997). Historic and ongoing land uses, including historical logging, agriculture and livestock activities, road construction, and stream channel modification have led to the loss of pollutant and stormwater attenuation capacity, altered drainage patterns, and increased sediment inputs to water resources (NPS 2001).

Temperature is critical for maintaining suitable habitat for native aquatic organisms. Thermal tolerance ranges for coho salmon are 53.6 degrees Fahrenheit (°F) to 66.2°F, while steelhead can handle warmer conditions, ranging from 55.4°F to 69.8°F. Elevated water temperatures lower water to store DO, which also reduces habitat suitability for salmon and steelhead (Ketcham 2001). Based on approximately 1,300 water samples collected in the park from 1999 to 2005, the majority of streams fall within the suitable range of water temperatures for salmonids during most of the year. Areas where water temperature exceeds the suitable water temperature for salmon and steelhead (>68ºF) are locations where salmonids do not occur (Pawley and Lay 2013). More recent data from SFAN monitoring indicate temperatures in the Lagunitas Creek (including Olema Creek) watershed remain within the thermal tolerance ranges for these species (Wallitner 2016; Wallitner and Pincetich 2017).

DO is another parameter monitored in streams that potentially support salmon and steelhead in the action area. Adequate oxygen is necessary for each life stage of salmonid development (CDFW 2004). Pawley and Lay (2013) reported that from 1999 to 2005, over 75% of the samples collected in Point Reyes were greater than the San Francisco Bay RWQCB numeric objective for cold water habitat of 7.0 milligrams per liter

(mg/L) and 90% were greater than the warm water objective of 5 mg/L. A few areas of higher exceedences were noted, including the most upstream Olema Creek sampling station. It should be noted that upper Olema Creek is intermittent, and samples were representative of individual pool conditions with no surface flow, where DO may be lower with warmer water (Pawley and Lay 2013). DO may be lower with warmer water and under intermittent flow conditions. Synoptic samples of John West Fork under intermittent conditions showed that conditions within individual isolated pools were stratified (temperature and DO), and that DO and temperature from pool to pool were distinct (Pawley and Lay 2013). More recent SFAN monitoring reports contain similar results: during water years 2015–2016 more than 80% of Olema Creek watershed results were above 7.0 mg/L, with the majority of exceedances from the most downstream station that often becomes stagnant, and two upstream stations that regularly become disconnected and pool during low flow (Wallitner and Pincetich 2017). During water years 2013–2014, more than 75% of the results were above 7.0 mg/L for all stations sampled in the Lagunitas Creek watershed (Wallitner 2016).

Specific conductance of surface waters is an indicator of dissolved solids, which can be influenced by the geology of an area as well as urban runoff (Pawley and Lay 2013). High conductivity levels in freshwater streams can be indicative of pollution such as inflow from sewage or runoff from highways. Pawley and Lay (2013) reported that from 1999 to 2005, most stream monitoring stations in the action area had specific conductance values in the range target range that would not adversely affect fish migration and estuarine habitat. More recent data from SFAN monitoring indicates specific conductance in the Lagunitas Creek (including Olema Creek) watershed remains below this target range, with a maximum value of 395.6 microsiemens per centimeter recorded between water years 2013–2016 (Wallitner 2016; Wallitner and Pincetich 2017).

Fecal contamination comes from inadequate management of animal wastes, especially manure from dairies and ranches. Runoff of livestock wastes or direct deposition to streams could contribute excess nutrients (nitrogen and phosphorus) that stimulate algal and aquatic plant growth that, if excessive, could lead to die offs of aquatic organisms from a loss of DO as the algae decompose or toxic byproducts associated with this process (Belsky, Matzke, and Uselman 1999). Nitrate monitoring on Lagunitas and Olema Creeks from 2007 to 2012 generally returned low nitrate values, with the most upstream site having the lowest values and the highest values at a downstream site (SWRCB 2013). SFAN monitoring of nitrate at long-term sites in the Tomales Bay watershed since late 2006 indicates that no samples have exceeded the drinking water standard of 10 mg/L, and fewer than 5% of samples have exceeded 1.0 mg/L. Long-term trend analysis at park water quality monitoring stations indicate a decreasing trend in fecal indicator bacteria (Lewis et al. 2019; appendix L of the EIS). Pawley and Lay (2013) reported high nutrient concentrations in Kehoe Creek but not in streams known to support salmonids. Specific details of these analyses are discussed below.

pH is a measurement of a water's acidity. Low pH, commonly a result of acid rain, can directly or indirectly cause the death of aquatic biota. The San Francisco Bay RWQCB's numeric target is maintenance of pH between 6.5 and 8.5, based on the National Recommended Water Quality Criteria for Aquatic Life (San Francisco Bay RWQCB 2013). Pawley and Lay (2013) reported that from 1999 to 2005, 95% of stream water samples had pH values in the acceptable range. More recent data from SFAN monitoring indicates only 1% of samples were below 6.5 pH units in the Lagunitas Creek (including Olema Creek) watershed during water years 2013–2014 (Wallitner 2016). However, in water years 2015–2016 approximately 10% of samples, all located in the upper Olema Creek watershed, fell below 6.5 pH units (Wallitner and Pincetich 2017).

Sediment loading to waterways can occur from erosion and degradation associated with natural processes, ranch and dairy activities, land development and disturbance, stream channel alteration, and stormwater runoff. Sediment loading can cause a variety of impacts, including turbid water, which can prevent aquatic species from seeing food, vegetation growth, and disrupt the natural food chain (Wood and Armitage 1997). Turbidity, a measure of relative water clarity reported in nephelometric turbidity units, is used as an indicator of levels of sediment, though it also includes any organic matter, such as algae. Turbidity typically increases in action area streams during rain events. Turbidity monitoring in the Lagunitas Creek watershed between 2009 and 2014 and the Olema Creek watershed from 2009 to 2017 indicates that approximately 90% of samples collected at long-term monitoring stations were below a threshold of 25 nephelometric turbidity units, with most samples above this threshold occurring during storm conditions (NPS unpublished data).

Coastal watershed monitoring data from 2010 to 2013 indicates 84% of samples were below this threshold, with very few exceedances in streams known to contain steelhead (see appendix L in the EIS).

Over the last 20 years in the action area, more than 170 activities to improve resource conditions, including water quality, have been implemented in the action area in partnership with USDA-Natural Resources Conservation Service (USDA-NRCS), San Francisco Bay RWQCB, the Marin Resource Conservation District, ranch operators, and others (see figure 4 in appendix A of the EIS). Riparian restoration projects have focused on benefits to salmonids and other sensitive aquatic resources and complying with TMDL regulations for pathogens. Practices implemented include riparian livestock exclusion fencing, erosion feature repair, controlled stream crossings, road rehabilitation and decommissioning, and off-stream water sources for livestock. Some riparian areas are included in larger pasture units that can be managed for riparian health (Aoyama et al. 2018).

7.5.1 Tomales Bay Watershed

Monitoring studies in the 1990s covering Tomales Bay, Lagunitas Creek, and Olema Creek have observed exceedances of San Francisco Bay RWQCB's fecal indicator bacteria criteria primarily affecting shellfish harvest, which occurs on state-managed tidelands in the bay, as well as elevated nutrient, suspended solids, and turbidity levels in the watershed especially associated with stormwater runoff following high-intensity storm events (Crunkilton 2000, as cited by Wallitner 2013, 2004, and 2017; SWRCB 2013; Wallitner 2016). As a result of these studies, the San Francisco Bay RWQCB listed Tomales Bay and its major 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 of materials that lead to sedimentation/siltation include soil disturbance associated with the San Andreas Fault zone, historical logging activities, and historical and current agricultural practices.

In 2005, the Tomales Bay Watershed pathogen TMDL 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 Bay RWQCB 2014). As part of these efforts, a Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay watershed was developed to outline control measures and operational practices to reduce bacterial input to the watershed from grazing lands, in particular from stormwater runoff (San Francisco Bay RWQCB 2018). The current five-year grazing waiver was renewed in October 2018 and implements the Tomales Bay Pathogen TMDL and the Lagunitas Creek Sediment TMDL (San Francisco Bay RWQCB 2018). Ten park ranch operations report under this conditional waiver. A TMDL for nutrients will be developed along with ongoing management efforts in the Tomales Bay watershed (San Francisco Bay RWQCB 2017).

The 2005 Tomales Bay TMDL staff report showed that of the watersheds in the action area, Lagunitas and Olema Creek contributed some of the lowest fecal coliform bacteria loads to the bay. Overall, the Olema Creek subwatershed was the second smallest fecal coliform contributor to Tomales Bay, with just 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 action area. Combined, the ranches in the action area cover just over 7% (approximately 10,000 acres) of the total Tomales Bay watershed, including Lagunitas Creek (3,900 acres), Olema Creek (5,200 acres), and direct drainage to Tomales Bay (1,060 acres).

Long-term trend analysis in the Olema Creek watershed indicates average fecal coliform bacteria concentrations were reduced by 95% over the 19-year period from 1999 to 2017 (Lewis et al. 2019). Although the general, long-term fecal coliform bacteria trend was downward, increases in precipitation during rain events (cumulative 24-hour and 5-day) were associated with temporary increases in fecal indicator bacteria concentrations during those events. Short-term watershed assessment monitoring (January 2016 to May 2018) in the watershed 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

Escherichia coli (*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 (Voeller et al. 2018).

The long-term 95% decrease in fecal coliform bacteria concentrations from 1999 to 2017 was concurrent with the implementation of Management Activities such as Livestock Water Supply, Fencing, and Stream Crossings intended to reduce pathogen, sediment, and nutrient loading to local streams throughout the watershed. This includes approximately 40 actions in the Olema Creek watershed, which cumulatively provided increased managerial control of livestock access to more than 28 kilometers of Olema Creek and nearby tributaries (Lewis et al. 2019). Additionally, between 1996 and 2012, NPS established approximately 780 acres of cattle exclusion adjacent to critical coho salmon and steelhead habitat, which were removed from lease/permits and are not in the action area, which also likely resulted in benefits to water quality. The effectiveness of these types of Management Activities at reducing pollutants of concern is consistent with findings from other studies (e.g., Line et al. 2000; Line 2003; George et al. 2011; Kay et al. 2018).

Results from monitoring in the Lagunitas Creek watershed are summarized in various reports but no long-term trend analysis has been conducted to date. Review of data that have been collected by NPS indicates that more than 86% of Lagunitas Creek watershed samples (stations LAG2 & LAG3) analyzed for *E. coli* between 2007 and 2014 were below the San Francisco Bay RWQCB single-sample statistical threshold value for water contact recreation (320 colony-forming units per 100 milliliters; SWRCB 2019).

Other activities that have been implemented in the Tomales Bay watershed include Riparian Vegetation Management and Planting and instream restoration activities to improve threatened and endangered species habitat. In 2007–2008, NPS and the Point Reyes National Seashore Association implemented an approximately 613-acre Giacomini Wetlands Restoration Project in the southern end of Tomales Bay. The project principally focused on conversion of a former dairy ranch into tidal wetlands by restoring natural hydrologic tidal and freshwater processes to promote restoration of hydrologic and ecological functions. The location of the Giacomini wetland at the confluence of Lagunitas Creek, Olema Creek, and Tomales Bay allows these waters to spread out over the restored marsh plain, resulting in improved ecological habitat and water quality for Tomales Bay. Compared to baseline conditions at the beginning of the Giacomini Wetlands Restoration Project, dissolved oxygen levels increased 16%, while nitrate, ammonia (NH_3), phosphate, phosphorous, and fecal coliform bacteria levels decreased at least 23% (Parsons and Ryan 2015).

7.5.2 Drakes Bay Watershed

NPS programs and other sampling programs have observed high concentrations of total suspended solids and nutrients in Drakes Bay and Drakes Estero (NPS 2004; Pawley and Lay 2013). Surrounding land uses such as ranches and pastures for dairies and other livestock operations contribute nutrients and sediment to Drakes Bay and Drakes Estero (NPS 2004). Occasionally high bacteria counts have been observed in some drainages (Pawley and Lay 2013). Potential 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 action area) (California Department of Public Health 2011). All ranches operate consistent with the San Francisco Bay RWQCB regulations for beef and dairy operations in these watersheds. Drakes Estero has been proposed as a new listing because of bacteria in the 2016 section 303(d) and 305(b) Integrated Report (San Francisco Bay RWQCB 2017).

Appendix L of the EIS summarizes 30 Management Activities such as exclusion Fencing along drainages and Infrastructure Improvements that were implemented on beef and dairy operations upstream of monitoring stations concurrent with sampling during 2000 to 2013 to address water quality concerns identified by initial monitoring in the Abbotts, Kehoe, and Drakes Estero watersheds. Analysis of water quality data collected from 1999 to 2013 in these watersheds found that fecal indicator bacteria concentrations (after accounting for variation in rainfall) declined at all 13 water quality stations that were downstream of Management Activities implemented on grazed lands during the monitoring period. This included one watershed known to contain steelhead, Home Ranch Creek, where riparian Fencing and Livestock Water Supply were installed. Monitoring on the only other watershed in the analysis known to contain steelhead, East Schooner Creek, showed a slight positive trend in fecal indicator bacteria concentrations; however, this station had the second

lowest mean of fecal indicator bacteria across the analyzed watersheds, with little grazing influence and no Management Activities implemented. Approximately 92% of turbidity results (84 out of 91) collected between 2010 and 2013 were below a threshold of 25 nephelometric turbidity units in these two watersheds known to contain steelhead (see appendix L of the EIS).

7.6 Past and Current Activities in the Action Area

Coho salmon and steelhead in the action area have been declining since the turn of the century, with significant declines occurring as late as the mid-1950s. Most historical information on salmonid numbers is anecdotal, while quantified data are lacking. After European settlement, extensive habitat alteration by dam-construction, logging, and channelization led to declines in salmon and steelhead habitat (Moyle, Israel, and Purdy 2008). Multiple past and current activities in the action area have affected salmon and steelhead and their aquatic habitats. The potentially affected federally listed species include: coho salmon, steelhead, and Chinook salmon. In addition to agriculture, other activities that have affected salmon in California according to Moyle et al. (2017) and could be applicable to watersheds in the action area, include: (1) dams and water infrastructure; (2) transportation infrastructure; (3) human development, (4) park visitation, (5) stream restoration projects, (6) fishing and harvesting, and (7) wildfire management.

7.6.1 Dams and Water Infrastructure

Streams, lakes, wetlands, and groundwater resources in the action area have been altered by a variety of factors such as water withdrawal (surface and groundwater), impoundments (dams and culverts), channelization and levees, channel hardening, expansion of impervious surfaces, loss of riparian buffers, and changes in runoff characteristics from changes in plant community composition. For example, the main stem of Lagunitas Creek was reduced by more than 50% by construction of Alpine Dam in 1918 and Peters Dam in 1953. Because neither dam has provisions for fish passage, their construction resulted in permanent loss of the upper portion of the drainage to anadromous fish (NPS 2004). Lagunitas Creek is used as part of the municipal water supply for Marin County. A series of dams operated by MMWD supply much of southern Marin from Kent Reservoir on the main stem and Nicasio Reservoir on Nicasio Creek. Well water diversions at the downstream end of the watershed supply MMWD's West Marin Service Area. Numerous earthen dams in the park also pose problems to aquatic habitat and fish migration (Pawley and Lay 2013).

7.6.2 Transportation Infrastructure

Stream crossings for transportation purposes cross over or through many stream channels in the action area, including culverts and bridges. Culverts vary in the degree of their impact on stream morphology but can be problematic for salmon and steelhead. If undersized or constructed improperly, culverts in danger of failing cause localized erosion, channel downcutting, and resultant aquatic habitat degradation (Pawley and Lay 2013). Culverts often create temporal, partial, or complete barriers for salmon and steelhead during their spawning migrations (Robison et al. 1999). An inventory of stream crossings on roads maintained by Marin County was conducted in 2002 and 2003, focused primarily on watersheds known to support runs of salmon and steelhead. This Stream Crossing Inventory and Fish Passage Evaluation Report identified and prioritized culvert locations to fix that would result in unimpeded passage for all species (and life stages) of salmonids (Ross Taylor and Associates 2003). In 2007, NPS removed or replaced culverts with bridges at five other sites in the Drake's Estero watershed to improve geomorphic process and fish passage. More recently, NPS, in cooperation with the Federal Highway Administration, began to repair 22 miles of road and adjacent parking areas in the park. This program includes road projects on Sir Francis Drake Boulevard to replace the existing culverts at East Schooner Creek with a single-span bridge and restore and stabilize approximately 710 feet of Sir Francis Drake Boulevard that is severely eroded. Also, CalTrans recently completed improvements at two sites along Highway 1 in Olema Valley.

7.6.3 Human Development

The watersheds in the action area beyond the park are expected to experience increasing human development in the form of moderately dense development permitted in the various villages, which would include infrastructure, roadways, and associated impervious surfaces (Marin County 2014). In the Lagunitas Creek

watershed, additional development could increase water demand, which would affect stream flows if current allocations are not fully used because water in Lagunitas Creek is fully appropriated (NMFS 2004). A variety of factors outside the park, such as water withdrawal (surface and groundwater), impoundments (dams and culverts), channelization and levees, channel hardening, expansion of impervious surfaces, loss of riparian buffers, and changes in runoff characteristics due to changes in plant community composition, can alter streams, lakes, wetlands, and groundwater resources in the action area. Water transport and diversion also affect stream processes such as sediment deposition and erosion, stream meandering, and flow regimes.

7.6.4 Park Visitation

Increased park visitation affects aquatic habitats because traffic and associated pollutants from roads increase. Ground disturbance and vegetation clearing associated with road maintenance and poorly maintained legacy roads and trails, coupled with heavy use in areas with high levels of visitation, could exacerbate erosion. Storm runoff from roads and areas with high human traffic could increase sedimentation and pollutant discharge into freshwater streams that are used by salmon and steelhead. In addition, road crossings could be problematic to aquatic wildlife if culverts or other crossing structures prevent fish passage. Lastly, park visitors could directly affect salmon and steelhead through disturbance during spawning due to off-trail horse use and visitors spooking fish while spawning.

7.6.5 Stream Restoration Projects

Numerous stream restoration projects have been conducted during the past couple decades in the action area, and additional projects are expected to occur. Restoration activities outside the park may cause temporary increases in turbidity, alter channel dynamics and stability, and temporarily stress salmonids (Habersack and Nachtnebel 1995). However, stream restoration projects are expected to have long-term benefits from increased habitat availability and complexity, increased channel and bank stability, improved spawning habitat, decreased sedimentation, and increased shading and cover for salmonids. Some aspects of aquatic habitat in the action area are expected to improve as a result of the restoration actions described above.

Throughout the action area, more than 170 Management Activities were implemented in the last two decades, including riparian cattle exclusion Fencing, erosion feature repair, Stream Crossings, Road Upgrade and Decommissioning, and Livestock Water Supply. Projects in the Tomales Bay watershed have received funding from the State Water Resources Control Board (SWRCB) under 319(h) grants and from the USDA-NRCS Environmental Quality Incentives Program, among others, to assist with assessment, design, and implementation to comply with regulations, including the pathogen TMDL (Aoyama et al. 2018).

MMWD has implemented several Waterway Stabilization projects, winter habitat enhancement projects, and other habitat enhancement actions in the Lagunitas Creek watershed (MMWD 2011). Multiple entities are focused on habitat enhancement and restoration in the Lagunitas Creek watershed to support endangered coho salmon. MMWD began implementing the Lagunitas Creek Winter Habitat and Floodplain Enhancement Project, carrying out actions at 10 sites to enhance winter habitat and floodplain function. In summer 2018, the SPAWN program initiated floodplain restoration and riparian habitat enhancement on NPS lands in the Jewell and Tocaloma areas of Lagunitas Creek. This reach of Lagunitas Creek has been identified as an opportunity to restore high value off-channel habitat for juvenile salmonids.

7.6.6 Fishing and Harvesting

Historically the Lagunitas and Olema Creek drainages supported large runs of spawning coho salmon and steelhead, with sufficient reproduction to support a fishery in Tomales Bay at the end of the 1800s (Moyle, Israel, and Purdy 2008). Currently, fishing is closed in Lagunitas Creek and its tributaries, and in all inland freshwater steams in the park, so there is currently no take of coho salmon, steelhead, or Chinook salmon in the action area.

7.6.7 Wildfire Management

Fire may lead to temporary increases in fine sediment in streams that potentially support salmon and steelhead, which can degrade egg and fry habitat in the short term. However, wildfire can improve habitat quality for adult and overwintering fish by increasing instream wood. The most recent wildfire affecting the

action area was the 1995 Vision Fire. In July 2004, the park completed a *Fire Management Plan and Environmental Impact Statement for Point Reyes National Seashore and for the Northern District of Golden Gate National Recreation Area* (NPS 2004). The plan provides a framework for all fire management activities in the park, including suppression of unplanned ignitions, prescribed fire, and mechanical fuels treatments; it is intended to guide the fire management program for the next 10 to 15 years. In accordance with NPS policy, the plan is responsive to the park's natural and cultural resource objectives, reduces risk of fire to developed facilities and adjacent communities, and provides for public and staff safety. Up to 3,500 acres annually could be burned or mechanically treated over the next decade as a result of the plan. Some of the Fire Management Units identified in the plan are in the action area. Prescribed burning could occur in the future in the action area for resource management (e.g., invasive species control). In 2018, NPS signed an agreement with Marin County to transfer most wildland fire operations and response actions to Marin County. Under this agreement, Marin County may implement mechanical treatments and conduct prescribed fire burns to reduce the risk in the Wildland Urban Interface.

8.0 EFFECTS TO EVALUATED SPECIES AND DETERMINATIONS

Potential effects to federally listed salmonids and their habitat in the action area were evaluated by considering predicted changes in ecosystem processes resulting from proposed grazing and ranch activities. The area of analysis includes watersheds in the action area that are potentially used by coho salmon, steelhead, and Chinook salmon. Additionally, potential effects on aquatic habitats downstream of the action area were considered.

8.1 Effects on Central California Coast Coho Salmon, Including Critical Habitat

8.1.1 Direct and Indirect Effects on Coho Salmon

8.1.1.1 Effects of Livestock Grazing

Grazing could affect coho salmon by increasing erosion into streams. Grazing reduces the amount of vegetation available to capture water and compacts soil, which reduces infiltration and available water capacity of rangeland soils. Soil compaction increases runoff, which carries topsoil and sediments into creeks and rivers during storm events. According to NMFS (2004), "High concentrations of suspended sediment can affect coho salmon in several ways, including increased mortality, reduced feeding efficiency, and decreased food availability (Berg and Northcote 1985; McLeay et al. 2002; Newcombe 1994; Gregory and Northcote 1993; Velagic 1995; Waters 1995). Substantial sedimentation rates could bury benthic macroinvertebrates that serve as food for coho salmon (Ellis 1936, Cordone and Kelley 1961), degrade instream habitat conditions (Cordone and Kelley 1961; Bjornn et al. 1977; Eaglin and Hubert 1993), cause reductions in fish abundance (Alexander and Hansen 1986; Bjornn et al. 1977; Berkman and Rabeni 1987), and reduce growth in salmonids (Crouse et al. 1981). Waters with high turbidity are avoided by migrating salmonids, and high amounts of suspended sediment can delay migration to spawning grounds (Bjornn and Reiser 1991). Sedimentation of redds can kill both eggs and alevins (Bjornn and Reiser 1991)."

While cattle are excluded from most riparian areas adjacent to streams used by coho salmon,[2] livestock grazing in riparian areas of tributary streams could reduce vegetative cover, which would reduce hiding cover for coho salmon or elevate stream temperatures to unsuitable levels. Elevated water temperatures reduce the ability of the water to hold DO, of which an adequate level is necessary for each life stage of coho salmon (CDFW 2004). In addition to increased runoff and erosion from uplands in the watershed, livestock grazing in riparian areas could also increase water turbidity, which could lead to reduced habitat for coho salmon from sedimentation of streambeds (Belsky, Matzke, and Uselman 1999). Livestock with access to stream channels could also trample stream banks and contribute excess nutrients via manure and urine, which could

[2] Livestock grazing is excluded from Lagunitas and Olema Creeks. In addition, cattle grazing is restricted from several tributaries that could support coho salmon.

affect coho salmon by increasing sedimentation and turbidity, increasing water temperatures, and reducing DO (Belsky, Matzke, and Uselman 1999).

Beef and dairy ranching in the action area could contribute nutrients, sediment, bacterial contaminants, and other pollutants into surface waters. Livestock wastes, if not contained, could contribute nutrients that stimulate algal and aquatic plant growth that, if excessive, could lead to die offs of aquatic organisms from a loss of DO as the algae decomposes. Tomales Bay and major Tomales Bay tributaries, including Lagunitas Creek and Olema Creek, are listed as impaired under section 303(d) of the Clean Water Act due to pathogens and sedimentation/siltation. In addition to other factors, agricultural activities and manure from livestock operations in the action area contribute nutrients and other pollutants into waters used by coho salmon (Ghodrati and Tuden 2005; San Francisco Bay RWQCB 2016). In the Tomales Bay watershed, runoff during storm events is an important factor that affects pollutant loading and water quality on the Clean Water Act 303(d)-listed Tomales Bay and its tributaries, including Lagunitas and Olema Creeks (SWRCB 2013).

In spite of the above described potential adverse effects of livestock on coho salmon, the actual effects are likely far reduced from those noted for the following reasons: (1) livestock grazing is managed to avoid heavy grazing via monitoring that would ensure an average of 1,200 pounds per acre of RDM in the fall in accordance with Bartolome et al. (2015); (2) livestock are prevented from accessing Olema Creek, Lagunitas Creek, and numerous tributaries; (3) many streams in the action area are steep wooded canyons that preclude access by livestock; and (4) most ranches along Lagunitas Creek, Olema Creek, and elsewhere in the park, have developed upland water sources for livestock, which can reduce livestock use of intermittent streams;. See table 7-1, in section 7.1, for further detail about the length of streams potentially supporting coho salmon, steelhead, and Chinook salmon in the action area. Because of the limited access of livestock to most streams in the action area, adverse effects of livestock grazing would be mostly avoided. Furthermore, increased stormwater runoff and sedimentation from cattle grazing of upland areas is unlikely to occur in amounts that would harm coho salmon.

8.1.1.2 Effects of Management Activities and Diversification

Implementation of additional Management Activities and Diversification associated with ranching in the action area could indirectly affect coho salmon by affecting erosion in upland areas from ground disturbance associated with human activity, vehicles, and machinery, and the maintenance and possible construction of Ranch Infrastructure. Activities could also change the type and amount of pathogens and nutrients entering streams through nonpoint sources. Adverse effects from sedimentation of streams potentially occupied by coho salmon could reduce pool depths, increase gravel embeddedness, and create wider, shallower stream channels. The potential effects in the categories of Ranch Infrastructure and Water Control, Vegetation Management, and Diversification are discussed below.

Implementation of Ranch Infrastructure and Water Control Management Activities are intended to reduce erosion or runoff of pollutants to surface waters (e.g., Road Upgrade and Decommissioning, Infrastructure Management, Waterway Vegetation Planting, and Waterway Stabilization), while others (e.g., Fencing, Stream Crossings, and Livestock Water Supply) can reduce direct cattle access to water resources.

Road Upgrade and Decommissioning treatments provide long-term stabilization for eroding roads or drainage infrastructure, reducing erosion and providing associated benefits to water quality. Decommissioning or relocating road sections reestablishes original landscape contours and native or other vegetation suitable for the former road site, providing additional stabilization and reducing erosion potential. Applying best practices when maintaining ranch roads would continue to minimize the potential for sedimentation and transport of other pollutants. Ranch roads with erosion issues would continue to be assessed and addressed but could continue to deliver sediment until repaired. Where implemented, Road Upgrade and Decommissioning projects result in relocation and improvement of existing access roads, with potential relocation to provide a setback from a stream corridor or to use low slopes and natural contours to minimize disturbance of drainage patterns.

Infrastructure Improvements, Stream Crossings, and Fencing projects manage livestock uses and limit cattle access to waterways or keep runoff from entering areas where livestock occur. Long-term benefits include

reduced potential for soil erosion and delivery of pollutants to waterways with associated benefits to water quality. Stream Crossings would ensure fish passage where appropriate, reduce sources of nutrient and bacteria loading, and reduce disturbances that result in turbidity by limiting waterway access to the direct vicinity of the crossing, which may include elevating the crossing above the waterway via culvert or bridge. Stream Crossings are typically implemented in combination with exclusion fencing to direct livestock to the crossing. In cases where stream systems are perennial, the design approach would ensure appropriate maintenance of fish passage. Additional short-term impacts could include temporary dewatering. In most cases, the crossings are in intermittent systems and would occur on sites that are already disturbed. Potential long-term impacts may also include changes to wetlands and stream morphology in the vicinity of the crossing, which could indirectly affect coho salmon, but mitigation measures would limit the potential impacts. New Stream Crossings would generally be limited, and other activities to prevent the need for a stream crossing would be evaluated first. They would be designed with enough flow capacity to convey the design flow without altering existing stream flow characteristics. Streambanks at each crossing would be protected using erosion reduction BMPs (e.g., riprap). Waterway Stabilization and Waterway Vegetation and Planting activities would reduce potential for soil erosion; less sedimentation would improve water quality, resulting in benefits for coho salmon. Changes to stream morphology could occur with the installation of permanent stabilizing materials such as rock but are not expected to adversely affect coho salmon.

Vegetation Management activities in the Pasture subzone, established to avoid sensitive resources, would not have the potential for direct short-term impacts on water resources, and therefore coho salmon. The Upland and Riparian Vegetation Management and Planting activities, often intended to establish cover in heavily disturbed areas or those lacking adequate vegetation, would reduce potential for nonpoint source pollution over the long term. They would initially disturb the ground surface but would ultimately provide soil stabilization, stormwater filtration, and uptake functions and improve water quality by reducing sedimentation and pollutant (i.e., nutrient and pathogen) loading to surface water and groundwater. Improved water quality would benefit coho salmon. Weed removal through IPM could also result in short-term ground disturbance. Vegetation management would comply with NPS IPM regulations and procedures, applicable handling and disposal laws, and the use of appropriate herbicide application methods (e.g., restrictions on spraying during windy or wet days) to minimize or prevent adverse impacts on surface water quality that could affect coho salmon. Site-specific impacts on water resources from Targeted Grazing could include those described for grazing; however, Targeted Grazing would be limited in duration and focused on specific locations to achieve NPS resource management goals and objectives, which include minimizing impacts on water quality. Mowing would not be expected to affect water quality or impact coho salmon.

Diversification activities, such as new types of livestock in the Ranch Core and Pasture subzones and crops, could change the type and amount of pathogens and nutrients entering streams through nonpoint sources. However, sheep and goats would be limited to the Ranch Core and Pasture subzones and they would not be authorized in the Range subzone where 99% of the water resources are located. Potential impacts on coho salmon via changes to water quality related to sheep and goats in these subzones are not expected to be any greater than the impacts of cattle under existing conditions because the total authorized AU in the action area would not increase, the density of these non-cattle livestock would not exceed 10 AU or 10% of AU for any operation, and the RDM standard would remain in place to protect soils. Impacts on water quality related to the authorization of up to 9,000 chickens distributed across the action area would be minimized by restricting their density (no more than 500 chickens per authorized operation) and location (limited to the Ranch Core and Pasture subzone). All confined animal facilities would be required to follow San Francisco Bay RWQCB regulations for these operations, which include compliance with a monitoring and reporting program, and development and implementation of site-specific management plans. Up to 2.5 acres of non-irrigated crops on individual ranches would be restricted to previously disturbed land that does not have the potential to impact resources.

8.1.2 Avoidance, Minimization, and/or Mitigation Measures for Coho Salmon

The potential for adverse impacts on coho salmon from the proposed action would be avoided, minimized, or mitigated through the implementation of Practice Standards (see appendix F of the EIS) and mitigation measures (see table 3-3 in section 3.3), as well as size limitations on certain Management Activities. Potential

effects would be minimized or prevented by implementing range management guidelines that minimize erosion and stormwater runoff. The most land-intense activities would be prohibited from the Range subzone, which includes approximately 77% of the stream miles in the action area. Most other surface water resources are contained in the Resource Protection subzone, which includes fencing that excludes livestock from potential streams occupied by coho salmon. Cattle are excluded from direct access to Lagunitas and Olema Creeks, the two most significant streams occupied by coho salmon in the action area. Cattle would thus only directly affect this habitat for salmon and steelhead on occasion if they were to breach pasture fences into excluded riparian areas. Lands added to the Resource Protection subzone would exclude cattle from approximately 2.4 miles of perennial streams in the Lagunitas and Olema Creek watersheds. In the Olema Creek watershed, these livestock exclusion areas would restrict grazing from approximately 1.9 miles of riparian habitat covering approximately 33 acres, including critical habitat on John West Fork and Horse Camp Gulch. In the Lagunitas Creek watershed, cattle would be excluded from approximately 60 acres added to the Resource Protection subzone in the upper reaches of Devil's Gulch, and an additional 5 acres would be added to the Resource Protection subzone along other reaches of important aquatic habitat.

Within the Pasture and Ranch Core subzones, Practice Standards (see appendix F of the EIS), mitigation measures (see table 3-3 in section 3.3), and size limitations would be implemented to reduce impacts of ground-disturbing activities, and diversification activities that would effectively minimize any effects of sediment- or pollutant-laden stormwater runoff. Impacts in the Range subzone would be avoided or minimized through continued adherence to the RDM standards of Bartolome et al. (2015). These standards would require a "moderate" level of grazing that maintains an average RDM of 1,200 pounds/acre at the end of the grazing season, which protects soil from erosion and maintains rangeland plant community health (Bartolome et al. 2006). Water quality in Lagunitas and Olema Creeks is expected to continue to improve due to additional implementation of Management Activities as described above.

The majority of dairy operations in the action area, including their Ranch Core subzones and Forage Production areas where the most intensive activities occur, are all outside watersheds that support coho salmon. Approximately 162 acres of Pasture subzone on dairies authorized for Nutrient and Manure Management would be located within the Tomales Bay watershed, but the small coastal tributaries flowing to Tomales Bay do not support coho salmon. Runoff laden with nitrogen and phosphorus from fields following manure application is a potential source of water pollution to Tomales Bay; however, multiple measures would be in place to protect water resources including: (1) absence of waterways and slopes greater than 20% within the Pasture subzone; (2) required Nutrient Management Plans under regulation by the San Francisco Bay RWQCB; and (3) adherence to Practice Standards and mitigation measures for Manure and Nutrient Management (see appendix F of the EIS). These measures would serve to avoid or minimize any potential adverse effects of leachate flowing into groundwater or surface waters that lead to Tomales Bay, thereby minimizing and avoiding adverse effects on coho salmon.

8.1.3 Cumulative Effects on Coho Salmon

Cumulative effects are defined differently under the ESA than under NEPA. Under the ESA, cumulative effects are reasonably foreseeable future state, private, and tribal activities only. For ESA cumulative effects, the effects of past or future federal actions are not considered. Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. ESA cumulative effects are additive to the environmental baseline (past and ongoing actions and their effects) described above in section 7 of this BA. Conversely, under NEPA, cumulative effects include all past and ongoing actions and their effects that are additive to the effects from all reasonably foreseeable future actions (federal and nonfederal). For ESA consultation purposes in this BA, the ESA definition of cumulative effects is followed.

No reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CCC coho salmon or its habitat would occur in the action area. All projects by entities other than NPS, such as state highway projects or stream restoration projects, have had prior programmatic or project-specific section 7 consultations (see section 7.3).

8.1.4 Conclusion

Although CCC coho salmon populations are declining throughout the ESU, the Lagunitas Creek population is the most abundant ESU. NPS has focused its management of coho salmon restoration on both passive (i.e., fencing) and active restoration (e.g., instream habitat enhancement). Most streams in the action area potentially used by coho salmon are excluded from grazing, and areas applying the zoning framework, together with Practice Standards and mitigation measures for a defined set of Management Activities would further avoid or minimize effects. Therefore, adverse effects from ranching would generally be minimized or avoided but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CCC coho salmon ESU. The proposed action is not likely to result in destruction or adverse modification of critical habitat designated for CCC coho salmon.

8.2 Effects to Central California Coast Steelhead Trout, Including Critical Habitat

8.2.1 Direct and Indirect Effects on Steelhead Trout

The effects of permitted ranch operations on steelhead under the proposed action would be the same as those described above for coho salmon. In addition to potential effects of beef ranching on approximately 8,800 acres in the Lagunitas and Olema Creek watersheds, potential effects could occur from ranching on approximately 8,200 acres in the Drakes Estero watershed (see attachment A, figure 3). Cattle are excluded from direct access to Lagunitas and Olema Creeks, the two most significant streams occupied by steelhead in the action area. In the few riparian areas where beef cattle are not excluded from perennial streams, cattle herbivory and trampling could alter riparian vegetation and hydraulic and geomorphic processes, which could negatively affect aquatic habitat and water quality in streams occupied by spawning adult and developing juvenile steelhead. Cattle could also infrequently breach fences into riparian areas because they are drawn to the cooler temperatures, shade, available water, and high-quality forage, particularly during seasonally dry periods (Belsky, Matzke, and Uselman 1999). Of the three identified stream reaches identified as critical steelhead habitat in the Drakes Estero watershed, East Schooner Creek is outside grazing lease/permit areas, Home Ranch Creek has cattle exclusion along approximately 62% of critical habitat in the action area, and cattle would be excluded from the remainder of Home Ranch Creek critical habitat outside the Ranch Core as well as the inlet to Creamery Bay under the proposed action.

Steelhead do not occur in the watersheds where the six dairy Ranch Cores are located (Drakes Bay, Kehoe and Abbotts Lagoon; see attachment A, figure 3), but a portion of two dairy operations fall within the Tomales Bay watershed, where grazing and Manure and Nutrient Management would be authorized in pastures above Tomales Bay. The limited potential for effect to Tomales Bay and steelhead from Management Activities on dairies would be the same as discussed above for coho salmon. Forage Production (haylage) would continue to be authorized on approximately 175 acres of low slope areas away from waterways on the G Ranch within the Pasture subzone and would require Practice Standards and mitigation measures identified in appendix F of the EIS to reduce erosion potential, which would minimize potential for impacts to steelhead.

8.2.2 Avoidance, Minimization, and/or Mitigation Measures for Steelhead Trout

The potential for adverse impacts on steelhead from the proposed action would be avoided, minimized, or mitigated through the implementation of mitigation measures (see table 3-3 in section 3.3). Continued compliance with TMDL regulations for pathogens in Tomales Bay would dictate that necessary measures are taken to minimize or prevent potential adverse impacts on water quality, which could affect steelhead. Practice Standards for Management Activities (see appendix F of the EIS) would also reduce erosion and minimize potential sediment- or pollutant-laden stormwater runoff into streams. Livestock grazing would continue to be avoided in riparian areas of streams potentially supporting steelhead.

The zoning framework would specify that only grazing would be authorized in approximately 65% of the lands under lease/permit in the action area, minimizing impacts on fish that could result from more intensive agricultural activities. Also, lands added to the Resource Protection subzone would protect approximately

370 acres in the Drakes Estero watershed, which would prevent cattle grazing in several areas along the Drakes Estero shoreline, including portions of Creamery Bay, Schooner Bay, and Home Bay. This acreage includes approximately 1.35 miles of perennial streams on North Schooner Creek between the D and M Ranches, along lower Home Ranch Creek and the adjacent tributary to Home Bay, and at the inlet of Creamery Bay. Lands would also be added to the Resource protection subzone in the Lagunitas and Olema Creek watersheds as described above under "Coho Salmon."

8.2.3 Cumulative Effects on Steelhead Trout

There are no reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CCC steelhead or its habitat in the action area.

8.2.4 Conclusion

Nearly all stream reaches in the action area that are potentially occupied by steelhead are excluded from grazing. The application of the zoning framework, together with Practice Standards and mitigation measures for a defined set of Management Activities would avoid or minimize effects. Adverse effects from ranching would be avoided but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CCC steelhead DPS. The proposed action is not likely to result in destruction or adverse modification of critical habitat designated for CCC steelhead.

8.3 Effects to California Coastal Chinook Salmon

8.3.1 Direct and Indirect Effects on Chinook Salmon

The effects of permitted cattle operations on CC Chinook salmon under the proposed action would be the same as those described for coho salmon and would be restricted to beef cattle operations in the Lagunitas Creek watershed (see attachment A, figure 1). These effects would result from livestock grazing potentially indirectly affecting aquatic habitat and water quality in streams occupied by spawning adult and developing juvenile Chinook salmon. The geographic context of these effects would be less because of the smaller number and more restricted distribution of Chinook salmon relative to coho salmon in the action area.

8.3.2 Avoidance, Minimization, and/or Mitigation Measures for Chinook Salmon

The potential for adverse impacts on CC Chinook salmon from the proposed action would be avoided, minimized, or mitigated through the implementation of mitigation measures (see table 3-3 in section 3.3). The implementation of Management Activities with associated Practice Standards (see appendix F of the EIS) on ranches would help reduce erosion and minimize potential sediment- or pollutant-laden stormwater runoff into streams. In addition, livestock grazing would continue to be avoided in riparian areas of streams potentially supporting Chinook salmon.

8.3.3 Cumulative Effects on Chinook Salmon

There are no reasonably foreseeable future state, private, and tribal activities with potential for cumulative effects on CC Chinook salmon or its habitat in the action area.

8.3.4 Conclusion

Stream reaches in the action area that are potentially occupied by Chinook salmon are excluded from grazing. The application the zoning framework with Practice Standards and mitigation measures for a defined set of Management Activities would further avoid or minimize effects. Adverse effects from ranching would be avoided but would not be insignificant or discountable. Therefore, the proposed action "*may affect, is likely to adversely affect*" the CC Chinook salmon ESU.

9.0 EFFECTS DETERMINATION SUMMARY

Livestock grazing has been shown to be compatible with the continued persistence of the federally listed salmon and steelhead considered in this BA. Potential effects on listed salmon and steelhead would continue to be avoided or minimized under the proposed action via a zoning framework, Practice Standards for Management Activities, and implementation of numerous added mitigation measures. Additionally, the continued monitoring of salmon and steelhead and their habitats would ensure that any adverse effects are identified and adequately avoided, minimized, or mitigated.

Table 9-1 provides a summary of the effects determinations for these species, subspecies, or DPS/ESU.

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

Common Name	Scientific Name	Status[a]	Determination of Effects[b]	Summary of Potential Effects of Livestock Grazing and Other Ranch Activities
Central California Coast coho salmon	*Oncorhynchus kisutch*	T	LAA	Ranch activities, including livestock grazing, could affect habitat by changing streambank and channel morphology, reducing hiding cover, increasing water temperatures, and impairing water quality (USFWS 2002). However, cattle are excluded from most riparian areas in the park and implementing additional Practice Standards and mitigation measures for Management Activities would avoid most adverse effects on the species. However, not all adverse impacts would be insignificant or discountable. Therefore, the proposed action may affect, and is likely to adversely affect California Coast coho salmon.
Central California Coast coho salmon critical habitat	N/A	N/A	NDAM	See above under "Central California Coast coho salmon."
Central California Coast steelhead trout	*Oncorhynchus mykiss*	T	LAA	Impacts on Central California Coast steelhead trout would be the same as those described above under "Central California Coast coho salmon."
Central California Coast steelhead trout critical habitat	N/A	N/A	NDAM	See above under "Central California Coast steelhead trout."
California Coastal Chinook salmon	*Oncorhynchus tshawytscha*	T	LAA	Impacts on Central California Coastal Chinook salmon would be the same as those described above under "Central California Coast coho salmon."

[a] Status Codes: E – federally listed endangered; T – federally listed threatened.

[b] ESA determinations: LAA – likely to adversely affect; NDAM – no destruction or adverse modification

10.0 NEED FOR REASSESSMENT BASED ON CHANGED CONDITIONS

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

11.0 LIST OF PREPARERS

Prepared by: Phil Baigas, M.S.

Junior Reviewer: Joe Dalrymple, M.S.

Senior Reviewer: Spence Smith, M.S.

12.0 LITERATURE CITED

Alexander, G. R., and E. A. Hansen

1986 "Sand Bed Load in a Brook Trout Stream." *North American Journal of Fisheries Management* 6:9–23.

Aoyama, L., L. Waks, P. Hopkinson, and J. Bartolome

2018 *Grazing Plan: Recommendations for Point Reyes National Seashore Managed Grazing Lands*. University of California, Berkeley, Range Ecology Laboratory Department of Environmental Science, Policy, and Management. Final version – August 15, 2018. 119 pp.

Bartolome, J. W., W. E. Frost, N. K. McDougald, and J. M. Connor

2006 *California Guidelines for Residual Dry Matter (RDM) Management on Coastal and Foothill Annual Rangelands*. University of California Division of Agricultural Natural Resources Rangeland Management Series Publication 8092 (Revised). 8 pp. http://anrcatalog.ucdavis.edu/Details.aspx?itemNo=8092

Bartolome, J., M. Hammond, P. Hopkinson, and F. Ratcliff

2015 *1987-2014 Residual Dry Matter Analysis Report and Updated Rangeland Monitoring Guidelines for Livestock Grazed Grasslands within Point Reyes National Seashore and Golden Gate National Recreation Area*. University of California, Berkeley, Range Ecology Lab Department of Environmental Science, Policy, and Management. Point Reyes National Seashore (PORE) Project Phase 1: CESU Task Agreement # P11AC91045. August 30, 2015. Accessed January 4, 2019. https://www.nps.gov/pore/getinvolved/upload/planning_ranch_cmp_background_report_ucberkeley_residual_dry_matter_analysis_150830.pdf

Becker, B., D. Press, S. Kraft, R. Foss and D. Voeller

2019 "Rationale, Workflow, and Examples for the Forage Package." Unpublished NPS Report.

Berkman, H. E., and C. F. Rabeni

1987 "Effect of Siltation on Stream Fish Communities." *Environmental Biology of Fishes* 18(4):285–294.

Belsky, A. J., A. Matzke, and S. Uselman

1999 "Survey of Livestock Influences on Stream and Riparian Ecosystems in the Western United States." *Journal of Soil and Water Conservation* 54:419–431.

Berg, L., and T. G. Northcote

1985 "Changes in Territorial, Gill-Flaring, and Feeding Behavior in Juvenile Coho Salmon (*Oncorhynchus kisutch*) following Short-Term Pulses of Suspended Sediment." *Canadian Journal of Fisheries and Aquatic Science* 42:1410–1417.

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. A. Klamt, E. Chacho. and C. Schaye

1977 *Transport of Granitic Sediment in Streams and its Effects on Insects and Fish*. Forest, Wildlife and Range Station. Technical Report, Project B-036-IDA.

Bjornn, T. C., and Reiser, D. W

1991 *Habitat Requirements of Salmonids in Streams*. American Fisheries Society Special Publication, 19, 83–138.

Booth, K.

2013 *Freshwater Quality Monitoring in the San Francisco Bay Area Network: 2009–2010 Biennial Report*. Natural Resource Technical Report. NPS/SFAN/NRTR—2011/720. National Park Service. Fort Collins, CO.

Cal-IPC (California Invasive Plant Council)

2015 *Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management*. Cal-IPC Publication 2015-1. California Invasive Plant Council, Berkeley, CA. Accessed January 3, 2019. http://www.cal-ipc.org/

CalFish

2018a "Chinook Salmon (*Oncorhynchus tshawytscha*)." CalFish: A California Cooperative Anadromous Fish Habitat Data Program. Species webpage. Accessed October 9, 2018. http://www.calfish.org/FisheriesManagement/SpeciesPages/ChinookSalmon.aspx

2018b "Coho Salmon (*Oncorhynchus kisutch*)." CalFish: A California Cooperative Anadromous Fish Habitat Data Program. Species webpage. Accessed October 9, 2018. http://www.calfish.org/FisheriesManagement/SpeciesPages/CohoSalmon.aspx

Carlisle, S, M. Reichmuth, and B. McNeill

2016 *Long-Term Monitoring of Coho Salmon and Steelhead Trout During Freshwater Life Stages in Coastal Marin County: 2014 Annual Report.* Natural Resource Report NPS/SFAN/NRR—2016/1142. National Park Service. Fort Collins, Colorado.

2017 *Long-Term Monitoring of Coho Salmon and Steelhead Trout During Freshwater Life Stages in Coastal Marin County: 2015 Annual Report.* Natural Resource Report. NPS/SFAN/NRR—2017/1392. National Park Service. Fort Collins, Colorado.

2018 *Long-Term Monitoring of Coho Salmon and Steelhead Trout During Freshwater Life Stages in Coastal Marin County: 2016 Annual Report*. Natural Resource Report. NPS/SFAN/NRR—2017/1577. National Park Service. Fort Collins, Colorado.

CDFW (California Department of Fish and Wildlife)

1996 *Steelhead Restoration and Management Plan for California*. Report authored by McEwan, D., and T.A. Jackson. Accessed September 19, 2018. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3490

2003 "Classification of the Vegetation of Point Reyes National Seashore Golden Gate National Recreation Area, Samuel P. Taylor, Mount Tamalpais, and Tomales State Parks, Marin, San Francisco, and San Mateo Counties, California." CDFW California Heritage Program, Wildlife and Habitat Data Analysis Branch, Association for Biodiversity Information, In Cooperation with The California Native Plant Society. Revised June 2003.

2004 *Recovery Strategy for California Coho Salmon.* Report to the California Fish and Game Commission. Accessed September 19, 2018. http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=99401

2016 *California Department of Fish and Wildlife Plan for Assessment and Management of California Coastal Chinook Salmon.* CDFW Fisheries Administrative Report 2016-02. Prepared by Lacy, M.K., K. Atkinson, S.P. Gallagher, B. Kormos, E. Larson, G. Neillands, A. Renger, S.J. Ricker, and K.E. Shaffer. California Department of Fish and Wildlife. August 30, 2016. Accessed October 9, 2018. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=133266&inline

2018a *State and Federally Listed Endangered and Threatened Animals of California.* Dated August 6, 2018. Accessed October 4, 2018. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109405&inline

2018b "Coho Salmon." Fish Species Webpage. Accessed October 4, 2018. https://www.wildlife.ca.gov/Conservation/Fishes/Coho-Salmon

2018c "Chinook Salmon (*Oncorhynchus tshawytscha*)." Fish Species Webpage. Accessed October 4, 2018. https://www.wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

California Department of Public Health

2011 "2010–2011 Annual Sanitary Survey Update Report for Commercial Shellfish Growing Areas in Drakes Estero, California." California Department of Health Services, Division of Drinking Water and Environmental Management Technical Report #11-21. Prepared by V. Zubkousky, October 2011.

Cordone, A. J., and D. W. Kelley

1961 "The Influences of Inorganic Sediments on the Aquatic Life of Streams." *California Fish & Game* 47(2):189–228.

Crouse, M. R., C. A. Callahan, K. W. Malueg, and S. E. Dominguez

1981 "Effects of Fine Sediments on Growth of Juvenile Coho Salmon in Laboratory Streams." *Transactions of the American Fisheries Society* 110:281–286.

Crunkilton, R.

2000 "Acute and Chronic Toxicity of Nitrate to Brook Trout (*Salvelinus fontinalis*) Eggs and Fry." *Wisconsin Cooperative Fisheries Extension Unit Annual Report, 1999–2000.* (not seen, as cited in Wallitner 2013).

Eaglin, G. S., and W. A. Hubert

1993 "Effects of Logging and Roads on Substrate and Trout in Streams of the Medicine Bow National Forest." *North American Journal of Fisheries Management* 13:844–846.

Ellis, M. M.

1936 "Erosion Silt as a Factor in Aquatic Environments." *Ecology* 17:29–42.

Ford, L., and G. F. Hayes

2007 "Northern Coastal Scrub and Coastal Prairie." In *Terrestrial Vegetation of California*, 3rd Edition, edited by M. G. Barbour, T. Keeler-Wolf, and A. Schoenherr, 180–207. Berkeley: University of California Press.

George, M. R., R. D. Jackson, C. S. Boyd, and K. W. Tate

2011 "A Scientific Assessment of the Effectiveness of Riparian Management Practices." In *Conservation Benefits of Rangeland Practices,* edited by D. D. Briske. United States Department of Agriculture Natural Resources Conservation Service. pp. 213–252.

Gregory, R. S., and T. G. Northcote

1993 "Surface, Planktonic, and Benthic Foraging by Juvenile Chinook Salmon (*Onchorhynchus tshawytscha*) in Turbid Laboratory Conditions." *Canadian Journal of Fisheries and Aquatic Sciences* 50:233–240.

Ghodrati, F., and R. Tuden

2005 "Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL) Staff Report." California Regional Water Quality Control Board, San Francisco Bay Region.

Habersack, H., and H. P. Nachtnebel

1995 "Short-Term Effects of Local River Restoration on Morphology, Flow Field, Substrate and Biota." *Regulated Rivers: Research & Management* 10(3-4):291–301.

Kay, D., J. Crowther, C. M. Stapleton, and M. D. Wyer

2018 "Faecal Indicator Organism Inputs to Watercourses from Streamside Pastures Grazed by Cattle: Before and After Implementation of Streambank Fencing." *Water Res.* 2018:143, 229–239.

Ketcham, B. J.

2001 "Point Reyes National Seashore Water Quality Monitoring Report May 1999–May 2001." NPS Unpublished Report. Point Reyes National Seashore, Point Reyes Station, CA.

Line, D. E.

2003 "Changes in a Stream's Physical and Biological Conditions Following Livestock Exclusion." *Trans. ASAE* 2002, 46:287–293.

Line, D. E., W. A. Harman, G. D. Jennings, E. J. Thompson, and D. L. Osmond

2000 "Nonpoint-Source Pollutant Load Reductions Associated with Livestock Exclusion." *Journal of Environmental Quality* 29:1882–1890. doi:10.2134/jeq2000.00472425002900060022x.

Marin County

2014 *Marin County Housing Element 2015–2023*. Prepared by the Marin County Community Development Agency. Adopted by the Marin County Board of Supervisors December 9, 2014. https://www.marincounty.org/-/media/files/departments/cd/planning/housing/housing-element/marincountyhousingelement_2015_2023_certified.pdf?la=en

McLeay, D.J., I.K. Birtwell, G.F. Hartman, and G.L. Ennis

2002 "Responses of Arctic Grayling (*Thymallus arcticus*) to Acute and Prolonged Exposure to Yukon Placer Mining Sediment." *Canadian Journal of Fisheries and Aquatic Sciences* 44:658–673.

McNeill, B., M. Reichmuth, and A. Iwaki

2020 *Long-term Monitoring of Coho Salmon and Steelhead During Freshwater Life Stages in Coastal Marin County: 2018 Annual Report*. Natural Resource Report NPS/SFAN/NRR—2020/2153. National Park Service, Fort Collins, CO.

Moyle, P. B.

2002 *Inland Fishes of California – Revised and Expanded*. Berkeley, CA: University of California Press.

Moyle, P. B., J. A. Israel, and S. E. Purdy

2008 *Salmon, Steelhead, and Trout in California, Status of an Emblematic Fauna: A Report Commissioned by California Trout, 2008*. U.C. Davis Center for Watershed Sciences. Davis, CA. Accessed March 26, 2019. https://watershed.ucdavis.edu/pdf/SOS-Californias-Native-Fish-Crisis-Final-Report.pdf

Moyle, P. B., R. A. Lusardi, P. J. Samuel, and J. V. Katz

2017 *State of the Salmonids: Status of California's Emblematic Fishes*. A Report Commissioned by California Trout August 2017. U.C. Center for Watershed Sciences. Available at: https://caltrout.org/wp-content/uploads/2017/08/SOS-II_Final.pdf

MMWD (Marin Municipal Water District)

2005 *Lagunitas Creek Salmon Spawner Survey Report 2004–2005.* Prepared by E. Ettlinger, G. M. Andrew, J. Neuffer, and F. Rohr. Marin Municipal Water District. Corte Madera, CA.

2011 *Lagunitas Creek Stewardship Plan Marin Municipal Water District Final – June 2011.* 99 pp. Corte Madera, CA. https://www.marinwater.org/DocumentCenter/View/174/Lagunitas-Stewardship-Plan-Final-June-2011-Part-1-Text

2013 *Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2012-13.* Prepared by Eric Ettlinger and Gregory M. Andrew, Marin Municipal Water District. Corte Madera, CA. November 2013. Accessed October 9, 2018. http://marinwater.org/DocumentCenter/View/2331/Lagunitas-Creek-Adult-Salmonid-Monitoring-Report-2012-13

2014 *Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2013-14.* Prepared by Eric Ettlinger and Gregory M. Andrew, Marin Municipal Water District. Corte Madera, CA. October 2014. Accessed October 9, 2018.

http://marinwater.org/DocumentCenter/View/2331/Lagunitas-Creek-Adult-Salmonid-Monitoring-Report-2012-13

2016 *Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2015-16.* Prepared by Eric Ettlinger, Gregory M. Andrew, Daniel Hossfeld, and Elizabeth Ruiz of Marin Municipal Water District. September 2016. Corte Madera, CA. Accessed October 9, 2018. http://marinwater.org/DocumentCenter/View/4630/Lagunitas-Creek-adult-salmonid-monitoring-2015-16-sm

2018 *Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2016-17*. Prepared by Gregory M. Andrew and Eric Ettlinger of Marin Municipal Water District, in Association with the National Park Service, Point Reyes National Seashore and the Salmon Protection and Watershed Network (SPAWN). March 2018. Corte Madera, CA. Accessed October 9, 2018. http://marinwater.org/DocumentCenter/View/6301/Adult-salmonid-monitoring-2016-17?bidId=

2019 *Adult Salmonid Monitoring in the Lagunitas Creek Watershed – 2017-18*. Prepared by Eric Ettlinger and Gabriela Guaiumi of Marin Municipal Water District, in Association with the National Park Service, Point Reyes National Seashore and the Salmon Protection and Watershed Network (SPAWN). January 2019. Corte Madera, CA. Accessed May 16, 2019. https://www.marinwater.org/DocumentCenter/View/7190/Lagunitas-Creek-Adult-Monitoring-2017-18

Newcombe, C.P.

1994 "Suspended Sediment in Aquatic Ecosystems: Ill Effects as a Function of Concentration and Duration of Exposure." British Columbia Ministry of Environment, Lands and Parks, Habitat Protection Branch, Victoria.

NMFS (National Marine Fisheries Service)

2004 "Biological Opinion on the Continued Issuance of Grazing Leases at Point Reyes National Seashore and the Golden Gate National Recreation Area in Marin County, California." Submitted by the R. R. McInnis, Acting Regional Administrator of National Marine Fisheries Service, Southwest Region, to D. L. Neubacher, Superintendent of Point Reyes National Seashore. April 5, 2004. Prepared by the Southwest Region Office, Long Beach, California.

2012 *Final Recovery Plan for Central California Coast Coho salmon Evolutionarily Significant Unit.* National Marine Fisheries Service, Southwest Region, Santa Rosa, California. Accessed September 19, 2018. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/north_central_california_coast/central_california_coast_coho/ccc_coho_salmon_esu_recovery_plan_vol_i_sept_2012.pdf

2014 "Response to Request for Scoping Comments Regarding Initiation of an Environmental Assessment/Initial Study and Biological Assessment to Study Potential Improvements to 12 Miles of Sir Francis Drake Boulevard in The National Park Service Point Reyes National Seashore (FHWA File # HFPM-16)." Memo to Nathan Allen, Project Manager. August 19, 2014.

2016a *Coastal Multispecies Final Recovery Plan: California Coastal Chinook Salmon ESU, Northern California Steelhead DPS and Central California Coast Steelhead DPS*. National Marine Fisheries Service, West Coast Region, Santa Rosa, California. Accessed September 19, 2018. https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/north_central_california_coast/coastal_multispecies_recovery_plan.html

2016b *2016 5-Year Review: Summary & Evaluation of Central California Coast Coho Salmon.* National Marine Fisheries Service, West Coast Region, Santa Rosa, California. April 2016. Accessed October 4, 2018. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/2016/2016_ccc-coho.pdf

2016c *2016 5-Year Review: Summary & Evaluation of Central California Coast Steelhead.* National Marine Fisheries Service, West Coast Region, Santa Rosa, California. April 2016. Accessed October 4, 2018. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/steelhead/steelhead_status_reviews.html

2016d *2016 5-Year Review: Summary & Evaluation California Coastal Chinook Salmon and Northern California Steelhead*. National Marine Fisheries Service, West Coast Region, Santa Rosa, California. April 2016. Accessed October 4, 2018. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/2016/2016_cc-chinook_nc-steelhd.pdf

2016e "Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management act Essential Fish Habitat Response for the Program for restoration projects within the NOAA Restoration Center's Central Coastal California Office jurisdictional area in California" Jun 14, 2016 August 3, 2018. Letter to Patrick Rutton, NOAA Restoration Center Supervisor, NMFS, from William W. Steele, Jr., Regional Administrator, NMFS. Santa Rosa, CA. Reference Number WCR-2015-3755.

2016f *Species in the Spotlight, Priority Actions: 2016-2020, Central California Coast Coho Salmon, Oncorhynchus kisutch*. National Marine Fisheries Service. Silver Spring, Maryland. January 2016. Accessed May 16, 2019. https://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2016-2020-central-california-coast-coho

2018 "Species Lists." NOAA Fisheries West Coast Region. Accessed October 4, 2018. https://www.westcoast.fisheries.noaa.gov/protected_species/species_list/species_lists.html

2019 "Endangered Species Act Critical Habitat." NOAA Fisheries West Coast Region. Accessed May 4, 2019. https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

NPS (National Park Service)

1980 *Golden Gate National Recreation Area and Point Reyes National Seashore General Management Plan.* September 1980. Accessed September 19, 2018. https://parkplanning.nps.gov/document.cfm?parkID=303&projectID=15075&documentID=65697

1990a *Range Management Guidelines, Point Reyes National Seashore.* National Park Service—U.S. Department of Interior. March 1990.

1990b *Range Management Handbook, Point Reyes National Seashore*. National Park Service—U.S. Department of Interior. December 1990.

2001 *Biological Assessment on the Renewal of Livestock Grazing Permits in Point Reyes National Seashore and the North District of Golden Gate National Recreation Area, Marin County, California*. 65 pp.

2004 *Final Fire Management Plan Environmental Impact Statement for Point Reyes National Seashore and North District of Golden Gate National Recreation Area*. National Park Service. July 2004.

2006 *Management Policies 2006.* Accessed September 19, 2018. https://www.nps.gov/policy/MP_2006.pdf

2007 *Final Environmental Impact Statement/Environmental Impact Report for Giacomini Wetlands Restoration Project Golden Gate National Recreation Area/Point Reyes National Seashore, Marin County*. National Park Service/California State Lands Commission. http://www.nps.gov/pore/parkmgmt/upload/planning_giacomini_wrp_eiseir_final_2007.pdf

2017 *Lagunitas Creek Floodplain and Riparian Enhancement Project Endangered Species and Essential Fish Habitat Biological Assessment*. Prepared for the National Marine Fisheries Service and U.S. Fish and Wildlife Service by Environmental Science Associates. November 2017. Petaluma, CA.

2019a *A Natural Resource Condition Assessment for Point Reyes National Seashore. Natural Resource Report*. NPS/PORE/NRR—2019/1895. National Park Service. Fort Collins, CO.

2019b GIS data for threatened and endangered species." Received from NPS on May 8, 2019.

Pachepsky, Y. A., and D. R. Shelton

2011 "Escherichia Coli and Fecal Coliforms in Freshwater and Estuarine Sediments." *Critical Reviews in Environmental Science and Technology* 41:1067–1110.

Pacific Fisheries Management Council

2016 *Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California, as Revised Through Amendment 19*. March 2016. Accessed September 19, 2018. https://www.pcouncil.org/wp-content/uploads/2016/03/FMP-through-A-19_Final.pdf

Pawley, A., and M. Lay

2013 *Coastal Watershed Assessment for Golden Gate National Recreation Area and Point Reyes National Seashore*. Natural Resource Report NPS/PWR/NRR—2013/641. Fort Collins, CO: National Park Service. Accessed February 2, 2018. https://irma.nps.gov/DataStore/Reference/Profile/2194043

Prunuske Chatham, Inc.

2010 *San Geronimo Valley Salmon Enhancement Plan, A Guidance Document.* Prepared for Marin County Department of Public Works. February 9, 2010. Accessed March 10, 2019. https://www.marinwatersheds.org/sites/default/files/2017-12/SEPFINAL.pdf

Reichmuth, M., B. J. Ketcham, D. Fong, S. Carlisle, E. Brown, and M. Koenen

2010 Salmonid Monitoring Protocol for the San Francisco Bay Area Network. Natural Resource Report NPS/SFAN/NRR—2010/202. National Park Service, Fort Collins, CO. Accessed September 4, 2020. https://irma.nps.gov/DataStore/Reference/Profile/2124828

Robison, E. G., A. Mirati, and M. Allen

1999 *Oregon Road/Stream Crossing Restoration Guide: Spring 1999*. Advanced Fish Passage Training Version. Accessed 2006. https://digital.osl.state.or.us/islandora/object/osl%3A104570/datastream/OBJ/download/Guide.pdf

Ross Taylor and Associates

2003 *Marin County Stream Crossing Inventory and Fish Passage Evaluation: Final Report*. McKinleyville, CA. July 2003. https://www.marinwatersheds.org/sites/default/files/2017-11/2003_Taylor_Fish_Barriers.pdf

San Francisco Bay RWQCB (San Francisco Bay Regional Water Quality Control Board)

2013 *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf

2014 *Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Improving Habitat Management for Sonoma Alopecurus: Developing the Optimal Grazing Regime." Plan*. Staff Report. June 2014. Prepared by Mike Napolitano. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/lagunitascrksediment/LagunitasSedimentHabitat%20StaffReportPublicReviewDraft.pdf

2016 *Pathogens in Tomales Bay Tributaries Water Quality Report Card.* Released October 2016. https://www.waterboards.ca.gov/about_us/performance_report_1617/plan_assess/tmdl_outcomes/r2_tomales_bay_pathogens.pdf

2017 *Clean Water Act Section 303(d) and 305(b) 2016 Integrated Report for the San Francisco Bay Region*. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/303dlist.html

2018 "Renewal of Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay Watershed (Tomales Bay, Lagunitas Creek, Walker Creek, and Olema Creek) in the San Francisco Bay Region." Resolution No. R2-2018-0046. Accessed March 1, 2019. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/agriculture/grgrazi/tomalesbay_grazing.html

Skancke, J. R. and R. Carson

2009 *Freshwater Quality Monitoring in the San Francisco Bay Area Network: 2007 Annual Report*. Natural Resource Technical Report. NPS/SFAN/NRTR—2009/177. National Park Service. Fort Collins, CO.

SWRCB (State Water Resources Control Board)

2010 *2010 Integrated Report (Clean Water Act Section 303(d) List/305(b) Report).* Accessed February 13, 2015. http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

2013 *Tomales Bay Wetlands Restoration and Monitoring Program, 2007–2012 Final Water Quality Technical Report and Program Summary.* California State Water Resources Control Board SRF Project No. C-06-6926-110. Prepared by R. Carson, Tomales Bay Watershed Council Foundation. www.tomalesbaywatershed.org/assets/2011_12_tbwc_finalwqreport_complete_finalv4_sm.pdf

Stillwater Sciences

2008 "Limiting Factors Analysis, Limiting Factors for Coho Salmon and Steelhead." Prepared for Marin Conservation District. Prepared by Stillwater Sciences. March 2008.

Thompson, A., and K. W. Goyne

2012 "Introduction to the Sorption of Chemical Constituents in Soils." *Nature Education Knowledge* 4(4):7. https://www.nature.com/scitable/knowledge/library/introduction-to-the-sorption-of-chemical-constituents-94841002

USDA-NRCS (US Department of Agriculture Natural Resources Conservation Service)

2014 *Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices.* Agronomy Technical Note No. 9, February 2014. Accessed January 3, 2019. https://directives.sc.egov.usda.gov/opennonwebcontent.aspx?content=34828.wba

USEPA (US Environmental Protection Agency)

2004 *Issue Paper 5, Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids [On-line].* Accessed June 23, 2016. https://www.epa.gov/sites/production/files/2018-01/documents/r10-water-quality-temperature-issue-paper5-2001.pdf

USFWS (US Fish and Wildlife Service)

2002 "Formal Consultation [Biological Opinion] on the Grazing Permit Renewal Program, Point Reyes National Seashore and the Golden Gate National Recreation Area, Marin County, California." September 25, 2002. Memorandum to Superintendent, Point Reyes National Seashore, National Park Service, from Acting Field Supervisor, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 81420-2001-F-0310 (formerly 1-1-01-F-310).

2018a "Critical Habitat Geospatial Data." Accessed April 2018. https://ecos.fws.gov/ecp/report/table/critical-habitat.html

2018b "Formal Consultation on the Lagunitas Floodplain and Riparian Enhancement Project in Marin County, CA." August 3, 2018. Memorandum to Cicely Muldoon, Superintendent, Point Reyes National Seashore, National Park Service, from Jennifer Norris, Field Supervisor, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Reference Number 08ESMF00-2018-F-0922.

USGS (US Geologic Survey)

2005 "Assessment of Hydrologic and Water Quality Data Collected in Abbotts Lagoon Watershed, Point Reyes National Seashore, California, during Water Years 1999 and 2000."

2018 *National Hydrography Dataset.* U.S. Department of the Interior, U.S. Geological Survey, 2004. The National Map Download Viewer. Accessed November 27, 2018. Reston, VA. https://www.usgs.gov/core-science-systems/ngp/national-hydrography/access-national-hydrography-products

Velagic, E.

1995 "Turbidity Study (A Literature Review): A report to Delta Planning Branch Department of Water Resources, State of California." Centers for Water and Wildland Resources, University of California, Davis, California.

Voeller, D., D. Lewis, B. Becker, K. W. Tate, and T. Saitone

2018 "Olema Creek Watershed Water Quality Analysis and Condition Assessment." May 31, 2018.

Walling, D. E., B. W. Webb, and M. A. Russell

1997 "Sediment-associated Nutrient Transport in UK Rivers." Freshwater Contamination, IAHS Publication No. 243, p. 69–81.

Wallitner, K.

2013 *Freshwater Quality Monitoring in the San Francisco Bay Area: 2011-2012 Biennial Report*. Natural Resource Technical Report. NPS/SFAN/NRTR—2013/801. National Park Service. Fort Collins, CO.

2016 *Freshwater Quality Monitoring in the San Francisco Bay Area: 2013-2014 Biennial Report.* Natural Resource Report. NPS/SFAN/NRR—2016/1188. National Park Service. Fort Collins, CO.

Wallitner, K., and A. Pincetich

2017 *Freshwater Quality Monitoring in the San Francisco Bay Area: Biennial Report on Water Years 2015 and 2016.* Natural Resource Report. NPS/SFAN/NRR—2017/1471. National Park Service. Fort Collins, Colorado.

Waters, T. F.

1995 "Sediment in Streams: Sources, Biological Effects, and Control." American Fisheries Society Monograph 7.

Wood, P. J., and P. D. Armitage

1997 "Biological Effects of Fine Sediment in the Lotic Environment." *Journal of Environmental Management* 21(2):203–217.

Attachment A: Figures

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

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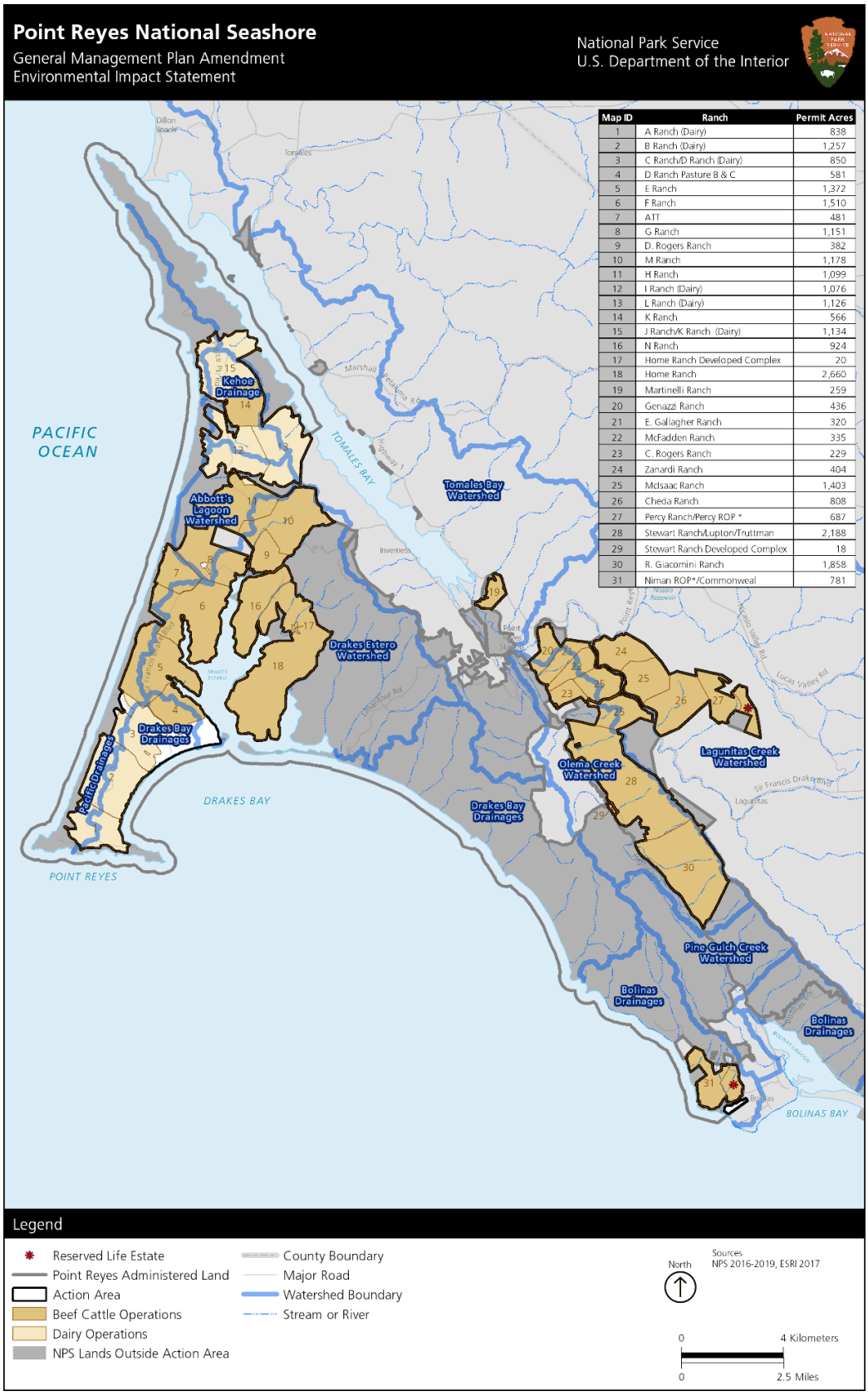

Figure 1: Map of beef and dairy ranches in the action area

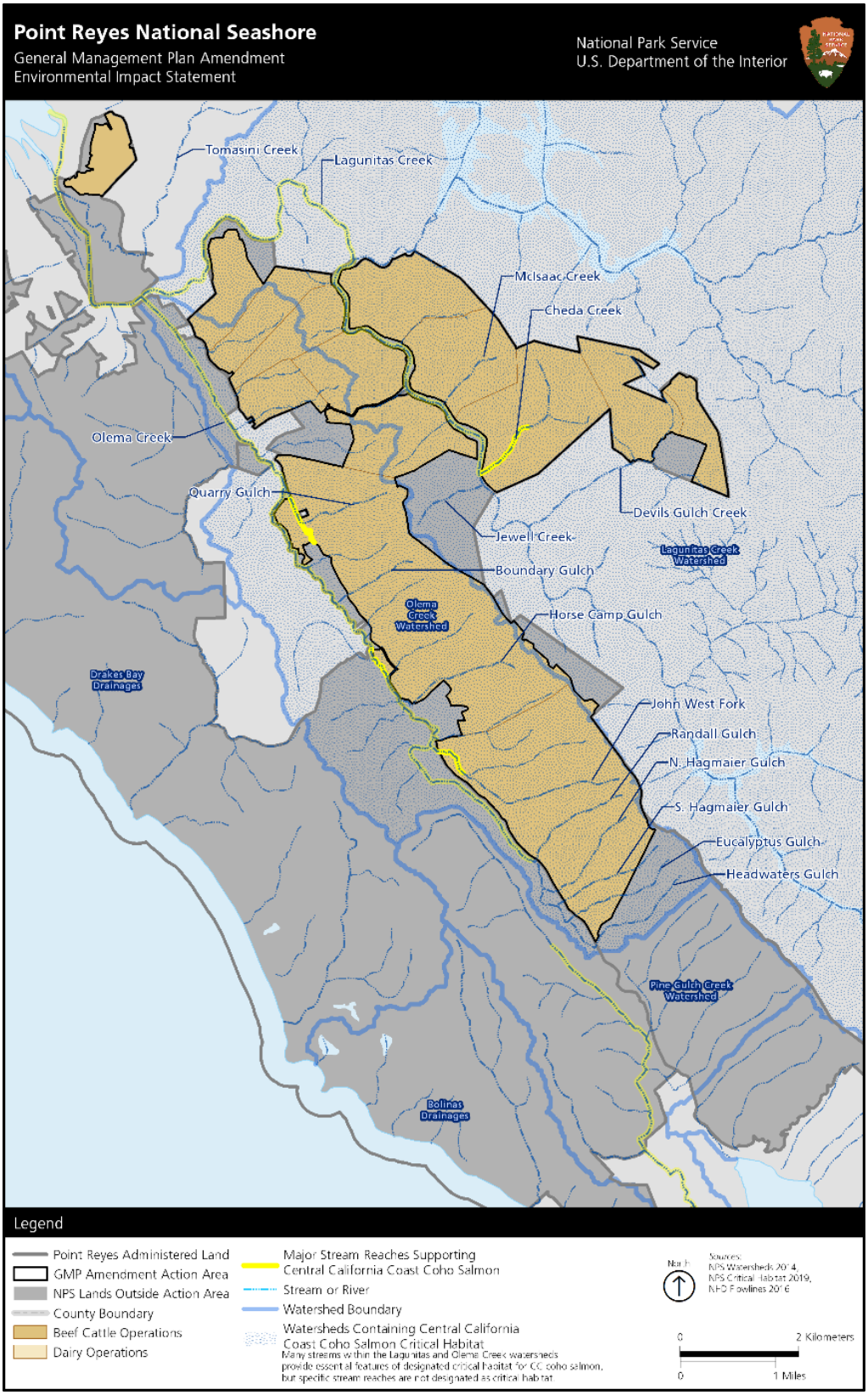

Figure 2: Stream reaches potentially supporting Central California Coast Coho salmon and critical habitat in the action area

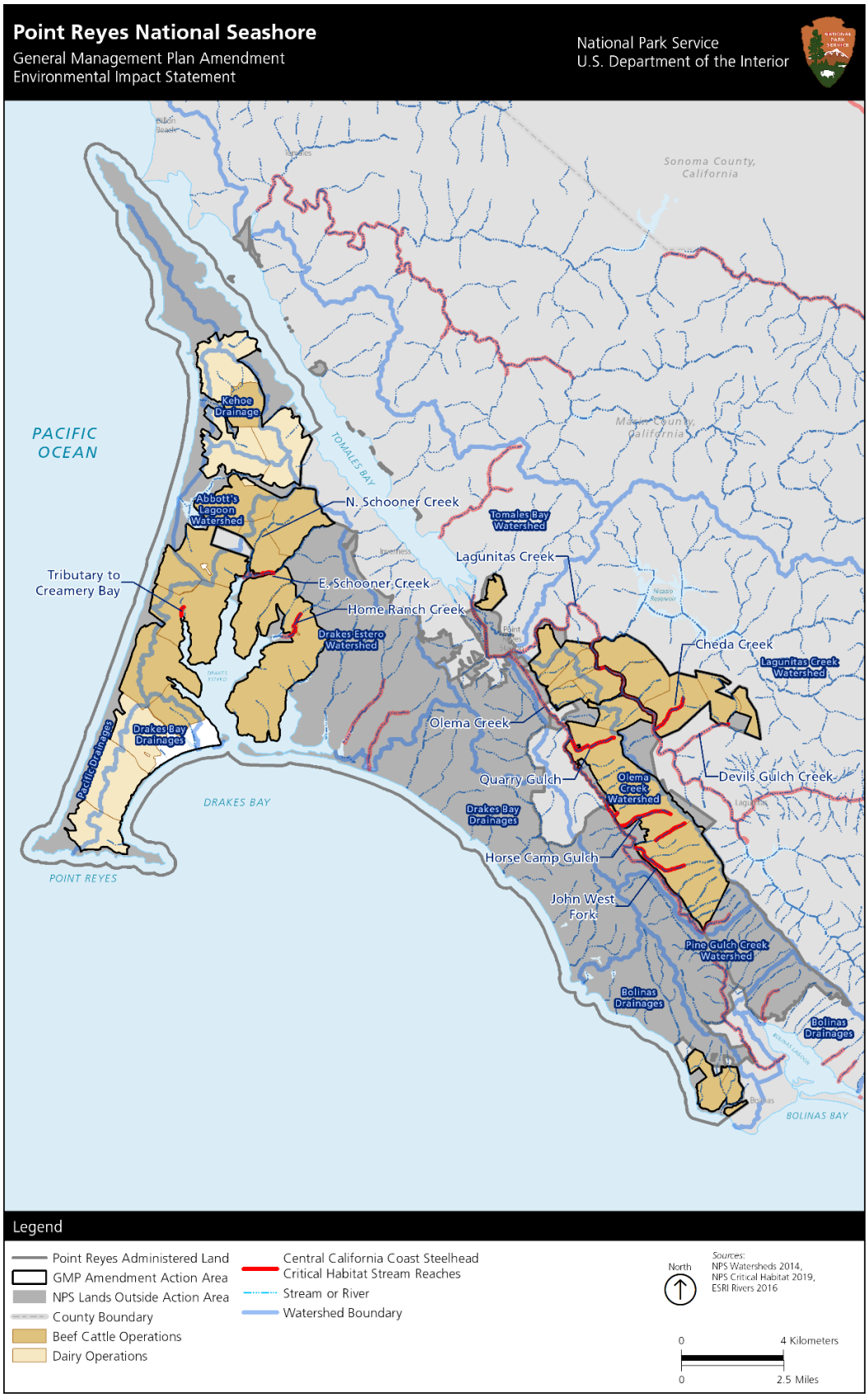

Figure 3: Central California Coast steelhead critical habitat in the action area

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APPENDIX P—PUBLIC COMMENT RESPONSE REPORT

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General Management Plan Amendment

Point Reyes National Seashore

Public Comment Response Report

June 2020

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Contents

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Introduction

Pursuant to the National Environmental Policy Act (NEPA) and its implementing regulations, the National Park Service (NPS) must assess and consider comments submitted on the Environmental Impact Statement (EIS) for the General Management Plan Amendment (GMP Amendment) for Point Reyes National Seashore and the north district of Golden Gate National Recreation Area (collectively referred to as the park) and provide responses to concerns raised in these comments.

The draft EIS was made available for a 45-day public review through publication of a Notice of Availability in the *Federal Register* on August 8, 2019. During this time, two open house meetings were held at different locations near the park. The public was encouraged to submit comments through the NPS's Planning, Environment, and Public Comment (PEPC) website (http://parkplanning.nps.gov/POREGMPA). Comments were also accepted at the meetings, by US mail, and in person at the park. More than 7,600 pieces of correspondence were received during the comment period. This report describes how the NPS considered public comments and provides the responses to substantive comments, which are grouped together by area of concern.

Public Outreach During the Comment Period

NPS issued a press release on August 8, 2019, announcing the availability of the draft EIS and the dates, times, and places of the public meetings. On that date, the NPS PEPC website (http://parkplanning.nps.gov/POREGMPA) was activated for the public to submit comments. Two open house meetings were held during the comment period at the following locations:

- August 27, 2019: West Marin School Gymnasium, Point Reyes Station, California
- August 28, 2019: Bay Model Visitor Center, Sausalito, California

A total of 401 people attended the two meetings (266 people attended the meeting at Point Reyes Station, and 135 attended the meeting in Sausalito).

Meeting banners (display posters) were presented at each venue. The meeting banners provided an overview of the GMP Amendment alternatives, the zoning and subzoning framework, and the planning area; included information about tule elk; described the National Register Historic Districts and the section 106 process; and provided information about how to comment. The digital versions of the banners (with maps) were made available on the park website following the public meetings. Park staff was available to answer questions and provide additional information to open house attendees. At least one Spanish interpreter was present at each meeting.

Meeting attendees were able to provide comments both verbally and in writing. Flip charts were set up to capture verbal comments at each venue. Writing stations were provided at each meeting where attendees could sit, write down their comments, and submit the form into a box. Attendees were also welcome to submit any written comments they had brought with them. Comment forms could be taken home and mailed later.

Definition of Terms

Primary terms used in the document are defined below.

Correspondence: A correspondence is the entire document received from Commenters. This includes letters; written comment forms; comments entered directly into PEPC; flip charts from the open houses; and any other written comments provided either at the public meetings, by US mail, or in person at the park.

Code: A code is a grouping centered on a common subject. The codes were developed during the comment analysis process and were used to track major issues.

Concern: Concerns are statements that summarize the comments under each code. Some codes required multiple concern statements, while others did not.

Response: A response is the agency response to a concern statement. The response details if a change was made in the final EIS as a result of the concern.

Substantive Comment: Substantive comments are those that: question, with reasonable basis, the accuracy of the information in the NEPA document; question, with reasonable basis, the adequacy of the environmental analysis; present reasonable alternatives other than those presented in the NEPA document; or cause changes or revisions in the proposal. Comments that merely support or oppose a proposal or that merely agree or disagree with NPS policy are not considered substantive.

Comment Analysis Methodology

Correspondence was received by hard copy letter via US mail or delivered in person at the park, comment forms submitted at the public meetings, oral statements recorded on flip charts during the public meetings, or correspondence entered directly into the internet-based PEPC system. Letters received through the US mail, or submitted in person at the park, as well as the comments received from the public meetings, were entered into the PEPC system for analysis. If attachments, such as articles or photos were submitted, this was noted in the PEPC entry so they could be reviewed, but these attachments were not entered as part of the correspondence.

Once all the correspondence was entered into PEPC, each was read, and substantive comments within each unique correspondence were identified and coded to identify the general content and to group similar comments. Thirty-nine codes were used to categorize the substantive comments received. An example of a code developed for this project is *AL2400 – Alternative Elements: Elk Management*. In some cases, the same comment may be categorized under more than one code, reflecting the fact that the comment may contain more than one issue or idea. Once all substantive comments were identified for every correspondence, concern statements were developed to summarize all of the comments grouped under each code. These concerns are provided in the Agency Responses to Public Comments Received on the EIS, and NPS prepared a response to each concern statement. If changes were made to the final EIS as a result of public comments, the location of the changes are noted in the response.

Agency Responses to Public Comments Received on the EIS

Table 1. PN1000 – Purpose, Need and Objectives

ID	Concern Statement	Response
1	Commenters state that the draft environmental impact statement (EIS) needs to clarify how and why the National Environmental Policy Act (NEPA) process is currently underway. One commenter indicates that the directive from the Secretary of the Interior and delegation of authority from the National Park Service (NPS) director authorizing lease/permit terms up to 20 years does not mention a requirement for NEPA; therefore, the reason an EIS is being prepared should be clarified.	Per the Settlement Agreement, NPS agreed to complete a General Management Plan Amendment (GMP Amendment) and EIS, making this NEPA review necessary. Absent the Settlement Agreement, NEPA would still be triggered because the potential issuance of 20-year permits to ranch operators is considered a federal action for which the requirements of NEPA apply.
2	Commenters question the scope of the GMP Amendment and offer multiple recommendations for revising the planning area, including adding the Philip Burton Wilderness area and all historic ranches and two additional trailhead locations in Olema Valley. One commenter states that the EIS should document why the planning area is now limited to ranch land and not the rest of the seashore as was the case in previous GMP planning efforts.	The scope of this GMP Amendment addresses the park's highest priority planning needs, which include determining the future management of lands currently leased for ranching and the future management of elk herds in this area. Ranchers are operating under interim permits, and guidance is needed as to whether ranching should be allowed to continue, and if so, under what conditions. The population of free-ranging elk continues to expand, and guidance is needed on herd management. NPS policy allows parks to prepare GMP amendments. The scope of the GMP Amendment is also guided by the court-approved Settlement Agreement that requires a range of alternatives focused on lands currently leased for ranching, including no ranching, reduced ranching, and no dairy ranching. An explanation for why a park-wide GMP is not being prepared has been added to the "Alternatives Considered but Dismissed from Further Analysis" section in chapter 2.

Table 2. PN2000 – Desired Conditions

ID	Concern Statement	Response
3	Commenters suggest that park desired conditions should be based on the clause from 16 United States Code (U.S.C.) 459 c-6 "maximum protection, restoration and preservation." Commenters ask how NPS will set goals to achieve the "maximum protection, restoration and preservation" of the Seashore, specifically how will progress be measured, what is the time frame for meeting this goal, and what new or additional management methods NPS will implement to meet this goal. Additionally, commenters ask about the costs of achieving this goal and the resources NPS has allocated to achieving it.	Language from the park's enabling legislation informed the desired conditions presented in chapter 1 of the GMP Amendment. For example, the desired conditions for the planning area include preservation of native and sensitive species so that their habitats and populations persist and thrive. Methods to achieve these desired conditions and monitor progress over the life of the plan are included in the alternatives presented in chapter 2 and in table 2. Additional information on the costs of each alternative has been added as part of "Appendix D, Costs to Implement the GMP Alternatives."

Table 3. PN3000 – Enabling Legislation

ID	Concern Statement	Response
4	Commenters provide differing interpretations of the Point Reyes enabling legislation and the legislative history of the park. Commenters identify legal authorities that they believe take precedent over the management of agricultural activities on NPS lands, including the Organic Act, Park Enabling legislation, 16 Code of Federal Regulations (CFR) 2.6, *Management Policies*, and the 2019 Joint Explanatory Statement. Commenters state that a close review of Point Reyes' legislative history and foundation document demonstrates that although the ranches are a cultural or historic resource, their preservation and management should advance and not weaken Point Reyes' overall purpose of natural resource protection and enhancement. Commenters note that no legislation commits NPS to allowing these commercial operations. While the draft EIS mentions the Joint Explanatory Statement that accompanied a February 2019 omnibus spending bill, this statement has no binding legal effect. Commenters note the intent of legislative history was not to establish ranching as a	Language referring to the NPS's mandate under the National Park Service Organic Act, as amended and supplemented, has been added to the "Enabling Legislation" section in chapter 1. Neither the enabling acts for Point Reyes and Golden Gate nor the 2019 Joint Explanatory Statement require NPS to authorize ranching. The legislative history discussion in chapter 1 correctly explains that NPS has discretionary authority under the enabling acts for both Point Reyes and Golden Gate to authorize continued ranching.

ID	Concern Statement	Response
	permanent activity. They also indicate that ranching must be carried out in a manner that supports natural resource protection and noted that NPS issued regulations in 1983 that prohibit livestock grazing for agricultural purposes unless specifically authorized by federal statute, required under a reservation of rights, or designated as necessary for recreation or cultural resources, noting these exceptions do not apply to the planning area. They indicate that the draft EIS implies that legislative actions allow for ranching to continue in perpetuity, while this is not correct.	
5	Commenters request that the discussion of enabling legislation (chapter 1, p. 3) include the following language to help provide the full context of park creation, "should include the legislative language that the owner of improved property or of agricultural property on the date of its acquisition by the Secretary under sections 459c to 459c-7 of this title may, as a condition of such acquisition, retain for himself and his or her heirs and assigns a right of use and occupancy for a definite term of not more than 25 years, or, in lieu thereof, for a term ending at the death of the owner or the death of his or her spouse, whichever is later."	NPS owns all lands within the GMP Amendment planning area. All the retained rights of use and occupancy for ranch lands in the planning area have expired except for two life estates (Niman Ranch [Tract PORE-04-120] and Percy Ranch [Tract GOGA 05-124]). The enabling legislation discussion in chapter 1 focuses on the portions of the Point Reyes and Golden Gate enabling acts that are most relevant to decisions to be made in the GMP Amendment. As a result, the discussion concentrates on the leasing authority in these enabling acts because one of the decisions to be made in this EIS is whether the NPS should continue to lease lands for ranching purposes.
6	Commenters state that, based on the legal mandates of the 1962 enabling legislation, the 1976 amendments, and other legislation such as the ESA and Clean Water Act, the preferred alternative should be alternative F. Additionally, commenters note that alternative F is the only alternative consistent with the Organic Act. Some commenters state that alternatives A through E prioritize the commercial benefits of ranching and dairy operations by expanding these industries at the expense of the scenery, natural objects, and wildlife of Point Reyes and therefore violate the NPS Organic Act. Commenters state that if NPS adopts alternatives A through E, this action would be arbitrary, capricious, and an abuse of discretion because these alternatives are not in accordance with the NPS Organic Act, the Point Reyes enabling legislation, and NEPA. This would violate the Administrative Procedures Act.	NPS believes that the alternatives presented for consideration in chapter 2 are consistent with all substantive and procedural legal mandates. While the alternatives differ in their emphasis on natural and cultural resources, all would meet the purpose and need for the EIS and help further NPS's ability to achieve the desired conditions. Chapter 4 of the EIS analyzes the beneficial and adverse impacts on park resources that could result from implementing any of the alternatives described in chapter 2. Additional analysis of the alternatives in light of the park's enabling legislation and the National Park Service Organic Act's non-impairment mandate will accompany the Record of Decision (ROD).

ID	Concern Statement	Response
7	Commenters state that the draft EIS exceeds NPS's discretionary authority by allowing for new agricultural uses to be developed. They also note that the draft EIS does not analyze the consistency of its proposal with the NPS Concessions Act and fails to state what authority would be used to enact diversification activities, such as overnight accommodations operated by the lessee.	The leasing authority found in the Point Reyes and Golden Gate enabling acts allows NPS to lease ranch lands for agricultural, ranching, and dairying activities and to lease structures on ranch lands for related purposes. The proposal to lease existing ranch lands for dairying and ranching and for the types of agricultural uses presented in the GMP Amendment are consistent with NPS's legal authorities. Please see the response to Concern ID 98, which addresses NPS's authority to authorize overnight accommodations in the form of farm stays.
8	Commenters state that part of the Point Reyes enabling legislation seeks to promote, among other things, "historic preservation ... of the natural environment within the area" of Point Reyes, and the Golden Gate National Recreation Area Enabling Act established the Golden Gate National Recreation Area to preserve outstanding "historic ... values." They note that cattle grazing is part of those values, and any alternative that reduces this activity would violate the intent of Congress establishing this area. They also note that the Joint Explanatory Statement regarding the Consolidated Appropriations Act of 2019 stated 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;" therefore, adoption of alternatives D, E and F would violate the Point Reyes National Seashore Enabling Act and the Golden Gate National Recreation Area Enabling Act, would violate Congressional intent, and should be rejected in the final EIS.	As noted in the response to Concern ID 6, NPS believes that the alternatives presented for consideration in chapter 2 are consistent with legal mandates. While the alternatives differ in their emphasis on natural and cultural resources, all would meet the purpose and need for the EIS and further NPS's ability to achieve the desired conditions.

Table 4. PN5000 – Planning History, including Settlement Agreement

ID	Concern Statement	Response
9	Commenters state that the draft EIS does not discuss the history of elk depredations on ranches. They note that the paper, "The Continuously Managed Wild: Tule Elk at Point Reyes National Seashore" in the *Journal of International Wildlife Law & Policy* 18:298–308, 2015, discusses expansion of elk into the ranchlands and indicates that the statement in the draft EIS that this expansion was not contemplated is inaccurate.	Impacts of elk on ranches are discussed in the "Tule Elk" section of chapter 3 and the "Socioeconomics" section of chapter 4 of the EIS. The sections have been updated with information observed since publication of the draft EIS. All impacts noted in the article "The Continuously Managed Wild: Tule Elk at Point Reyes National Seashore" in the *Journal of International Wildlife Law & Policy* are also noted in the EIS. The author did not consult with NPS during the development of this article, and NPS has not verified the extent of impacts in certain cases. Note that in a May 18, 2012, letter to Senator Dianne Feinstein, then Secretary of the Interior Ken Salazar wrote, "The 1998 Tule Elk Management Plan and Environmental Assessment for Point Reyes did not contemplate, analyze, or assess the establishment of a tule elk herd in the pastoral ranching zone of the Park."
10	Commenters state that the draft EIS does not discuss the history of the GMP development process. They describe the history of notices of a new GMP/EIS in the 1990s and the public comments and workshops that occurred during that time. They indicate that the GMP/EIS process was abandoned in 2008/2009 for reasons that were unclear, and they request the draft EIS clarify these reasons.	Additional text was added to chapter 1 of the EIS that describes the history of the GMP development process.

Table 5. PN7000 – Issues and Impact Topics Considered but Dismissed

ID	Concern Statement	Response
11	Commenters request watershed-scale processes be added to the list of impact topics. Specifically, they request details about geomorphic and hydrologic processes, such as sediment generation and transport, stream and floodplain geomorphic functions, stormwater runoff characteristics, streamflow, and groundwater recharge and discharge. Commenters note that these impacts may be significant in the Ranch Core subzone.	Appendix C has been revised to explain why issues related to geomorphic and hydrologic processes were not carried forward for detailed analysis in the EIS, consistent with section 4.2(E) of the 2015 NPS NEPA Handbook.

ID	Concern Statement	Response
12	Commenters also indicate that elk management in wilderness areas and ranching activities that pollute the Phillip Burton Wilderness Area may affect the viewshed of the wilderness or adversely affect wilderness character and would therefore violate the Wilderness Act and requested impacts on wilderness be included in the final EIS. Commenters suggest further analyzing impacts on marine resources and marine life due to high fecal coliform levels and poor water quality caused by runoff in beaches along the Pacific Ocean, Tomales Bay, Drakes Bay and Drakes Estero.	Impacts on wilderness were analyzed as they relate to specific resource topics, including tule elk, water resources, and wildlife. Appendix C has been revised to explain why a separate wilderness character impact topic was not carried forward for detailed analysis in the EIS, consistent with section 4.2(E) of the 2015 NPS NEPA Handbook. Impacts on marine mammals have been added to the EIS in the "Wildlife" section of chapter 4. Water quality impact analysis has been updated in the "Water" section of chapter 4. Please see response to Concern ID 174 regarding impacts on marine mammals. Additionally two reports, *Rangeland best management practices associated with improved coastal watershed water quality at Point Reyes National Seashore, 2000-2013* (appendix L) and *Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters* (Lewis et al. 2019), have been completed since publication of the draft EIS, and information from these reports has been incorporated into the EIS.

Table 6. AL1000 – Alternative A

ID	Concern Statement	Response
13	Commenters suggest alternative A is inadequate in providing a long-term solution for maintaining and effectively managing tule elk herds in the planning area because it does not support proper coexistence between tule elk, ranchers, park visitors, and neighboring properties. Further, commenters state that alternative A does not provide information on livestock that serve as guard animals for ranchers or the requirements for improved quality of life and care standards for domestic animals and livestock currently on ranch properties. Commenters suggest that alternative A should require immediate corrections to ranch infrastructures that provide for appropriate shelter, fencing, and water sources, including wildlife-friendly fencing and wildlife escape ramps in all livestock water troughs. Commenters also indicate that alternative A is incomplete in its definition of "in-residence," as it relates to the use of rodenticides and poisons, and they recommend that other outbuildings, barns, and sheds be included in this language and definition, in addition to providing guidance on pest management.	Alternative A represents the no action alternative, which is required to be described and analyzed in an EIS (40 CFR 1502.14). CEQ guidance describes 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. See the "Introduction" section in chapter 2 for additional details regarding the no action alternative. The no action alternative presented in the EIS represents a continuation of current management approaches to existing uses in the planning area. As a result, the no action alternative included in the EIS does not address or resolve many of the issues and concerns identified during scoping and through public the comment process. These concerns are addressed through various elements of the action alternatives (e.g., developing elk management strategies, providing guidance on livestock guardian animals and use of pesticides). Alternative A identifies many of the Management Activities for ranching that occur on a case-by-case basis, which would continue. Additionally, it identifies the need for additional planning to determine an appropriate population level and methods for managing the free-ranging elk in Point Reyes.

ID	Concern Statement	Response
14	Commenters state that the draft EIS language for alternative A does not clarify if the continued testing of tule elk for Johne's disease and chronic wasting disease (CWD) would include lethal testing.	Alternative A text regarding disease testing and reporting has been clarified.

Table 7. AL1100 – Alternative B

ID	Concern Statement	Response
15	Commenters suggest the draft EIS does not provide a rationale for choosing alternative B as the preferred alternative, nor does it define how the alternative serves the public interest. Commenters state that alternative B (1) disregards the spirit of the Federal District Court Settlement Agreement, (2) does not comply with the Organic Act; the Point Reyes Act, or the Golden Gate National Recreation Area enabling legislation because of documented resource damage from ranch operations; and (3) inaccurately conflates Secretary of the Interior Ken Salazar's directive to extend ranch leases because it expands the footprint of ranching and types of agricultural activities allowed in the park.	There is no requirement to provide a rationale as to why a particular alternative is identified as the preferred alternative; the purpose of identifying the preferred alternative in the draft EIS was to let the public know which alternative the agency was leaning toward selecting at the time the draft EIS was released to the public (2015 NPS NEPA Handbook, section 4.3C). Decision rationale will be provided in the ROD for the selected alternative. Additionally, please see the responses to Concern IDs 1and 2 that address the Settlement Agreement, Concern ID 114 that addresses compliance with the Organic Act, and Concern ID 31 that addresses the planning area/extent of ranching in the action alternatives compared to existing conditions.
16	Commenters suggest that elk management under alternative B should only occur in support of other resource protection goals, not as a means to accommodate domestic agriculture production in Point Reyes and that culling elk would be contrary to the park's management goals and directives. They also suggest alternative B imposes an arbitrary and unreasonably low number of tule elk allowed in the planning area, and the draft EIS does not present supporting evidence to justify the currently permitted number of cattle. Commenters recommend that tule elk management in the planning area be managed in the context of the overall population level in the park. Commenters express support for translocation of tule elk outside the park as a management alternative to culling and suggest specific locations, including sites in Marin, Sonoma, Shasta, and Butte Counties.	Alternative B would support resource protection goals and is fully consistent with the park's management goals and directives. The intent of alternative B is to support desired natural and cultural desired resource conditions in the planning area by maintaining viable and sustainable free-ranging elk herds in Point Reyes while also allowing multi-generational ranching to continue in the park's two ranching historic districts. The enabling legislation for both parks authorizes the Secretary to lease agricultural lands for ranching and dairying and to include appropriate operational restrictions in ranch leases. Legislative history from the time the leasing provision was enacted in 1978, as well as recent legislative history, indicates strong Congressional support for continued multi-generational ranching, which Congress considers a compatible use of park lands. (See H. Rep. No. 95-1165, at 71 (1978); Conf. Rep. 116-9, at 720 (2019).) Ranching was considered an appropriate use of park lands in the 1980 General Management Plan. The zoning framework established in alternative B of the GMPA similarly recognizes ranching as an appropriate use of designated lands in the planning area and establishes prescriptions on ranching activities to support the GMPA's desired natural and cultural resource conditions. NPS developed the population threshold for the Drakes Beach herd in alternative B using field data on the Drakes Beach herd and the results of the forage model (appendix K). The population threshold proposed under alternative B would maintain the Drakes Beach herd as

ID	Concern Statement	Response
	Commenters request additional information regarding Johne's disease testing in tule elk, including how many elk would be tested annually under the preferred alternative. Commenters also question the rationale for testing elk for Johne's disease but not cattle.	a viable and sustainable free ranging herd. This herd size is also compatible with proposed ranching activities and together with restrictions on livestock grazing and ranching practices, would support range management goals. The permitted number of cattle for each ranch as proposed under alternative B is supported by long-term range management monitoring, would meet the preservation strategies for ecological function and native species as outlined in Table 2, and would be reviewed annually by the NPS and adjusted as needed. Other considerations in deciding to manage the Drakes Beach herd include the fact that in the absence of natural predators and without some sort of population control, the number of free-ranging elk would grow to as many as 2,800 animals in 20 years, as noted in alternatives E and F. As the population grows and elk spread to new areas, the effort and complexity of managing free-ranging elk multiplies. If an expanded Drakes Beach herd increased the amount of time it spent on ranches, it would become more difficult for NPS to feasibly manage the types of conflicts that are already occurring between elk and ranching (e.g., broken fences, hay consumption). NPS has engaged in extensive efforts to date to mitigate these conflicts including by constructing wildlife friendly fences, repairing fences for ranchers, improving elk habitat on lands not leased for ranching to encourage elk use of those areas, and hazing elk from ranch lands to discourage their use of ranches. Also, alternative B supports NPS's goal of preserving the characteristics of historic pasture lands by allowing appropriately managed livestock grazing to occur in the two ranching historic districts. This approach is consistent with the *Secretary of the Interior's Standards Guidelines for the Treatment of Cultural Landscapes* that support using cultural landscapes in the manner they were used historically. Even if some operations could possibly reduce cattle numbers and remain viable, elk populations are ultimately expected to reach the point of needing control to maintain the above described balance. Under alternative B, NPS would take action now, rather than waiting until the herd expands to a size that would likely be much more difficult to manage. Because of the presence of Johne's disease, translocation of elk to areas outside the park is not currently a viable option. However, translocation has been retained as an option under alternatives B, C, and D should it become a practicable option in the future. For more details, see the expanded discussion in chapter 2 of the EIS under "Alternative B, Elk Management," which includes additional content provided by the California Department of Fish and Game as it relates to translocation. Despite concerns, there is no evidence that Johne's disease is currently having a significant impact on the Drakes Beach herd. The State of California does not require Johne's disease testing for cattle, but the new NPS lease/permit template would require ranchers to share test results with NPS if testing is occurring. Future research opportunities may result in continued Johne's disease testing of both elk and cattle in the planning area, but there are no firm testing plans at this point.

ID	Concern Statement	Response
		As noted in the EIS, NPS would continue to perform testing for Johne's disease, including lethal removal and testing on suspect animals as well as on fresh, available carcasses. Because the testing is opportunistic in nature, the annual number of tests is unknown.
17	Commenters suggest alternative B should exclude all elk from the ranchlands because forage consumed by elk threatens the organic certification of ranches and eliminates forage that would otherwise be available to support cattle. Commenters suggest if elk remain on ranchlands, NPS should bear the cost of supplemental feed for cattle due to forage consumption by elk.	As noted in the "Alternatives Considered but Dismissed from Further Analysis" section in chapter 2 of the EIS, translocation of elk to areas outside the park is not currently a viable option and construction of a fence to keep elk off ranchlands would be ineffective and not feasible. Alternative B proposes strategies to simultaneously manage elk and ranch operations to achieve desired natural and cultural resource conditions. According to the forage model, maintaining the Drakes Beach herd at the viable herd size prescribed under alternative B would not compromise ranchers' ability to meet organic certification standards. To date, no ranches have lost organic certification. NPS recognizes that elk occasionally forage on supplemental feed placed out for cattle, but the scale (e.g., how much feed is consumed by elk that would otherwise be eaten by cattle) has not been well-documented. NPS will work with ranchers to explore operational and structural solutions to keep elk away from supplemental feed, including possible adjustments to hay storage and feed placement and timing.
18	Commenters request that the general description of alternative B be revised because as written it is unclear and misleading.	The description the commenter reviewed is part of the executive summary, which provides a general overview of the document. For specific details, please see the full description of each alternative in chapter 2.

ID	Concern Statement	Response
19	Commenters request that the EIS disclose the anticipated costs of implementing alternative B, including costs and sources of funding associated with public road maintenance, infrastructure, enforcement, monitoring, trail creation, oversight and improvements to the working and living conditions for ranch workers, park staffing, and reclamation of historic buildings. Commenters request additional information in the EIS about timing, funding, and details about facilities, trails, and access and indicate that until site-specific locations are provided and analyzed, the draft EIS should not authorize new trails, specifically for bicycle use. Commenters also suggest the draft EIS describe the environmental impact that may occur if park programs are reduced or cut to allocate funds for actions under alternative B.	NPS policies require general anticipated costs associated with types and levels of development associated with public use and enjoyment of an area to be included in a GMP. A new appendix has been added to the EIS to capture these anticipated costs from programmatic proposals in the GMP Amendment. Please see appendix D for this information. These costs are not intended for budgeting purposes; instead they are intended to show a relative cost comparison among the alternatives. Additional site-specific planning, compliance, and detailed cost estimates and funding strategies would be required prior to implementing public use and enjoyment projects, such as trail improvements, proposed in this plan. A 2018 analysis of park investment in the management of the range program was on average 1.5 times more than rental income derived from the ranch permits. In fiscal year 2017, the full cost of ranch management was in excess of $1.3 million, when ranch lease payments were less than $500,000. Evaluation of appraisals and rate structure identified that ranch rental rates have not been adjusted for approximately 10 years. If ranching is authorized to continue, the Department of the Interior's Office of Valuation Services would conduct an updated fair market value appraisal of the lands to be leased. A new appraisal would likely increase ranch lease payments, which would be invested in ongoing range program operations. The NPS anticipates that ranch oversight and monitoring actions identified under the preferred alternative could reasonably be implemented with market rate increases to lease payments and by pursuing additional internal and external project funds.
20	A commenter notes concern about sub-standard housing conditions for ranch workers. They question how NPS will oversee and improve the working and living conditions for ranch workers, as well as details about what standards currently exist and how they're maintained.	The new lease/permit includes requirements specific to ranch worker housing. It states that "If NPS authorizes Lessee to provide ranch worker housing, Lessee shall ensure, at its sole cost and expense, that such housing is safe, sanitary, and decent and that the physical condition of such housing complies with all Applicable Laws, including building codes. Lessee is also responsible for keeping exterior areas around such housing units clean and slightly." All ranch worker housing is within the Ranch Core subzone. Consistent with the EIS, ranchers would be authorized to undertake physical improvements to ranch worker housing in this subzone.

ID	Concern Statement	Response
21	Commenters express concern about the significant presence of elk on ranchlands that would continue under the preferred alternative. Commenters suggest that the EIS should give additional consideration to impacts of elk on ranching operations and express concern that continued presence of elk on ranchlands could jeopardize ranch organic certification. Commenters suggest that the EIS provide additional explanations of localized impacts that could justify hazing or lethal removal of elk in the Limantour herd. Commenters also recommend that alternative B set a maximum population level for the Limantour herd to guide management decisions and determine when the herd is beyond the permitted management capacity. The EIS should also include a map that delineates the areas where elk are permitted. Commenters suggest that impacts of elk on ranchlands should give additional consideration to impacts of elk on ranching operations.	Under current conditions, it would be difficult to identify a population threshold for elk on ranches from the Limantour herd as has been done in the EIS for the Drakes Beach herd. This is primarily because the Limantour elk are spread over a wide area, from Home Ranch to I Ranch, including lands not leased for ranching, and occur at low densities. As the elk herd grows, NPS can reasonably assume that more bull elk would move onto ranches, but it is impossible to predict whether higher elk numbers would be concentrated in specific areas or spread out over a wider area, thus reducing impacts on ranching operations. As such, the approach outlined in alternative B is that the elk "would be monitored closely and managed in consistent with the desired conditions for the planning area." The impact analysis for alternative B indicates that hazing and lethal removal may be used to address localized impacts from the presence of elk. To better understand localized impacts on ranches, NPS would concentrate residual dry matter (RDM) monitoring activities to ensure that pastures frequented by elk are still meeting range management goals. To confirm impacts by elk, cattle stocking information from these same areas would be obtained from park ranchers. Localized impacts that could prompt elk management actions may also be related to fence damage or interruptions to basic operational requirements, including activities related to new diversification opportunities. Alternative B also proposes to manage the Limantour elk herd using a graduated response so as to prevent new herds and new female groups from becoming permanently established in the planning area. NPS would also take management actions if new Limantour female groups begin calving in the planning area or remain in the planning area during the rut. NPS generally employs adaptive management strategies when managing natural resources like tule elk. The GMP Amendment proposes to use adaptive management techniques to manage tule elk to achieve desired conditions. A map delineating areas open to elk would be restrictive and would not allow for adaptations to changing conditions. According to the forage model, maintaining the Drakes Beach herd at the size prescribed under alternative B would not compromise ranchers' ability to meet organic certification standards. To date, no ranches have lost organic certification.
22	A commenter requests "pasture offsets" be added to page 40 of the EIS so alternative B matches the language for alternative A on pages 24 and 25 to show consistency between the alternatives.	Pasture offsets are not part of alternative B because with the introduction of a zoning framework and population management of the Drakes Beach herd, pasture offsets would no longer be needed. No change was made to the final EIS.
23	A commenter recommends changing the language under alternative B to clearly state that ranches must operate within the cultural and natural resources of the planning area and that NPS is not responsible for the economic viability of ranches.	The management zones established through the GMP Amendment, including the Ranchland zone, would be managed to support the desired conditions for natural and cultural resource conditions. Authorized practices in each subzone were developed to protect those resources and are therefore compatible with natural and cultural resources. NPS is not responsible for ensuring that the ranches are economically viable, and the EIS does not contain language to that effect.

Table 8. AL1300 – Alternative D

ID	Concern Statement	Response
24	One commenter indicates that providing one-year phase out periods for some of the ranching and grazing areas under alternative D is insufficient because it would not provide proper notice or offer alternatives to ranchers in these areas, especially those that house livestock.	The one-year phase-out refers to specific grazing-only lease/permits on ranches without residential complexes or associated infrastructure. One year is sufficient for these types of operations to be phased-out.
25	One commenter noted that the section on reduced ranching areas appears to be arbitrary because it fails to consider sea level rise and water quality concerns under the Clean Water Act, and ESA protections.	The reduced ranching alternative terminates ranching on full allotments rather than reducing acreage on all operations. Alternative D would discontinue ranching from approximately 7,500 acres, including allotments draining to the Drakes Estero, Duxbury Reef, Olema Creek and Lagunitas Creek watersheds. Those areas would be incorporated into the Scenic Landscape zone. The water quality impacts associated with alternative D are analyzed in the "Water Resources" section of chapter 4. In addition, Fencing and other mitigation measures are proposed to protect resources. Alternative D incorporates a suite of other Management Activities, Practice Standards, and mitigation measures, including limits to stocking rates and RDM requirements, which are means of reducing direct impacts on water quality, listed species, and other resources.

Table 9. AL1400 – Alternative E

ID	Concern Statement	Response
26	One commenter indicates that alternative E does not evaluate if dairy ranches could be converted to beef ranches in a period of five years and fails to disclose if the existing dairy ranches are appropriate for conversion to beef cattle operations. Additionally, the commenter notes that alternative E is incomplete because it does not provide other options for converting dairy ranches. Additionally, the commenter suggests that alternative E does not describe mitigation measures that would be implemented for negative elk conflicts.	During alternatives development, NPS determined it would be feasible and appropriate to convert dairy operations to beef operations. Many of the current beef operations in the park were once dairy operations, a transition undertaken voluntarily by those ranchers. Beef operations require fewer facilities than dairy operations and are stocked at a lower level of AU. As a result, beef operations can be easily accommodated on former dairy ranches. Other options for dairy ranches were considered under other action alternatives, including removal of all ranching under alternative F. Additional alternatives for dairy ranches are included under the "Alternatives Considered but Dismissed from Further Analysis" in chapter 2. Regarding mitigation measures for elk, ranch operations would be structured to accommodate the elk population, including the potential for reduced AU to ensure RDM standards are met. The EIS has been updated to reflect that a reduction in AU under alternative E may result in the closure of some ranches.

Table 10. AL1500 – Alternative F

ID	Concern Statement	Response
27	Commenters suggest including support services to assist ranchers as the park phases out ranching and dairy operations, as proposed under alternative F. One commenter suggests having Representative J. Huffman and the California Senators request federal funding for these services through the US Department of Agriculture (USDA). Commenters suggest other incentives, including a 20-year, non-renewable lease offer to each ranch with compensation available to lease holders who willingly dismantle their properties ahead of schedule or concessionaire arrangements that allow ranchers and employees to remain living in the buildings while offering fee-based lodging and interpretative services to the public.	If alternative F were selected for implementation, NPS would coordinate phase-out activities with ranchers. Whether Congressional representatives would seek federal funds to assist ranchers with phase-out operations is beyond the scope of this EIS. A 20-year lease term is not compatible with the objectives of alternative F, one of which is to phase out ranching within five years. Future re-use of developed ranch complexes would follow the process outlined in alternative F.
28	Commenters note the draft EIS does not provide enough detail to support the specified time periods for which all ranching operations would be phased out under alternative F. Some commenters feel that five years is too long; others feel that it is too short. Commenters recommend including, as part of alternative F, an assessment of which ranchers may need more than five years to phase out their operations. Based on the assessment, alternative F could allow for a gradual phase-out of historic ranches. Another commenter requests information about who would be responsible for the clean-up of ranches under alternative F.	Alternative F provides for ranches with developed complexes to be phased out in five years and for grazing-only operations to be phased out within one year. NPS believes this provides sufficient time for an orderly phase-out of operations. Responsibilities concerning the surrender and vacating the premises are included in current lease/permits and would be included in the 20-yr lease/permit should an alternative be selected that continues ranching.

ID	Concern Statement	Response
29	One commenter suggests including and analyzing an adaptive use plan for structures on decommissioned ranches under alternative F of the draft EIS, including consideration of sensitive resources and measures to reduce visitor impacts. Additionally, commenters indicate that alternative F should include a program for ecological restoration. Commenters specifically suggest using carbon farming as a wildlife habitat restoration element to mitigate disturbances to the ecosystem because the sequestration benefits of this practice (e.g., from wood plantings, herbaceous cover, and compost application) can be gained without using livestock.	Alternative F discusses future adaptive use of ranch complexes and resource restoration at the programmatic level. If alternative F were selected for implementation, NPS would initiate a tiered planning process to evaluate appropriate types of adaptive use for ranch complexes and restoration options. As indicated in the EIS, strategies would be developed to support the natural and cultural resource management goals in the planning area. If alternative F were selected, table 2 details the management strategies for each resource that would guide future planning efforts.

Table 11. AL1600 – Alternative Elements: Zoning/Subzoning Framework

ID	Concern Statement	Response
30	Commenters request that the Ranchland zone prioritize holistic planning areas and include resource protection buffers that are connected to sensitive water resources, watersheds, and wilderness areas within and outside the planning area. Additionally, commenters suggest the Ranchland zone consider future impacts from climate change, such as rising sea levels, by developing prioritized protections in this zone. Commenters request maps that identify current restoration projects and sensitive water resources located outside the planning area that may be affected by the activities proposed in the planning area. Commenters note that the draft EIS fails to consider impacts on the park as a whole through the proposed zoning changes.	The purpose of the new zoning framework is to create a holistic approach to managing lands in the planning area to support desired conditions, including the protection of sensitive resources. All subzones would be formally determined based on on-the-ground status of sensitive resources, practical feasibility, and other site considerations for proposed activities. Restoration projects in and adjacent to the planning area that could have synergistic effects on resources affected by the proposed alternatives are described in chapter 4 and analyzed in the cumulative impact analysis. A new map has been added to the EIS that displays the more than 170 projects completed in the planning area (figure 4 in appendix A) to improve resource conditions. Watershed boundaries are also shown on figure 44 in appendix A, and the impacts of the alternatives on these watersheds are analyzed in chapter 4. See the response to Concern ID 245, which addresses the way climate change is considered in the EIS. Regarding the comment about considering impacts on the entire park through the proposed zoning changes, please see the response to Concern ID 31, which explains that the zoning in the GMP Amendment does not represent an expansion of ranching activities in the park. Thus, there would be no meaningful change to other areas of the park as a result of implementing the broad zoning framework described in the EIS. Impacts on the entire park were considered when developing the impact analysis methodology for each resource. If impacts are expected to affect resources outside the planning area, then those impacts were described. Additional text has been added to the “Public Use and Enjoyment” section of chapter 4 to account for the potential changes in visitor use that may occur outside the planning area, especially in regard to alternative F.

ID	Concern Statement	Response
31	A commenter suggests the final EIS include an explanation of why the boundaries of the Ranchland Zone would be expanded under alternative B and how this action would benefit visitors.	The 7,600 acres of the park that were outside the 1980 GMP's Special Use-Pastoral Lands and Pastoral Landscape Management zones are included in the Ranchland zone because these lands have been actively used for ranching since their acquisition by NPS and the 1980 GMP. All alternatives in the EIS reduce the acreage allotted to ranching from current levels. Alternative B reduces the area authorized for ranching in the planning area from 27,000 acres under alternative A (no action/current condition) to 26,100 acres. Within each ranching alternative, the subzoning varies to account for differences in the location of authorized ranch activities. Visitor experience opportunities and potential improvements to visitor facilities are described for each alternative in chapter 2 and analyzed programmatically in chapter 4.
32	Commenters provide feedback regarding the mapping of subzones in the draft EIS. One commenter notes that figures 6–31 show a gap between the Resource Protection subzone and ranch areas near the ocean, Tomales Bay, Drakes Bay, and Point Reyes and suggest the zoning framework include a resource protection buffer zone along the boundaries of ranches that are close to surface waters because of high levels of coliform bacteria and nutrients in these areas. Commenters indicate that the draft EIS and maps do not clearly identify how each subzone would be defined by fencing, if proposed. One commenter notes that the draft EIS zoning maps are not accurate because experts in the farming and ranching industry did not visit all areas on the map or were not consulted for the delineation of zoning reflecting that visitation/consultation is necessary to properly zone the area for future ranching in Point Reyes.	The planning area around ranches does not always extend to the ocean or bay shoreline. The EIS zoning and subzoning framework was applied to all lands in the planning area. Areas not subzoned as Range, Pasture or Ranch Core are not authorized for ranching activities. Lands between the planning area boundary and the ocean or other large waterbodies are thus not included in the Ranchlands zone and are closed to ranching. In addition, the EIS includes a Resource Protection subzone that further protects and buffers the ocean and other surface waters from ranching impacts. Natural or physical barriers to livestock are necessary to delineate the Resource Protection subzone. To implement the Resource Protection subzone, Fencing or other management controls would likely be required. NPS staff met with ranchers during the development of the zoning framework. As noted in the EIS, ranch maps would continue to be refined based on site-specific field surveys and in collaboration with ranchers. The approval of proposed activities in the Pasture and Range subzones would be based on field surveys prior to authorization and inclusion in the ROAs.
33	A commenter indicates the Pasture subzone does not comply with state statutes regarding providing proper shelter for animals because it prohibits permanent buildings. The commenter suggests the draft EIS language is misleading because it does not fully describe how animals could access appropriate shelter in non-permanent buildings.	The EIS prohibits new permanent shelters in the Pasture subzone. Temporary infrastructure associated with diversification activities in the Pasture subzone, including Fencing and mobile huts for chickens, would be allowed and is analyzed in the EIS. Although the Pasture subzone does not allow permanent shelters, animals would have access to permanent buildings in the Ranch Core subzone. Under all alternatives that authorize diversification (B, C, and D), non-cattle livestock would have access to both the Pasture and the Ranch Core subzone. Therefore, no change was made to the EIS text. Any requirements for shelter where existing infrastructure does not currently exist in the Ranch Core would be evaluated on a case-by case-basis.

ID	Concern Statement	Response
34	Commenters indicate the draft EIS does not adequately analyze a flexible approach to applying natural resource and agricultural management practices actions across zones, nor does it adequately consider the potential environmental benefits from incorporating such flexibility into ranch zoning. Commenters suggest the draft EIS should include this flexibility for addressing resource management objectives across subzones into the zoning framework. Commenters suggest implementing fire management practices and integrating soil and water conservation management (e.g., carbon beneficial practices and carbon sequestration) across the boundaries of the proposed Resource Protection, Range, Pasture, and Ranch Core subzones.	NPS may authorize activities with a demonstrated beneficial impact on resources depending on consistency with resource management goals and objectives. The Fire Management Plan is included in the EIS as a cumulative project. Vegetation impacts associated with fire are included in the impact analysis of chapter 4.
35	A commenter suggests the draft EIS fails to provide adequate detail on the Resource Protection subzone and requests information on which resources would be protected by each subzone and how. Commenters suggest the acreage designated as a Resource Protection subzone is too small because all areas of the park contain sensitive resources, and the park has the responsibility to protect all resources. Another commenter suggests that the Range subzone be eliminated and all the lands in that zone be added to the Resource Protection subzone. Commenters request maps of individual ranches in the Resource Protection subzone that show the specific protected habitats on each ranch so that it is clear why the area is designated as a Resource Protection subzone. Further, commenters request the Resource Protection subzone maps delineate areas that exceed a 20% gradient and the sensitive resources that qualify the area as a Resource Protection subzone. Commenters suggest updating the maps in the EIS to show the locations of NPS and rancher restoration plans for water quality, special-status species, and other important plant and animal communities to inform the placement of Resource Protection subzones and Pasture subzones.	Chapters 3 and 4 of the EIS include discussion regarding resources within the various subzones. Appendix J provides the detailed criteria that were used to develop the subzones. The Resource Protection subzone is only one mechanism that would be implemented to protect sensitive resources. The other subzoning classifications are appropriate to resources in those zones. In addition, the action alternatives include many other mechanisms to protect resources, including the Management Activities, Practice Standards, and mitigation measures in appendix F. A new map has been added to the EIS that displays past projects, including more than 170 projects completed in the planning area (figure 4 in appendix A). Under NPS policy and for the protection of sensitive species, specific locations of threatened and endangered species and archeological resources are not provided to the general public. Mapped locations of those resources were provided to appropriate agencies, including USFWS and the California State Historic Preservation Office. Maps of non-sensitive park resources in the planning area are provided in appendix A.

ID	Concern Statement	Response
36	A commenter notes that the draft EIS incorrectly presents the percentage of land that would be permitted for cattle grazing under the zoning framework. Specifically, the commenter notes that the text on page 70 of appendix L reads, “The zoning framework would specify that only grazing would be authorized in approximately 70% of the action area”; however, on page 35 of the draft EIS, the text states that the 28,700-acre planning area, or “action area,” is divided into a Resource Protection subzone of 2,600 acres (where only prescriptive grazing would be allowed), plus a Range subzone of 16,900 acres and a Pasture subzone of 9,000 acres (where both would allow grazing). Thus, the commenter indicates the zoning framework would allow grazing in at least 91% of the planning area, and not 70%, as stated in the draft EIS.	It is unclear specifically what text the author is referring to; appendix L (appendix O of the final EIS) has only 60 pages. While grazing is authorized in some areas where other activities are also authorized, the quoted language refers to areas where only grazing would be authorized, specifically the Range subzone. As noted under “Alternative B” in chapter 2 of the EIS, the Range subzone is nearly 65% of the “lands under lease/permit.” As a result, both BAs have been updated to reflect 65% instead of 70%.
37	Commenters suggest the EIS should discuss why the shoreline of Drakes Estero, a Congressionally designated wilderness area, is not included in the proposed Resource Protection subzone.	While most uplands surrounding Drakes Estero are permitted for cattle grazing operations, more than 70% of the shoreline access to Drakes Estero is impeded by cliff bluffs, dense vegetation, or existing fencing. Where physical barriers do not exist, proposed resource protection buffers are generally included (see figure 8 in appendix A). It should be noted that Fencing is not the only measure of protection. Other management approaches, including limits to stocking rates, would be implemented to minimize impacts. NPS conducted a survey of Drakes Estero, and additional acreage was identified for potential inclusion in the Resource Protection subzone at four sites in the planning area. The inclusion of these areas would change the total acreage of the Resource Protection subzone by less than 5%, which would not affect the overall analysis. As noted in the EIS, ranch maps would continue to be refined based on site-specific field surveys and in collaboration with ranchers. The approval of proposed activities in the Pasture and Range subzones would be based on field surveys prior to authorization and inclusion in the ROAs.

ID	Concern Statement	Response
38	A commenter notes that the draft EIS does not cite any scientific research or include selection criteria to support the creation of the extent of Range subzones, specifically noting text on page H-1, in the second paragraph of Appendix H: Subzone Definitions and Selection Criteria. The commenter indicates that the creation of the Range subzone and Resource Protection subzone have been arbitrarily assigned and are not based on any resource determination. The commenter supports the statement by suggesting that removing grazing in the Range and Resource Protection subzones would decrease federally listed species populations and affect native biodiversity because managed grazing has proven compatible with preservation of some of the federally listed species at Point Reyes.	The establishment of the Range subzone was based on documented presence of a list of resources that are linked to desired conditions, including threatened and endangered species or critical components of their life cycle, rare plants, native grasslands, forests, ponds, streams and wetlands, archeological sites, and slopes greater than 20% (see appendix J for definition and selection criteria). Grazing is authorized in this subzone, but more intensive activities are generally not allowed. The Resource Protection subzone, including areas where grazing exclusions are already established, encompasses areas where NPS has identified full exclusion as the most effective means by which resource objectives may be met (e.g., forested riparian habitat that is incompatible with grazing). Where grazing has a demonstrated benefit to resources, NPS may authorize Targeted Grazing depending on consistency with resource management goals and objectives.
39	A commenter indicates that the proposed Ranch Core subzone boundary for the area containing the Lunny Ranch is not accurate because it does not include the high-impact feeding area of the bull pen or the crop area, which contains feed racks, concrete slabs, a concrete manure pit, and a pump station. The commenter suggests the areas adjacent to the building complex should be included in the final EIS and Lunny Ranch ROA as Ranch Core subzone land. The commenter also notes that a previously planned project at the northwest end of the Lunny Ranch near Abbotts Lagoon includes water and wetland resources where increased management and protection may be appropriate and should be considered in the zoning framework.	“Alternative B” in chapter 2 of the EIS identifies that the Ranch Core subzone includes the developed complex plus up to 2.5 acres of “disturbed lands located adjacent to the developed complex that do not contain or have the potential to affect sensitive resources.” Maps of the zones, which are presented in appendix A, were developed in consultation with ranchers and using NPS knowledge of site-specific conditions. Refinements to the zone mapping based on field surveys would be completed as necessary as part of the leasing process. The boundary of the Ranch Core subzone would be defined in the ROA if a ranching alternative is selected for implementation. The EIS provides detailed analysis for the activities and practices most commonly performed on ranches and certain types of diversification activities. Projects unique to a particular ranch would be analyzed in a subsequent planning process following receipt of a detailed proposal.

ID	Concern Statement	Response
40	A commenter suggests that the Ranchland zone be described and defined on page 25, paragraph 2, and page 35 of the draft EIS because it is a key component of the GMP Amendment/EIS. The commenter also indicates that page 25, paragraph 2, of the draft EIS states that the Ranchland zone would replace the existing Pastoral Lands and Pastoral Management zones; however, the commenter notes that figures 4 and 6 shows the Ranchland zone would replace the Natural Environment/Natural Landscape Management zone, Special Use zone, and lands acquired after 1980. The commenter recommends that the EIS clarify why the Natural Environment/Natural Landscape Management zone and Special Use Zone are being opened to grazing as Pasture and Range zones.	Additional language that clarifies the definition and purpose of the Ranchland zone has been added to the alternative B text in the EIS, as well as in the introduction to chapter 2. The zoning is consistent with existing land use and does not open new areas to grazing. The acres in question have been grazed consistently since NPS acquired the land. See response to Concern ID 31 that explains that the zoning in the GMP Amendment does not represent an expansion of ranching activities in the park.
41	A commenter suggests reducing the land designated as the Range subzone from approximately 65%to 45% because the land contains important and sensitive resources that could be damaged by cattle grazing and other ranching activities. The commenter also indicates that approximately 40%–45% of the 28,700 acres should be designated as Pasture subzone because there are no sensitive resources in the area.	The subzones were developed based on the GIS analysis process described in appendix J. As noted in the response to Concern ID 32 and 35, the subzones specific to each ranch would be further refined based on monitoring, surveys, and on-the-ground field verification.
42	A commenter notes that following a site visit to the southernmost section of Commonweal/Niman Ranch, ungrazed pastures of reed fescue (*Festuca arundinacea*), a European introduced livestock forage grass, was observed. The commenter notes the area also contains California oat grass (*Danthonia californica*), a native Coastal prairie species, and some native sedges and rushes. The commenter asks how ungrazed areas in the planning area would be managed in the future to maintain the resources.	This area is within the Pasture subzone, see appendix A, figure 32. As noted in the responses to Concern IDs 32, 35, and 41, field surveys to confirm that sensitive resources are not present would be conducted prior to the implementation of activities in the Pasture subzone as described in appendix J in the final EIS. Ungrazed areas would be managed in the same manner as other areas of the park—where grazing has a demonstrated benefit to resources, NPS may authorize Targeted Grazing, depending on consistency with resource management goals and objectives.

Table 12. AL1700 – Alternative Elements: Lease/Permits

ID	Concern Statement	Response
43	Commenters ask NPS to consider different lease periods, including 5 years, 10 years, and an interim period of 1 to 5 years until ranchers have best management practices (BMPs) and mitigation measures in place. Commenters also request additional information regarding how and when leases would be renewed and what would occur when 20-year leases are up. To provide clarity for lease renewal, one commenter suggests that leases have an option for renewal at year 15 or through 5-year incremental extensions Commenters suggest issuing rolling leases to ranchers to allow for ongoing ranch improvement projects. One commenter notes that the draft EIS does not address the conditions necessary for NPS to "offer this lease or a similar lease, to Lessee," and is not clear on what the terms of a subsequent lease may be. Additionally, commenters recommend 20-year rolling leases with at least one year of advance notice for renewal if the lessee meets all existing lease and ROA performance standards. Commenters suggest that the NPS include a significantly longer notification time frame than 6 months prior to the expiration to renew or issue new leases, including the conditions and terms of the same or similar new lease and the conditions for not offering such a lease.	As noted in the "Alternatives Considered but Dismissed from Further Analysis" section of chapter 2 of the EIS, the Secretarial delegation of authority directed NPS to consider extending lease/permits to 20-year terms. Congressional guidance also supports the issuance of lease/permits with 20-year terms. In January 2013, the Director of the NPS issued a memo delegating the authority to issue lease/permits to the Regional Director. The delegation memo clarifies that lease/permits may be issued with terms up to 20 years. The lease/permit template has been modified to allow ranchers to choose terms shorter than 20 years. The ROA, which is an exhibit to the lease/permit, will address Practice Standards and mitigation measures related to the Management Activities and diversification activities authorized on a particular ranch. Because Practice Standards and mitigation measures are activity-specific, a generic interim period of one to five years is not an appropriate mechanism. After reviewing public comments, NPS revised the draft lease agreement to extend the six-month notice to reissue a lease to a one-year notice. The reason that the lease template indicates that NPS may issue a "similar" lease at the end of the lease period is because legal requirements could change over the next 20 years. NPS therefore cannot guarantee that future leases would have the same language as the current template. Rolling leases were not considered for the reasons stated in the "Alternatives Considered but Dismissed from Further Analysis" section of the EIS.

ID	Concern Statement	Response
44	Numerous comments were received about the draft succession policy that was made available during the public review of the draft EIS. Commenters indicate that the succession policy is not consistent with agency direction for multi-generational ranching, specifically the issuance of a request for proposals. Commenters made many suggestions for succession policy revisions including: allowing ranching operations to expire on a given ranch if the named lessee does not wish to continue ranching, giving lands to the Coast Miwok tribe, including ranch workers in the succession policy, and allowing lessees to add family members to the lease.	NPS has revised the succession policy. The revised Succession Policy is available online at: https://parkplanning.nps.gov/poregmpa. The Succession Policy reflects a preference to continue multi-generational ranching by allowing existing lessees to continue ranching or by offering leases to other park ranchers
45	Commenters state that a programmatic approach for the GMP Amendment is not appropriate because it results in less public involvement and lacks detailed site-specific review. General concerns raised by commenters regarding the ROAs include clarification of whether NEPA is triggered when ROAs are updated or reauthorized, how the ROAs will accommodate the need for real-time decision making, and concerns regarding full public disclosure and opportunity for review of ROAs. Commenters suggest final EIS should include the Agricultural Lease/Permit and ROA templates as appendices and clarify how proposed standards and mitigation measures will be selected and implemented within the planning area to ensure that preservation strategies proposed in the draft EIS are achieved. Commenters also suggest appendices K and L should be referenced in the Agricultural Lease/Permit and ROAs, where relevant, as resources for identifying additional standards and mitigation measures for protecting threatened and endangered biological resources.	The EIS planning process involved three opportunities for public input. NPS solicited public feedback on an initial range of conceptual alternatives, held a 30-day public scoping period, and then released the draft EIS for a 45-day public review period. As stated in the EIS, programmatic components of the GMP Amendment would be subject to additional site-specific planning, review, and compliance. As specific projects and plans are developed, additional environmental analysis would be completed, including public involvement as appropriate. Public input as part of future site-specific planning ensures that the public will have an opportunity to comment when plan elements described in the EIS at the programmatic level are ready for detailed analysis and comment. ROAs would only authorize activities that have been analyzed in detail in the EIS or after analysis in a future NEPA document. The final EIS identifies ranching and diversification activities considered in sufficient detail in this EIS to allow their implementation without the need for additional NEPA analysis. As a result, the inclusion of these activities in an initial ROA (or as part of a subsequent ROA) would not trigger the need for additional NEPA compliance, barring unforeseen circumstances. Ranchers who seek to undertake activities that are not fully analyzed in this EIS would have to work with NPS to complete additional review and compliance before such activities could be authorized in an ROA. Thus, whether additional review and compliance is required before an activity could be included in an ROA depends on the whether the activity is fully analyzed in this EIS. Like the existing leases, all future lease agreements and ROAs would be made available to the public. ROAs will identify the Management Activities, Practice Standards, and mitigation measures that apply to authorized ranching activities. A revised draft of the lease/special use permit template is available online at: https://parkplanning.nps.gov/poregmpa. To further demonstrate how specific standards and mitigation measures would achieve the preservation strategies, NPS updated chapter 2 of the EIS. Appendices K and L (appendices N and O in the final EIS) do not contain additional standards and mitigation measures; those measures are a subset of applicable measures already included in appendix F. However, as NMFS and USFWS complete their review of the BAs and issue their Biological Opinions, any additional conservation measures they require will be integrated into the ROD and carried forward into ROAs as appropriate.

ID	Concern Statement	Response
46	Commenters state the EIS underestimates potential impacts because it assumes ranchers would comply with all regulations and required mitigation measures despite there being a history of non-compliance and unenforced regulations or lease terms. Commenters request additional information regarding how NPS would monitor and enforce lease conditions under continued ranching alternatives, especially given limited staff and funding. Commenters ask how performance would be tied to lease renewal and request that information about previous lease violations be included in the EIS.	This EIS clearly identifies locations for and types of activities that would be allowed on ranches should a ranching alternative be selected for implementation. The lease/permits and ROAs will require ranchers to conduct authorized activities in accordance with the EIS (e.g., zoning, Practice Standards, mitigation measures) and with the terms and conditions of biological opinions and other regulatory requirements. Park staff will monitor compliance with the lease/permits periodically, such as through routine ranch visits and during yearly meetings related to the ROA, as well as on an as-needed basis should concerns arise. The lease/permit allows the NPS to revoke a lease for non-compliance. It also does not require NPS to issue a subsequent lease/permit to a lessee. These provisions would allow NPS to refrain from issuing a subsequent lease if warranted.
47	Commenters offered suggestions and had questions regarding specific provisions of the draft Lease Template and the Ranch Operating Agreement.	NPS considered all comments related to the draft lease/permit and ROA and has prepared revised documents that are posted online. Examples of changes are included in the following sections: definitions (Ranch Operating Agreement and Ground Disturbance), residential requirements, special-use permits, terms, requirements related to cattle and livestock management, use of pesticides, and enforcement options for lease violations. NPS also revised the rent and insurance sections of the lease/permit and ROA.
48	Commenters request clarification on the lease appraisal process and specific revisions to the calculated appraisal. Commenters note that a case-by-case fair market value appraisal would need to be made based on the specifics of each diversification proposal. They note that the final EIS should clearly describe how the park intends to determine fair market value for diversification activities. Commenters suggest a range of revisions to the appraisal methods for the leases that should be analyzed in the EIS that would consider both the real costs as well as public costs associated with soil, water, and air quality impacts. The increased revenue could then be used for additional monitoring and mitigation activities	NPS does not determine fair market value. Appraisal approaches and methodology are overseen and approved by the US Department of Interior Appraisal and Valuation Services Office (AVSO). Relevant comments submitted during the comment period have been shared with AVSO.

ID	Concern Statement	Response
49	Several commenters submitted specific lease requests for individual ranches. One commenter requests that the Ranch Core subzone of Home Ranch be permitted with the Home Ranch agricultural permit and asks for a waiver or additional discussion regarding the residential use requirement. A second commenter asks that pastures B and C of D Ranches be reallocated to C Ranch to offset impacts from the Drakes Beach herd.	Ranch-specific lease requests would be considered during implementation and would be evaluated for consistency with the EIS and the alternative selected in the ROD.
50	One commenter suggests the park adopt a leasing policy that permits affordable, stable housing for families of farm and ranch workers to support the area's agricultural community.	Appraisals are used to determine fair market value for individual units within a ranch complex, and ranchers may charge up to fair market value. As described in chapter 2 under the alternative descriptions, housing is intended to support park ranch workers on ranches in the planning area and is not meant to provide housing for additional ranch workers in the region.
51	One commenter suggests that the final EIS analyze the requirement of a bond to guarantee any structure or alteration proposed for diversification operations would be removed and the area restored to its prior condition.	The lease/permit contains enforceable language that requires lessees to restore the premises as directed by NPS at the end of the lease term. A bond is not necessary.

Table 13. AL1800 – Alternative Elements: Diversification

ID	Concern Statement	Response
52	Commenters express concern about potential impacts associated with diversification activities and that many of these impacts were not analyzed adequately in the draft EIS. Potential impacts included disease transmissions from proposed livestock, increased visitor use and commercial traffic as well as the benefits of diversification such as soil conservation, wildlife habitat, and composting vegetable waste and manure. Commenters request a complete management plan to address impacts of increased visitor use and commercial traffic that may result from permitting diversification activities. They note that diversification would result in more frequent truck trips for processing, hauling, digging, planting, harvesting, sales, and delivering milk and hay, as well as visitor use traffic impacts such as increased congestion, limited parking areas, and public safety impacts to vehicles and bicycles in the park. Commenters also note that Point Reyes National Seashore and North District Golden Gate Recreation Area Agricultural Lease/Permit, Exhibit B Ranch Operating Agreement 20, does not include terms and conditions for local retail or farm stands; however, the draft EIS lists diversification activities to include the "sale of local agricultural products," and that tastings could include alcoholic beverages or cannabis (if it becomes federally legal) and could impair individuals' ability to operate motor vehicles.	Chapters 2 and 4 of the final EIS identify the activities that are analyzed in sufficient detail as part of this NEPA process to allow implementation under new lease/permits. Diversification activities that are only analyzed at the programmatic level in this EIS would not be incorporated into the ROA until a rancher submits a detailed proposal that would then be reviewed in a site-specific NEPA document, subject to NPS review and approval. Impact analyses related to diversification activities under all impact topics were reviewed and expanded, where appropriate. A measurable difference in traffic due to diversification activities or public use and enjoyment activities is not anticipated. Sale of agricultural products would be limited to products produced in-park and would not include alcohol or cannabis. For specific responses to impacts from diversification, please see individual impact topic responses in this document, as well as Concern ID 54.

ID	Concern Statement	Response
53	A commenter notes that the draft EIS dismisses certain species of livestock (ducks, geese, turkeys, and rabbits) as possible types of livestock diversification due to the level of environmental impacts, but does not explain why chickens, sheep, goats, pigs, and crops would be permitted.	Certain livestock species, including ducks, geese, turkeys, and rabbits, were dismissed from consideration for livestock diversification in the EIS because of concerns regarding adverse effects on wildlife from escaped animals crossbreeding with native species (Simberloff 1996; Foufopoulos et al. 2003). Species that would be permitted for livestock diversification under the preferred alternative (e.g., chickens, sheep, and goats) are species that have been previously authorized in the planning area and that are less likely to escape and crossbreed with native species. Therefore, the same concerns do not exist for these species. Similarly, crop species authorized would only include those not expected to hybridize with native vegetation via cross-pollination. References: Foufopoulos, J., S. Altizer, and A. Dobson. 2002. “Interactions between wildlife and domestic livestock in the tropics.” *Tropical Agroecosystems*, pp.219–244. Simberloff, D. 1996. “Hybridization between native and introduced wildlife species: importance for conservation.” *Wildlife Biology* 2(3):143–150.
54	Commenters suggest that guard dogs are dangerous to park visitors and may kill predators such as bald eagles, red-tailed hawks, owls, mountain lions, bobcats, coyotes, foxes, raccoons, skunks, and weasels. Commenters made several suggestions regarding the use of guard animals, including limiting new species of diversification to fenced subpastures to reduce the number of guard animals required to protect livestock, approving only herd-trained guard animals. One commenter suggests using the term “Livestock Guardian Animals” per the California Health and Safety Code definition. Another commenter states that the draft EIS is inconsistent in its treatment of hazing, and notes that page 49 states that guard dogs can haze wildlife to protect livestock, but page 63 prohibits dogs from hazing elk to protect livestock.	NPS revised the EIS to reflect the appropriate language by replacing “guard animals” with “livestock guardian animals.” The commenter correctly notes that livestock guardian dogs can be aggressive toward people and may harass or kill non-target wildlife or livestock. The EIS has been revised to acknowledge this risk, and additional information has been incorporated regarding appropriate training of livestock guardian animals and other measures that would be taken to limit this risk. As stated in the EIS, the use of livestock guardian animals would be permitted only for the protection of livestock from predators. Use of livestock guardian animals to haze elk would be prohibited. References: University of California Agriculture and Natural Resources (UC ANR). 2018. *Livestock Protection Tools for California Ranchers*. ANR Publication 8598. 15 pp. Redden, R. R., J. M. Tomacek, and J. W. Walker. 2015. “Livestock Guardian Dogs.” Texas A&M AgriLife Extension Service. 8 pp.

ID	Concern Statement	Response
55	One commenter notes that diversification activities need to have enforceable limits so that it does not alter the historic ranching landscape or become a substitute for income from ranching and dairying. The commenter notes that although the draft EIS sets explicit limits on the number of livestock and the acres of crops, it does not set a limit on income. Commenters suggest the final EIS discuss the impacts of elk on ranching income, income from diversification activities, and the appropriate rent for diversification activities. Commenters note that the 10% limit on income from diversification activities would be enough to mitigate the impact of elk on ranching income and would likely be considered a de minimis departure from ranching and dairying, as described in the enabling legislation. A 10% limit on income would also flatten the 20% possible fluctuations in income associated with ranching and dairying.	The GMP Amendment establishes a zoning framework that is based on resource sensitivity and protection. Diversification activities in the Pasture subzone are limited based on natural and cultural resource constraints and would not exceed 10% of authorized AU or 10 AU total for any operation (whichever is lower). The Ranch Core subzone establishes an area where more intensive activities, including adaptive use of structures and other diversification activities, may be considered. The zoning framework ensures that the primary land management use remains beef and dairy ranch operations. Because NPS does not make determinations based on ranch operation income, establishing arbitrary financial limits either for diversification or elk management was not considered at this time.
56	Commenters note that diversification represents a movement away from preserving and portraying historic multi-generational beef and dairy ranching and indicate that commercial sustainability is not a legitimate NPS management goal. One commenter notes that these new uses would require rodenticides, pesticides, and high-water use, which are incompatible with historic and cultural values.	NPS is authorized to lease agricultural property in the park subject to restrictive covenants deemed necessary by NPS. Agricultural property is defined as any property used for agricultural, ranching, or dairying purposes. The diversification activities considered in the GMP Amendment are agricultural activities or are directly tied to agriculture and consistent with preservation treatment standards for cultural landscapes. If allowed, they would be subject to restrictions and mitigation requirements to protect park resources. The alternatives presented in chapter 2 are designed to help achieve desired conditions, not to maximize revenue for ranchers. Proposals to use pesticides or herbicides by ranchers in any of the subzones would be subject to NPS review and approval in accordance with NPS's Integrated Pest Management (IPM) program. The EIS evaluates water use and other impacts associated with certain diversification activities that have been considered at a detailed level in this plan (see table 6). Other types of diversification, such as irrigated crops, would require additional NEPA analysis before NPS could determine whether the activity is appropriate for the park. Ranchers who seek to conduct such activities would need to identify water sources and provide other detailed information about the proposed activity before it could be considered.

ID	Concern Statement	Response
57	Commenters suggest that the park lacks the authority to consider diversification activities because it does not comply with and would be in direct violation of the mandates of the Organic Act of 1916, the Point Reyes enabling legislation, the Concessions Act, Secretary Salazar's directive, and NEPA, and current NPS *Management Policies*. Commenters suggest that diversification activities are outside the scope of the EIS and do not enrich the experience of visitors to the park.	The Organic Act grants NPS broad discretion in the management of park areas. The leasing authority found in the Point Reyes and Golden Gate enabling acts allows NPS to lease ranch lands for agricultural, ranching, and dairying activities and to lease structures on ranch lands for related purposes. The types of diversification activities considered in the GMP Amendment are consistent with NPS's legal authorities and preservation strategies for cultural landscapes. In addition, NPS is only proposing to authorize diversification activities that are consistent with resource protection goals. Concessions laws and policies are not relevant to the proposed diversification activities, which can be authorized under the leasing authority found in the Point Reyes and Golden Gate enabling acts. Secretary Salazar's directive did not seek to limit the authorities available to NPS when considering the issuance of long-term ranching leases. Finally, NEPA is a procedural statute and does not mandate a particular outcome.
58	Commenters note that the draft EIS gives the public the false impression that the diversification sought by ranchers is new and expansive and that farming and ranching outside the planning area is far more diverse. Commenters state that ranches in the planning area historically included irrigated and non-irrigated crops (e.g., beans, peas, barley, artichokes, and other vegetables) as well as hogs and sheep. Commenters suggest the draft EIS consider how diversification activities would help the ranches maintain their operations, add to visitor experience, and allow ranchers to partner with the park to manage grasslands, brush, and wildfire risk. One commenter noted that ranchers would not be able to compete with Marin County ranchers outside of the planning area if they are not authorized to diversify in a meaningful way and felt the draft EIS did not consider the economic effects of the restrictions in the zoning framework and diversification and must be revised for the final EIS.	The EIS includes an analysis of how diversification activities could expand visitor experience opportunities, create operational flexibility and maintain ecosystems for vegetation and wildlife communities. Chapter 2 describes existing authorizations, including 121 AU of existing non-cattle livestock, and chapter 3 describes existing conditions. The zoning framework would allow for additional opportunities that do not currently exist. While socioeconomic impacts from each alternative were analyzed, the ranches are located in a national park on federal land and have separate operating criteria than those on private property. Protection of park resources is a requirement for operation, and NPS is not responsible for economic viability or competitiveness with ranches outside the planning area.
59	Commenters made the following comments and suggestions requesting allowable diversification activities in the EIS: ▪ adding "meat and crop" to farm core diversification for small-scale, on-farm processing, in addition to cheese to balance the opportunity for all ranches. ▪ One commenter asks if small-scale processing also includes animal slaughter.	NPS considered all additional recommendations and revised the EIS to include the authorization of meat and crop processing for items produced in-park only and pending site-specific analysis as needed. Mobile slaughter units could be used for meat processing, but no permanent facility would be authorized. NPS would authorize the sale of items produced in-park as long as no additional infrastructure is required to support such sales. Adaptive use of existing infrastructure would be consistent with the GMP Amendment and could be approved following review of a site-specific proposal. The language in the EIS does not preclude the sale of these products in locations outside the park, such as Point Reyes Station, at the discretion of the rancher.

ID	Concern Statement	Response
	▪ selling products created from diversification activities through the Point Reyes National Seashore Association and reinvesting the profits into the park to fund natural resource protection, restoration, and enhancement projects. Commenters also requested clarification on diversification activities. Commenters note that sales of local agricultural products is included in the draft EIS (chapter 2, p. 37; chapter 4, pp. 118, 121, 150) and appendix K (p. 75), but the explicit list of diversification activities and the subzones to which they have been assigned in chapter 2, p. 37, appendix K, pp. 15-16, appendix L, p. 15, and the Draft Sample Lease, Exhibit B, Ranch Operating Agreement, do not list sales of local agricultural products as a diversification activity. Commenters request that on-farm sales be included in any lists within the Ranch Core subzone analysis and Draft Sample Lease Exhibit B of the final EIS. One commenter suggests that it is unclear whether fee-for-service events, such as farm-to-table dinners, pumpkin patches, fundraisers, or weddings, would be allowed under public-serving ranch activities. Commenters states that the Draft Sample Lease section 4.13 reads, "Lessee may neither authorize nor host activities that require a National Park Service Special Use Permit, including organized events and filming activities, upon the Premises without Lessors prior approval and issuance of a Special Use Permit." Commenters suggest the final EIS clearly distinguish between special use permits and activities allowed under public-serving ranch activities. One commenter recommends that the final EIS clarify on-site origin for small-scale processing. The commenter suggests that small-scale processing could be interpreted as milk trucked in from dairies outside the park or as multiple farmers markets selling local agriculture from within the park. The commenter suggests that the final EIS consider prohibiting farm stands and authorizing the sale of agricultural	The lease/permit template has been revised to clarify the activities that would require a special-use permit. NPS has prepared a table of assumptions for activities and operations to clarify what is included in the impact analysis under chapter 4 (see table 6 of the EIS as well as the "Assumptions" section of chapter 4). For fee-for-service events, authorized diversification activities would need to have a public-serving, educational component, as described under Concern ID 98.

ID	Concern Statement	Response
	products on Point Reyes Ranches, Point Reyes Station, or in the visitor parking lot at Bear Valley or Drakes Beach.	
60	Commenters note that the economic impacts of diversification need to be analyzed in the final EIS and state that although diversification activities would allow ranchers to react to fluctuations in the economic market and maintain profits, it is not the goal of NPS to ensure the profitability of operations within the park and conflicts with NPS mandates and Congressional direction. Commenters suggest the draft EIS prioritizes the effects on commercial lease holders of foreseeable financial market fluctuations ahead of foreseeable environmental impacts to park resources. Commenters question the rationale for approving diversification because USDA offers programs to ranchers and farmers to mitigate for poor forage production years and fluctuations in the economic market. These provisions include discounted grazing fees; below-market-rate housing; and the benefit of the park's maintenance and improvements to roads, homes, and farm buildings at the public's expense, in addition to not paying property taxes. Commenters suggest other opportunities for diversified income available to ranchers include extended family ranches in Marin and Sonoma Counties, second jobs by lessee family members, and independent businesses owned by lessee family members. One commenter notes that if restrictions on ranching operations are increased, the ranches will not be able to financially sustain themselves and will ultimately go out of business.	The EIS analyzes the adverse and beneficial socioeconomic impacts of each alternative; however, the EIS does not contain any language that guarantees economic viability of ranch operations. Diversification activities at the scope and scale of those analyzed in the EIS are appropriate agricultural uses of ranchlands in the planning area and are compatible with natural and cultural resource protections. NPS is creating a framework for these activities that is consistent with NPS resource management goals. USDA does not control rental rates, grazing fees, or housing costs in the park. NPS will obtain an appraisal from the US Department of the Interior's Office of Valuation Services to establish the rents and fees associated with the lease/permit.

ID	Concern Statement	Response
61	One rancher submitted multiple requests for diversification activities they would like to implement on their ranch, including 30 acres of crop production, restoration of historic dairy activities, and NRCS-approved water and pasture planting projects.	Given the scale, scope, and timeline for this EIS, not every action that was suggested by individual ranchers was analyzed in site-specific detail (proposals specific to the Lunny Ranch fall into this category.) Actions prioritized for analysis at a detailed level are the most common actions and activities necessary for ranchers to operate on a daily basis (see chapter 2 and appendix F) and that can be implemented in a consistent manner across ranches. Other actions, such as the construction of new buildings or the cultivation of irrigated crops, will require ranchers to prepare site-specific proposals that will be subject to additional review and compliance beyond this EIS. After the ROD is signed, NPS will move forward with implementation of the selected alternative. If the selected alternative includes issuance of agricultural lease/permits, NPS will issue a lease/permit for each ranch and develop a ROA with each rancher. As part of the ROA process, proposed ranching activities will be evaluated for consistency with the EIS. If the proposed activities are consistent with the EIS and were evaluated in detail, then the activities will be authorized in the ROA (see table 6 for a list of actions that could be authorized without the need for additional compliance). If a rancher proposes activities that are only addressed at a conceptual level in the EIS (e.g., irrigated crops), additional information and site-specific review and compliance will be necessary. Activities such as Ranch Infrastructure and Water Control Management, Vegetation Management, Manure and Nutrient Management, and Forage Production are included in the analysis (e.g., chapter 2 and appendix F) and may be pursued in coordination with the NPS.
62	Commenters note that 2.5 acres of crop production without irrigation is limiting and suggest that up to 75 acres of crops should be allowed, not exclusively within the Ranch Core subzone, to compensate for poor forage production years and economic variability. Commenters suggest that prohibiting irrigation systems would severely limit crop varieties, allowing only crops to be planted in the fall and harvested in the spring using winter rains. They note that allowing irrigation would afford the opportunity to produce crops that are planted in the spring and harvested through the fall, allowing for more economic viability. Commenters suggest that the draft EIS evaluate all reasonable water use irrigation, like drip irrigation, when ranchers can demonstrate they have the necessary water available. In the evaluation of all reasonable water use irrigation systems, commenters suggest the EIS include permanent, temporary, and above or below ground techniques of irrigation.	In response to public comments, the EIS text was revised for those alternatives that authorize diversification to indicate that NPS would consider ranch-specific proposals for irrigation, including low-drip irrigation systems, on a case-by-case basis. The rancher would need to demonstrate that water is available for this use, and site-specific review and compliance would also be required. Based on future NPS review of specific proposals, up to 2.5 acres of crops could be authorized per ranch, to be sited in a location adjacent to the developed complex and incorporated into the Ranch Core subzone.

ID	Concern Statement	Response
63	One commenter suggests that if tilling is not allowed on crops, disc harrowing should also not be allowed. The commenter suggests that if these activities were allowed, impacts on native wildlife and plants should be analyzed. Another commenter notes that the draft EIS language indicates that only direct-sown crops are allowed within crop diversification and that the text should instead read that tillage minimization is encouraged, including use of no-till seed drills for direct-sown crops.	All crop production requests would require development of a site-specific proposal that would be reviewed by NPS for consistency with activities and mitigation measures identified in appendix F as well as the analysis in the EIS. For proposals that include activities not analyzed in detail in the EIS (e.g., irrigated crops), additional review and compliance would be required. During this review process, tillage and discing may be authorized.
64	Commenters suggest adopting the USDA California State Office definition of a row crop, which explicitly excludes “a crop planted in rows,” because it would eliminate exotic mushrooms planted in rows or growing 2.5 acres of only livestock food. Commenters also suggest prohibiting diversification into cannabis. One commenter notes that the definition of row crop locations on page 37 is different from the definition on page 51, and indicates that page 37 of the draft EIS states that up to 2.5 acres of row crops not requiring irrigation would be allowed on previously disturbed areas within the Ranch Core subzone, but that page 51 states 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. Commenters suggest the text be corrected to conform to the description on page 41 that allows 2.5 diversification acres within the 10-acre Ranch Core subzone, not in addition to the Ranch Core subzone.	NPS revised the EIS to remove “row” from “row crop.” Site-specific proposals would be required for all crop requests. Crops and vegetables consistent with those grown in Marin County would be considered. Cannabis is not legal on federal land and would not be authorized for crop production. Chapter 2 of the EIS specifies that the Ranch Core subzone includes the developed complex plus up to 2.5 acres of “disturbed lands located adjacent to the developed complex that do not contain or have the potential to affect sensitive resources.” Maps of the subzones (appendix A) were developed in consultation with ranchers and based on NPS knowledge of site-specific conditions. If a ranching alternative is selected for implementation, refinements to the zone mapping based on field surveys would be completed as necessary as part of the leasing process. These maps would be an attachment to the ROA so that the boundary of the Ranch Core subzone is clearly would be defined.

ID	Concern Statement	Response
65	Commenters express concern about the locations of the Ranch Core subzone and note that the subzones may not always be placed in the best location for crops due to soil conditions, erosion potential, floodplains, water sources, or other landscape attributes. One commenter suggests that if diversification activities are not limited to Ranch Core areas, proposed activities could be moved to areas with a lower visual impact. Commenters suggest coordinating with the San Francisco Bay RWQCB to identify all project design commitments to reduce future impacts from flooding events. Commenters also recommend limiting crop production to previously disturbed areas and note that if crops are sited in low-lying areas, they may be susceptible to erosion, runoff, and flooding and potentially introduce fertilizers and pesticides into fisheries, areas of instream uses, or impaired bodies of water, including Tomales Bay. Commenters note that if sheep and goats were allowed to browse outside the Ranch Core and Pasture subzone in a rotating manner, they could be used throughout the park to control vegetation, invasive weeds, brush encroachment, and fire fuels.	The EIS identifies that the Ranch Core subzone includes the developed complex plus up to 2.5 acres of "disturbed lands located adjacent to the developed complex that do not contain or have the potential to affect sensitive resources." The EIS states that up to 2.5 acres of crops could be authorized on each ranch, to be sited in the most appropriate location adjacent to the developed complex to minimize adverse impacts. The 2.5 acres would be incorporated into the Ranch Core subzone. Adjacent lands that are zoned as Range would not be considered for inclusion in the Ranch Core subzone. As noted in other responses, additional review and compliance (including review by the San Francisco Bay RWQCB as appropriate) would be required for diversification proposals that include activities not analyzed in detail in the EIS (e.g., irrigation, new structures). Sheep and goats in the Ranch Core and Pasture subzones would be allowed for diversification purposes under alternatives B, C, and D. If there are locations outside these subzones that require Targeted Grazing to meet NPS resource management objectives, NPS may determine the appropriate species and work with ranchers to use sheep and goats in those locations.
66	Commenters question whether horse boarding is an appropriate diversification activity given that it is not an agricultural use according to the Marin County General Plan. If horse boarding remains as a diversification activity in the EIS, commenters recommend considering a cap on the number of horses or operations allowed under diversification activities impacts and require them to comply with SWRCB regulations.	The Marin County General Plan does not govern NPS land management decisions. Alternative B identifies horse boarding as an authorized use provided that site-specific proposals for such use are consistent with the GMP Amendment, reviewed through additional NEPA compliance, approved by NPS, and conducted in accordance with applicable legal requirements, including SWRCB requirements.

ID	Concern Statement	Response
67	Commenters indicate that pig farm manure can affect groundwater and air quality and degrade vegetation cover. Commenters express concern about escaped domestic pigs becoming feral. They also suggest the park establish a cap on the number of pigs allowed within the Ranch Core subzone, specifically suggesting a limit of five pigs per ranch. Commenters recommend the EIS address waste management of pigs and prohibit the importation of hog feed from off-site sources.	The description of alternative B has been revised to clarify that a limited number of livestock common within a typical ranch complex, including non-breeding pigs for noncommercial use, may be present within the Ranch Core subzone. NPS would consider ranch-specific proposals for commercial pig production on a case-by-case basis and would require additional review and compliance. Based on future review of specific proposals, pigs could be authorized in the Ranch Core subzone, including up to 2.5 acres on each ranch, to be sited in a location adjacent to the developed complex that would be incorporated into the Ranch Core subzone. Adjacent lands that are zoned as Range would not be considered for inclusion in the Ranch Core subzone. Chapters 2 and 4 of the EIS have been revised accordingly.
68	One commenter suggests removing the limitation on the number of chicken huts and adding a mitigation measure that requires any chicken hut on pastureland to be half sized and moved by hand no less than once per day to allow the chicken manure to be spread rather than concentrated. Because chicken huts need to be moved frequently, commenters suggest that they should not be limited to the Ranch Core subzone. Other commenters suggest chicken sheds and huts should be limited to three, with height and color requirements. Another commenter suggests the park consider revising the chicken cap to be a percentage of AU, similar to the procedure for sheep and goats. A commenter suggests authorizing 2.6 chickens per AU, which would allow smaller ranches to have fewer than 100 chickens and larger ranches to have about 750 chickens. One commenter notes that chapter 4 states that ranches with an occupied residential complex would be authorized to diversify livestock, but that appendix K restricts chickens to the Pasture subzone. The commenter suggests that this inconsistency should be resolved by allowing livestock species in the Pasture subzone of all ranches.	Chickens and chicken huts would be authorized in the Pasture subzone for ranch operations with an occupied residential complex under alternatives B, C, and D. The Pasture subzone comprises lands where no sensitive species are known to occur and that contain introduced or domestic species (appendix J). Rotation and stocking density of poultry is crucial for balancing concentration of nutrients and minimizing risk of disease and pathogens among poultry and wildlife (Sossidou et al. 2011). A rotation schedule would be set out in the ROA with rotations occurring on an estimated daily to weekly basis depending on the total number and density of poultry. Monitoring requirements would also be implemented to ensure consistency with desired conditions. No changes were made to the EIS regarding the maximum number of chickens per ranch (up to 500) or the limit of three chicken huts. The EIS clarifies that chicken huts should be of a limited height and color that does not result in visual impacts on the landscape. Chapter 2 of the EIS clarifies that if allowed under the particular alternative, all livestock diversification species on pasture, including chickens, would only be authorized on ranches that have a developed complex. See response to Concern ID 69 regarding the limitation of livestock diversification to residential operations. The USFWS BA (appendix N in the EIS) has been updated for consistency with the information presented in chapter 2. Reference: Sossidou, E. N., A. Dal Bosco, H. A. Elson, and C. M. G. A. Fontes. 2011. “Pasture-based Systems for Poultry Production: Implications and Perspectives.” *World Poultry Science Journal* 67(1):47-58.

ID	Concern Statement	Response
69	One commenter recommends that the draft EIS language on page 37 that reads “Pasture subzone: Livestock species (sheep, goats, chickens),” should clearly state the rationale for distinctions between approving sheep and goats on all ranches and limiting chickens to 18 ranches.	Under alternatives B, C, and D, sheep, goats, and chickens would only be authorized in the Pasture subzone on ranches that have a developed complex due to the need for temporary fencing and possible use of livestock guardian animals. The EIS has been revised to reflect this change.
70	Commenters indicate that the proposed provisions of diversification limit dairies because they operate as authorized number of cattle and not authorized AU. Commenters suggest the final EIS apply a 10% AU concept that is appropriate for beef and dairy operations. Commenters note that organic dairy cows must get a minimum of approximately one-third of their dietary needs from in-ground forage, whereas beef cattle get closer to 100% of their needs from in-ground forage, thus 10% of authorized beef AU is approximately equal to 3.33% of authorized dairy head.	Alternatives B, C, and D would allow diversification with sheep and goats for up to 10% of authorized AU or not to exceed 10 AU, if authorized AU are greater than 100. As such, the maximum diversification of livestock on pasture would not exceed 10 AU on any beef or dairy ranch operation. Standard AU equivalent calculations for dairy animals would be used to determine the equivalent 10 AU offset.

ID	Concern Statement	Response
71	One commenter notes discrepancies between the ranch maps in appendix A and appendix B and the underlying leases on the park website. Commenters provide the following examples: ▪ Figure 20: Home Ranch is shown with a developed complex, but leases AGRI-8530-9007 and -1003 do not include this developed complex, and instead reference only "incidental use of a ranch house." ▪ AGRI-8530-9007 and -1003 will not be authorized for diversification because incidental use of a ranch house qualifies as neither a developed complex or a ranch core. ▪ Figure 27: McIsaac/Cheda Ranch (Lease 8530-1000-9012) is shown with two developed complexes, but the final EIS should show if the ranch has a developed complex so show if the lessee will have one Ranch Core subzone diversification opportunity. This applies to all ranches discussed in the draft EIS, specifically A and E Ranches (Leases 8530-2600-9002 and -9009) and the Percy Ranch (Lease 2600-10-1002). The commenter suggests that a name change on the list of lessees should not add a Ranch Core subzone diversification opportunity, but the park should consider that when names on different leases are the same and more than one of the leases has a developed complex, then only one Ranch Core subzone diversification opportunity should be allowed per family. For example, two ranches with developed complexes that are leased to the same four lessees should have one Ranch Core subzone diversification opportunity (i.e., 5 pigs) and changing one of the four lessee names on one ranch lease should not create a second diversification opportunity (i.e., 10 pigs).	With regard to Home Ranch, the complex was previously under a separate lease. The complex is best preserved by use, and NPS would look at approaches consistent with the EIS to ensure structures are used and maintained. The impact analysis evaluates this site as including a developed complex associated with the operation. If a ranching alternative is selected, NPS would work with the operators of the McIsaac/Cheda ranch to identify appropriate uses in the Ranch Core subzone. The residential structures away from the primary ranch complex pre-date the park but would not be the location of additional or secondary Ranch Core subzone diversification areas. With respect to A and E ranches, the EIS evaluates each of these as including a developed complex. If a ranching alternative is selected, NPS would address situations the commenter identifies on a case-by-case basis. While NPS generally agrees that two Ranch Core subzone diversification proposals would not be appropriate for a single family, generational considerations would be considered when reviewing diversification proposals.

ID	Concern Statement	Response
72	Commenters note that the draft EIS should provide an appropriate evaluation of the cumulative impacts of the ROAs. Commenters state that the draft EIS does not consider how ranching activities within the planning area affect other ecological areas outside the planning area, such as designated wilderness areas, beaches, and wetlands. As written, commenters state that the draft EIS proposes a delayed, disconnected, and piecemeal review of diversification activities through individual ROAs. They note that this approach does not reflect the interconnections of watersheds or species considerations, such as movement corridors, in the planning area. By considering each ranch individually and not collectively, reasonably foreseeable adverse impacts on vegetation, air and water quality, water resources, visitor experience, and soils are not considered. They also note that because the draft EIS lacks mapping of these actions, the public cannot fully understand the restoration work that occurs in the park and how those activities are connected or disconnected from current beef and dairy ranching operations. The interconnections between upstream and downstream operations need to be illustrated to fully understand cumulative impacts.	The boundary of analysis was not limited to the planning area if impacts would affect resources outside the planning area. For example, impacts on water resources were analyzed at a watershed scale, not arbitrarily limited to the waters in the planning area, to ensure impacts that may extend outside the planning area were considered. Similarly, impacts on cultural resources look at the entire historic district, which extend beyond the boundaries of the planning area. The scale varied for each resource that was analyzed to ensure direct, indirect, and cumulative impacts were adequately analyzed. Commenters did not provide specific actions or impacts that were omitted from the cumulative impact analysis, thus NPS has not made any changes to the impact analysis in response to these comments. ROAs would only authorize activities that analyzed in this EIS or a future, site-specific NEPA process following submission of a detailed proposal from a rancher. Because lease/permits under alternative B would allow terms up to 20-years, it is not possible at this time to foresee and analyze every activity that a rancher may seek to undertake during the lease term. Should a new activity be proposed and considered for implementation on a particular ranch, the additional NEPA review would require an analysis of cumulative effects on the resources that the proposed activity would affect, including impacts on the same resources on adjacent ranches or other resources in the planning area. Maps in the EIS are at a scale sufficient to understand the location of resources relative to the zoning framework. A map depicting many of the restoration actions in the planning area has been added as figure 4 in appendix A.

Table 14. AL1900 – Alternative Elements: Range Management and Monitoring

ID	Concern Statement	Response
73	Commenters suggest that grazing recommendations referenced in the NMFS BA be included in the description of the alternatives in the EIS.	The grazing recommendations in the EIS have been updated, and those updates have been incorporated into the NMFS BA.

ID	Concern Statement	Response
74	Commenters suggest that the forage model should include clear procedures for adjustments should conditions on the ground differ from model outputs and request that the forage model be tested and refined for multiple years before being used to help determine appropriate carrying capacity for ranch leases. Commenters state that the model does not consider or provide management direction for daily and seasonal forage demands of grazing livestock or the free-ranging elk herds and therefore does not address the impacts of elk on ranching operations because any forage consumed by elk is no longer available for cattle consumption and affects forage availability. Commenters request that the role of advisors cited in appendices H and I be revised and clarified, noting that advisors were consulted, but they did not peer review the model and that a complete peer review of the model is warranted. One commenter recommends allocating forage needs of elk before cattle. One commenter requests NPS provide the optimum numbers for elk and cattle with the supporting research in the EIS. Commenters note that the draft EIS forage model omits information about how the Drakes Beach herd was already established when D Ranch closed. Because of this omission, commenters suggest that the AU offset between C and E Ranch, when D Ranch was divided became the baseline for how elk impacts are measured today.	As stated in appendix K, the forage model is a supplementary management tool that integrates best available information from a number of parameters to predict ranch-specific average RDM over the long term given environmental conditions (soil, rainfall, cattle stocking and elk) over the past few decades. Subsequently, the model predicts long-term average RDM conditions given specified stocking rates. Therefore, it does not and cannot predict the forage availability or RDM for any specific year. Rather, it reports a long-term distribution of expected forage availability and RDM based on a specified stocking rate, elk presence, and natural variability in rainfall. This is no different than traditional stocking rate calculations except that it (1) adds a correction for forage productivity based on local field plots, and (2) shows expected variation around the RDM. Comparing the model to on-the-ground conditions has and will be used to improve, calibrate, and continue validations of the simulations. NPS is currently collecting forage productivity data from several ranches that can be fed back into the model to improve future estimates. Seasonal variation in growth of forage is accounted for, but seasonal changes in dietary demand by individual animals is not included. The model currently treats the entire ranch as one unit, but it has been built to allow for use at the pasture scale. However, use at this scale would require much more detailed information regarding distribution of cattle on individual ranches than is currently available. Due to the site-specific nature of potential variations in conditions on the ground, an explicit procedure for adjustments would be difficult to define. Monitoring data combined with range manager and rancher expertise would be the primary tools used to make adjustments. Additional site-specific monitoring criteria would be defined in individual ROAs. The forage model looks at current operations, authorizations, and RDM to predictively model future conditions. It is updated annually to further refine its predictive accuracy. While additional AU allocations from the 2002 addition of D Ranch permits to C and E Ranches helped each of the operations, other operational changes, including conversion of C Ranch to an organic dairy also result in the need for access to pasture and forage for the dairy cattle.
75	Commenters question the use of the RDM standard for range monitoring, noting that NPS overestimates the amount of available forage and does not account for new livestock under alternative B. Commenters note that the existing RDM standards are not being met and are considered outdated by other land management agencies that use indicators of rangeland health, natural range of variability, disturbance regimes, proper functioning condition, and landscape ecology approaches for range	The EIS lays out an adaptive approach to range monitoring, relying on several strategies to inform management toward desired conditions. RDM is one well-established metric that is useful in assessing the level of grazing use. Maintaining RDM above a certain threshold has been demonstrated as a protective measure against soil erosion and can maximize Forage Production and species richness (Bartolome et al. 2006). Visual mapping of pastures during RDM monitoring also provides a relatively rapid assessment method at the ranch scale, similar to qualitative monitoring approaches used for other indicators of rangeland health. NPS has developed a forage model to assist with predicting stocking rates that will meet the RDM standard for different classes of livestock. Visual mapping has been incorporated into the EIS as appendix E. This model is adjusted based on best available data, including forage

ID	Concern Statement	Response
	management. One commenter requests the final EIS tailor RDM limits to the underlying plant communities and subzones for each ranch, consistent with the 2019 grazing plan RDM range of 1,200 to 2,100 pounds (lbs)/acre.	productivity plots currently being monitored on ranches in the park following University of California Agriculture and Natural Resources guidelines (see Becchetti et al. 2016), NRCS soil survey data, RDM results, actual stocking rates, and USDA dry matter demand tables. Methods using modeling and/or imagery analysis are being developed that could also inform or replace future monitoring (e.g., Liu et al. 2019). Other monitoring strategies currently used by NPS to assess resource conditions include vegetation community and water quality monitoring (see: https://www.nps.gov/im/sfan/what-we-monitor.htm). Additional site-specific monitoring would be used to provide adaptive management based on targeted objectives tied to the desired conditions laid out in this EIS. This could include adjustments to the 1,200 pounds per acre RDM standard at particular locations for specific resource management purposes. As updated information and tools become available (e.g., local ecological site descriptions), this information would be incorporated into management toward desired conditions according to best available science. New livestock authorized under alternative B would be limited to sheep, goats, and chickens in the Pasture subzone on each residentially occupied ranch, with sheep and goats having AU equivalents of 0.2 and 0.15 AU, respectively. 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. The sheep, goats, and chickens and would be subject to the same RDM monitoring requirements for cattle unless adjusted otherwise as per the management strategy described above. See also, AU equivalents discussion in the response to Concern ID 76. References: Bartolome, J., W. Frost, and N. McDouglad. 2006. *Guidelines for Residual Dry Matter on Coastal and Foothill Rangeland in California*. UC Agriculture and Natural Resources--Rangeland Monitoring Series: Publication 8092. Becchetti, T., M. George, N. McDouglad, D. Dudley, M. Connor, D. Flavel, C. Vaughn, L. Forero, B. Frost, S. Oneto, R. Larsen, K. Striby, J. Davy, M. Doran, and G. Markegard. 2016: "Rangeland Management Series, Annual Range Forage Production." ANR Publication 8018. https://anrcatalog.ucanr.edu/pdf/8018.pdf Liu, H., R. A. Dahlgren, R. E. Larsen, S. M. Devine, L. M. Roche, A. T. O'Geen, A. J. Wong, S. Covello, and Y. Jin. 2019. "Estimating Rangeland Forage Production Using Remote Sensing Data from a Small Unmanned Aerial System (sUAS) and PlanetScope Satellite." *Remote Sens.* 11:595.

ID	Concern Statement	Response
76	One commenter provided specific calculations for the average beef cow weight, and amount of forage and water these cattle consume, noting they felt that the draft EIS underestimates these calculations.	The EIS uses existing and accepted standards and guidelines for rangeland management, including AU. In 2017, the Society for Range Management Rangeland Assessment and Monitoring Committee, which is composed of range professionals from several academic, research, land management, ranching, and consulting entities, published an article in *Rangelands* regarding AU and animal weights. In it, they describe the concepts of AU and AU equivalents and conclude that the existing definitions are adequate to accommodate the increasing size of cattle. The AU is a standard useful for administration of grazing, not a specific measurement. AU equivalents are used to account for different animal weights and classes, and NPS has used AU equivalents for decades, as is common practice. Both are starting points that are informed by management. Stocking rate adjustments are not made based on pounds of forage consumed by cattle (a metric that has proven difficult to measure), but rather based on monitoring results such as RDM, which are tied to resource goals and objectives. The use of site-specific monitoring and adaptive management is the standard currently recommended by range management professionals. For these reasons, no changes were made to the methodology in the EIS. The EIS was updated to reflect the information regarding water requirements for beef and dairy cattle, which reflects a range of 21–63 gallons per day consumed based on published literature (see table 8). The commenter's suggested water consumption numbers fall within the range considered in the EIS. Alternatives with reduced cattle numbers (D, E, and F) reflect the beneficial impact of reduced water use. Dairy manure would be managed according to San Francisco Bay RWQCB regulations, which include a Waste Management Plan and Nutrient Management Plan that contain calculations regarding how much material is produced on each dairy ranch and protective measures regarding management of manure in relation to waters of the state.

Table 15. AL2000 – Alternative Elements: Ranch Infrastructure

ID	Concern Statement	Response
77	Commenters made multiple comments regarding fencing in the planning area, including suggesting a requirement that all new and existing fencing be made wildlife friendly, additional information on the amount and cost of new fencing that will be needed to exclude cattle from the Resource Protection subzone, and a recommendation to require fencing in heavily trafficked corridors to disperse cattle and prevent new soil erosion.	While all new Fencing would be required to be wildlife friendly, the EIS does not require that existing fencing be changed until it needs to be replaced because replacing all fencing would be cost prohibitive. NPS would work with ranchers as needed to make adjustments to fences that pose a threat to wildlife. In areas where elk occur, fences would be repaired and/or replaced with wildlife-friendly fence designs that reduce the extent of damage by elk, and as existing fencing is replaced, it would be replaced with wildlife-friendly Fencing. The general cost of Fencing for the Resource Protection subzones is provided in appendix D of the final EIS, which details costs associated with the alternatives. Heavily trafficked corridors would be addressed on a case-by-case basis but are not expected to be fenced to exclude cattle because some level of disturbance is acceptable in high concentration areas. Although only accounting for approximately 150 acres (or 0.5% of the planning area), limited high-intensity-use areas of concentrated cattle use, such as water and feeding troughs, corrals, and small pastures adjacent to dairies are expected as part of these operations. Improvements such as locating them away from sensitive resources is the preferred management strategy and creating managed runways would continue to be used to minimize impact.

Table 16. AL2100 – Alternative Elements: Vegetation Management

ID	Concern Statement	Response
78	Commenters questioned the need for mowing and IPM treatment of native shrubs, suggesting that it should only be allowed in areas that were previously occupied by native grassland, or not allowed at all because of NPS policy and statutes. Commenters suggest that mowing no longer be authorized and be replaced by prescribed fire. One commenter asked how the use of pesticides will impact bees, butterflies, insects and birds.	IPM is a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage by cost-effective means while posing the least possible risk to people, resources, and the environment. One of the purposes of IPM is to prevent or mitigate on-site pesticide risks to pollinators and other beneficial species. Specific details relative to many of the Vegetation Management activities, such as Mowing and IPM, are included in appendix F, where mechanical Mowing of shrubs is identified as a tool used with other site-specific considerations to achieve a desired plant community, such as grassland. The EIS has been updated to bring that information forward into the “Vegetation Management” section of chapter 2 for clarity. Prescribed fire is one tool NPS may use to manage vegetation, in accordance with the park’s *Fire Management Plan*, and it is listed as a potential management strategy to help achieve desired conditions in table 2 of the EIS.
79	Commenters suggest wildlife management should adhere to IPM methodology, prioritize non-lethal methods, and identify lethal forms of wildlife management in the ROAs.	Appendix F of the EIS includes a mitigation measure that states "If wildlife control is needed, only non-lethal management methods are permitted (i.e., scarecrows or decoys and control garden debris). Lethal control of wildlife by ranchers is explicitly prohibited." Appendix F also contains a general principle that ranchers would employ IPM strategies (i.e., prevention, avoidance, monitoring and suppression) to prevent or mitigate pest management risks for identified natural resource concerns.

ID	Concern Statement	Response
80	Commenters encouraged NPS to work with the ranchers to establish managed or prescribed grazing to achieve specific resource management objectives. They note that prescribed grazing as a management tool is extremely complex and site-specific, and the intensity of timing of grazing must be tailored to each individual ranch depending on the resources that are present and carefully monitored. One commenter requests that the final EIS define the term "prescribed grazing," while another commenter requests additional information regarding prescribed grazing under alternative F, including what species would be used to graze.	The term "prescribed grazing" has been revised to "Targeted Grazing" throughout the document. A definition has been added the EIS and appendix F. NPS would collaborate with ranchers to achieve resource management goals related to grazing, which may include specific areas for targeted grazing. If alternative F were selected for implementation, a Vegetation Management strategy would need to be developed, which would include the potential species used for targeted grazing in the planning area, based on the management objective for specific locations. As noted in alternative F in chapter 2 of the EIS, it is anticipated that targeted grazing would be minimal, approximately 100 to 200 AU.

Table 17. AL2200 – Alternative Elements: Other Activities

ID	Concern Statement	Response
81	Commenters request more information about manure management plans be provided in the EIS. Specifically, they request details about the contents of these plans, results of implementation and monitoring, and direction on how the public can access and review these plans. Commenters suggest that nutrient management plans be analyzed now for each ranch and made public before the ROD so that the public can be assured that manure management does not impede water quality in the future. Commenters also suggest that manure monitoring and management plans be applied to beef ranches in addition to the dairies, given the proximity of all Point Reyes ranches to coastal waters. Additionally, commenters suggest alternatives A-E should describe how NPS would alter manure management practices following the methodology and recommendations outlined in the Coastal Watershed Assessment to minimize impacts on coastal watersheds protected by the Clean Water Act and clarify whether federal Clean Water Act or state water board compliance has been achieved.	The EIS and zoning framework establish a strategy for how to manage grazing lands to achieve desired conditions. As indicated in the EIS, lease/permits and associated ROAs would require ranchers to adhere to management activity standards, mitigation measures, and other requirements that are consistent with the Coastal Watershed Assessment's recommendations for management actions, including development and implementation of scientifically based watershed adaptive management programs and use of BMPs to reduce stormwater runoff and erosion, improve water quality, and protect ecological values. Nutrient management plans are part of the compliance required for all dairies by the San Francisco Bay RWQCB to protect water quality under the Clean Water Act and state law. The plans include numerous protective measures, practices, and monitoring and reporting requirements to ensure compliance. These requirements are developed through a public process and are available publicly online. As noted in the EIS, Manure and Nutrient Management (spreading) would be limited to the Pasture and Ranch Core subzones. The requirements surrounding Manure and Nutrient Management would be incorporated into ROAs based on site-specific information relevant to each individual dairy ranch. Working with the San Francisco Bay RWQCB, NPS would regulate beef ranches in the planning area under the same framework as the grazing waiver for Tomales Bay. This includes site-specific planning, the implementation of Practice Standards and mitigation measures to improve water quality, and annual monitoring and reporting.

ID	Concern Statement	Response
82	Commenters note that the storage and usage of silage for feeding uses plastic silage wraps, which are a one-time use material and cannot be recycled as suggested in appendix D. Commenters suggest that the draft EIS language be revised.	NPS appreciates the feedback. The language has been removed from what is now appendix F.
83	Commenters suggest the draft EIS alternatives eliminate the practice of growing and mowing silage for dairy cows and not allow more land to be dedicated to silage production. One commenter requests additional acreage for silage on dairies where silage is not currently authorized. Commenters request additional information on how monitoring of mowing would occur. One commenter suggests that mowing no longer be authorized and be replaced by prescribed fire. Commenters provide specific recommendations to limit impacts of silage mowing (e.g., mowing only after bird nesting season and mowing from the center of a field outwards). Commenters state request that only native seed should be used for silage planting and silage mowing should only be done after bird nesting season.	The range of alternatives in the EIS includes both removal of silage and maintenance of existing levels of silage, referred to as Forage Production. Under alternative B, once Forage Production is stopped, it would not be replaced, thereby lowering the total acres of Forage Production. NPS would continue to look for opportunities to reduce Forage Production and minimize impacts and would not authorize additional Forage Production under any alternatives because of the required timing of harvest and potential impacts, as analyzed in the EIS. No additional Mowing for Forage Production would be authorized. Species used for Forage Production would be subject to NPS approval, and introductions of new species known to spread into adjacent lands would not be authorized (see appendix F). Brush Mowing would be authorized in the Pasture and Ranch Core subzones to minimize impacts on sensitive resources and would be reviewed by NPS on a case-by-case basis for requests in the Range subzone. Other impacts from Mowing, such as those to small mammals, are analyzed in the EIS, and Practice Standards and mitigation measures to minimize the potential impacts associated with Mowing are included in appendix F. Fire is listed as a management strategy on all lands in table 2. Prescribed burning could occur in the future in the planning area for resource management, as noted in the cumulative project descriptions section of the EIS.
84	Commenters suggest that the analysis in the EIS consider the greenhouse gas (GHG) effects of the additional cattle that could be sustained on the land from increases in forage species resulting from the application of compost to previously un-fertilized rangeland. Additionally, commenters suggest that the “Carbon Farming” section in the draft EIS be amended to consider the potential risks to native species and their carbon sequestration from application of compost to previously un-fertilized rangeland. Commenters suggest the EIS consider setting a 10-year goal for dairies to convert to manure management methods that achieve a 40% reduction in GHGs, according to California law SB 1383.	If an alternative authorizing ranching were selected, the agricultural lease/permits issued to ranchers would require ranchers to comply with state laws and regulations regarding GHG emissions. NPS would work with operators to support emission reduction projects compatible with progress toward desired conditions presented in the EIS. SB 1383 envisions that dairies would achieve a 40% reduction in methane from 2013 emissions levels by 2030 and has been added as a cumulative project. This is consistent with the 10-year goal expressed in the comment. Compost spreading would be restricted to dairy operations that have generated it on site, and it may only be spread on the ranch where it originated. Compost application would not be authorized in the Range subzone and could occur in the Pasture and Ranch Core subzones only. Application on beef ranches, as the commenter suggests, would not be at a scale that would increase forage to a level where additional AU would be authorized. NPS would continue to explore ways to reduce impacts associated with GHGs through partnerships.

ID	Concern Statement	Response
85	Commenters suggest all imported hay, feed, and seeds be weed-free to avoid expensive invasive plant monitoring and elimination programs.	If NPS were to require all hay, feed, and seeds be weed-free, it would not eliminate the need for continuous monitoring and eradication because invasive species would still be able to enter the park via visitors, vehicles, and other pathways. Invasive plant monitoring and management are the best tools to prevent new infestations. Additional Practice Standards and mitigation measures surrounding the potential introduction of weed species are included in appendix F. These include measures for import of equipment, soils, movement of cattle, disturbance, and import of seeds. Weed-free hay/feed was not included because of limited availability given the level of use as part of existing operations and thus low feasibility of being able to successfully implement such a program at the scale of the planning area. However, monitoring measures for feeding areas to prevent new infestations are required as part of the EIS.
86	Commenters note that the language used in the draft EIS language to describe fertilizer and compost is incorrect, in that it equates the two actions; commenters recommend that the two activities be evaluated separately. Commenters indicate that the draft EIS does not describe the benefits of soil amendments and inputs on soil health, such as improved soil fertility and water retention from the use of weed-free and pathogen-free compost. One commenter indicates that ranchers should be allowed to produce compost and mulch, sell compost and mulch to other ranchers in the planning area, and be allowed to use both compost and mulch from sources within or outside the planning area. Additionally, commenters suggest that NPS could require all compost used in the planning area meet the National Organic Rule for use in organic food production.	Although the use of compost as a soil amendment may have benefits for soil health, importing compost increases the risk of importation of weed seeds, pathogens, physical contaminants, and certain persistent chemicals, such as those contained in herbicides. The National Organic Program (7 CFR Part 205.203 (c) & (d)) requires the producer to “manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances.” Furthermore, California sampling requirements under 14 CCR § 17868.1 include maximum metal concentration limits and pathogen reduction requirements, and 14 CCR § 17868.3.1 includes physical contamination limits. Requiring the use of certified compost such as the U.S. Composting Council’s Seal of Testing Assurance Program (https://www.compostingcouncil.org/page/CertifiedCompostSTA) could ensure required testing is completed; however, some concerns still exist. Though the pathogen reduction regulations include temperature requirements for sterilization, in practice it is difficult to ensure that all areas of a compost pile reach consistent temperatures or to ensure that handling or transit of composts does not reintroduce pathogens and seeds (Inserra et al. 2006; Bernkardt and Swiecki 2015). In addition, time and temperature requirements for thermal death vary considerably among weed species (Larney and Blackshaw 2003). Current pathogen reduction regulations also do not include tests for Phytophthora species, and their inadvertent spread into natural systems could have long-term environmental and economic impacts (Rooney-Latham et al. 2017). The physical contamination limit of no more than 0.5% by dry weight means that for every 1,000 pounds of material imported, up to 5 pounds of contaminants (which can include microplastics) could occur. Lastly, although testing through a certifier does include bioassays to assess phytotoxicity, bioassays have been shown to be widely variable, depending on the plant species used, and do not distinguish the source of phytotoxicity (Wichuk and McCartney 2010), leaving the possibility for contaminants such as herbicide residues to be inadvertently introduced. Due to these concerns the use of imported compost is not being authorized through this EIS.

ID	Concern Statement	Response
		While import of compost from areas outside the park is not included, the EIS does authorize the potential for dairy operators to compost material on-site for use in the Pasture and Ranch Core subzones. References: Bernkardt, E., and T. Swiecki. 2015. “Using Heat to Eradicate Soil-borne Plant Pathogens from Nursery Potting Media (“Soil Sterilization”)” Phytosphere. Accessed November 26, 2019. http://phytosphere.com/soilphytophthora/soilsterilization.htm Inserra, R. N., M. Ozores-Hampton, T. S. Schubert, J. D. Stanley, M. W. Brodie, and J. H. O'Bannon. (2006). *Guidelines for Compost Sanitation*. Annual Proceedings Soil and Crop Science Society of Florida. 65. Larney, F. J., and R. E. Blackshaw. 2003. Weed Seed Viability in Composted Beef Cattle Feedlot Manure Lethbridge Research Centre contribution no. 38702008. *J. Environ. Qual.* 32:1105–1113. doi:10.2134/jeq2003.1105. Rooney-Latham, S., C. L. Blomquist, M. C. Soriano, Y. Y. Guo, P. Woods, K. L. Kosta, K. Weber, T. J. Swiecki, E. A. Bernhardt, K. Suslow, and S. J. Frankel. 2017. “An Update on Phytophthora Species in California Native Plant Nurseries and Restoration Areas.” In: Frankel, S. J.; Harrell, K. M., tech. coords. *Proceedings of the Sudden Oak Death Sixth Science Symposium*. Gen. Tech. Rep. GTR-PSW-255. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 51. Wichuk, K. M., and D. McCartney. 2010. “Compost Stability and Maturity Evaluation—A Literature Review.” *Canadian Journal of Civil Engineering* 37(11):1505.

Table 18. AL2300 – Alternative Elements: Ranch Complex Management

ID	Concern Statement	Response
87	Commenters suggest the EIS clarify the process for adding new housing and upgrading existing housing for the ranch labor force. Commenters feel that it is important for ranch operators to lease ranch houses to a family member or ranch worker to reduce the possibility for vandalism and theft, reduce the number of vehicle trips to the ranch, and better manage cattle and ranch infrastructure.	NPS supports improving ranch worker housing. Proposals to do in-kind upgrades to existing housing would be required to be consistent with the practices and approaches to maintenance that are described in Appendix G: Preservation and Maintenance Guidelines for Ranch Buildings under Agricultural Lease Permit. In-kind replacements of manufactured housing units would be reviewed for consistency with Guidelines for the Treatment of Cultural Landscapes and may require review under Section 106 of the NHPA. Many variables are associated with constructing new housing or undertaking major upgrades of existing housing. Projects of this magnitude would be subject to site-specific review and environmental compliance prior to receiving approval to move forward. Residential uses on ranches are intended to support ranch operations in the park. Operators have discretion about who they offer housing to, provided they comply with the lease/permit, which states “Ranch worker housing is only authorized for workers who are employed on a ranch within Point Reyes National Seashore or the north District of Golden Gate National Recreation Area on at least a part-time basis.” The type and amount of ranch worker housing allowed on an individual ranch will be identified in the ROA.
88	Commenters suggest that the EIS should include regulations for free-ranging domestic cats and dogs allowed in ranch complexes.	NPS regulations in 36 CFR allow park residents to keep pets provided that the dogs are kept on a leash, in a fenced area, or otherwise restrained. Cats cannot be free range and must be contained within barns or residences. In addition, ranchers must comply with Marin County regulations that require dogs to be licensed and vaccinated so as to avoid disease transmission. These measures make it less likely that domestic pets would affect park resources. Livestock guardian animals are working animals and are not considered pets. The potential impact of livestock guardian animals is addressed in chapter 4 of the EIS.
89	Commenters suggest that the draft EIS should disclose park requirements for ranch complex and building upkeep and language in the EIS be clarified to clearly identify the requirements and responsibilities for maintaining roads, historic structures, and ranch buildings. Commenters note that page 173 of the draft EIS states that NPS would explore creating a maintenance account using rental payments from each ranch. Commenters suggests the draft EIS include a more detailed discussion of who currently pays for maintenance of ranch structures, if this mechanism is an additional reduction of rent, and why such a maintenance account is needed. Commenters also question how the maintenance reserve accounts would be established, operated, and maintained for all	Building maintenance requirements and responsibilities are specified in the agricultural Lease/Special Use Permits (See the revised agricultural lease/Special Use Permits template.) Maintenance costs for ranch structures are currently paid for by ranchers and in some cases by NPS. Additional details regarding requirements for maintenance activities on ranch buildings under agricultural lease/permit are outlined in appendix G. In general, cyclic maintenance is the responsibility of the lessee. The ROA would provide more clarity to maintenance needs and responsibility by outlining specific activities that are planned over the specified period, and lessees would report annually on cyclic maintenance activities conducted in the prior calendar year. In some cases, NPS may provide support for completing cyclic maintenance activities, and these activities would also be outlined in the individual ROAs. After further review, it is unlikely that maintenance reserve accounts would be used as a mechanism in the lease/permit and references to the establishment of such accounts have been removed from the EIS; however, NPS anticipates improved communication and coordination about maintenance investments would be part of the ROA meeting process.

ID	Concern Statement	Response
	ranches or individual ranches, including structure and expenditures of such accounts.	Most ranch roads are the responsibility of the ranch operator. Opportunities to improve conditions are available through NRCS and other potential fund sources. Road Upgrades, including Access Roads are analyzed in chapter 4, and Practice Standards and mitigations are included in appendix F. Many roads in the Lagunitas Creek watershed have been maintained through fisheries and water quality fund sources. Some ranch roads are also identified as park roads or trails. In those cases, NPS maintains those facilities as public access features. As described above, clarity and transparency of expectations for road maintenance would be reviewed during annual meetings.

Table 19. AL2400 – Alternative Elements: Elk Management

ID	Concern Statement	Response
90	Commenters request clarification regarding the definition of new herds. Commenters also ask about the measures that would be taken to avoid new herds being established and what would happen if a new herd does establish.	For the purposes of alternatives B, C, and D, a new herd would consist of a group of elk that splits from either the Drakes or Limantour herds to occupy a distinctly new home range and where the juveniles and adult females in the splinter group have limited interaction with, or do not return to, their herd of origin. Adult males may move between herds without constituting a new herd. A graduated response would be taken to deter establishment of new herds. First, NPS staff would try, on foot, to haze elk back to their original location. If unsuccessful, NPS would employ more aggressive hazing techniques such as firing bean bag shots at the elk. If hazing does not work, lethal removal of a few individuals, particularly the lead cow if she can be identified, could be tried. As a last resort, NPS would move forward with complete elimination of the new herd through lethal removal. The EIS has been updated with these clarifications.
91	Commenters suggest that the EIS quantify a threshold of ranch impact on forage and income to determine whether management actions need to be taken to address impacts of the Limantour Herd on ranchlands. Commenters note that tule elk herds graze in the Ranchland zone, and organic cattle and dairy operations are at risk of losing their organic certifications from the reduced availability of livestock forage and the Point Reyes grazing standard of 1,200 lbs of RDM on pastures required prior to the rainy season.	Alternative B does not propose to manage elk in consideration of ranchers' incomes. Rather, the preferred alternative proposes to manage elk and livestock in support of desired natural and cultural resource conditions. Please see the responses to Concern IDs 21 and 75 that describe monitoring and management approaches to elk and cattle and that address organic certification issues.
92	Commenters request clarification on how elk management responsibilities are divided between NPS and CDFW on park lands.	NPS has jurisdiction to manage elk on park lands and coordinates with CDFW as necessary.

ID	Concern Statement	Response
93	Commenters request that the EIS provide additional details about lethal management activities, including clarifying the parties that would be responsible for its implementation, specific methodologies that would be used, monitoring of both herds, and timing.	The overall approach, including who would be responsible for implementing elk management actions, monitoring the herds, and timing of proposed management actions are described in chapter 2 of the EIS. In addition, NPS clarified text in the EIS to state that no females or reproductively active bulls would be lethally removed during the calving season or rut. If an alternative involving lethal management were selected, operational protocols consistent with the selected action would be developed.
94	Commenters request that the EIS provide specific costs for all elk management activities considered under the alternatives.	Please see response to Concern ID 235. NPS updated the EIS to include an overall cost for each alternative, including elk management activities (see appendix D).
95	Commenters state that reduction of the Drakes Beach herd is not warranted because potential competition for forage resources between cattle and elk would be minimal based on seasonal patterns of elk grazing on ranchlands. Commenters suggest that if competition is documented, instead of establishing a maximum population size for the Drakes Beach herd, NPS should reduce cattle AU and provide economic offsets to ranchers if losses can be documented. Commenters state that higher densities of tule elk will naturally promote better species composition and structure of the area's plant communities.	Please see the response to Concern ID 16.
96	Commenters state that elk management as proposed in the EIS is not consistent with NPS requirements under the Organic Act and the park's enabling legislation. Commenters question the legal justification for managing tule elk in the park, as the park has instituted closures and restricted access to areas to protect other wildlife species.	NPS believes that the elk management alternatives presented for consideration in chapter 2 are consistent with legal mandates and the purpose and need for the GMP Amendment. Each of the alternatives would allow a viable population of free-ranging tule elk to persist and thrive in the planning area. Additional analysis of the alternatives in light of the Point Reyes enabling legislation and the NPS Organic Act's non-impairment mandate will accompany the ROD.

Table 20. AL2800 – Elements Common to All Action Alternatives

ID	Concern Statement	Response
97	Commenters provided two specific suggestions for edits to table 2 in chapter 2. One commenter made specific suggestions for revising/clarifying the text in table 2 (Strategies for the Preservation of Area Resources), including a request that the final EIS identify specific permits that ranchers have that regulate protection of listed species and native plant and animal communities and clarify how these activities are monitored and enforced. The commenter requested the final EIS incorporate the findings of Estimating Impact of Mowing in the Silage Fields of Point Reyes National Seashore on Nesting Birds and detailed specific suggestions. The commenter also noted the desired conditions for air, water, noise, and light pollution include total maximum daily loads (TMDLs) and associated grazing waivers in the Tomales Bay watershed but indicated that most of the ranches in the park are not in that watershed. As a result, they indicate that the ranches are not covered in the San Francisco Bay RWQCB Waiver of Waste Discharge Requirements. The commenter also noted that the desired conditions for National Register Historic Districts include the text: "NPS staff would collaborate with ranchers to interpret traditional land use and current agricultural practices." To reach this condition, commenters state that current practices should mirror traditional practices that were in place prior to the establishment of the park, such as milking by hand (which is showcased at Pierce Point Ranch). Commenters also request further clarification regarding the use of IPM strategies, noting that the use of the words "expect" and "unlikely" show there is not a commitment to these actions.	Table 2 provides a summary of strategies the NPS would adopt to achieve the desired conditions articulated in the plan. The strategies in this table fulfill the statutory requirement to include the types of management actions required for the preservation of park resources and are consistent with the programmatic nature of general management planning. The strategies in this table are not intended to detail every specific requirement, permit, and action that NPS may take to implement the plan and achieve desired conditions. Table 2 has been revised to provide clarity regarding IPM strategies. The EIS also explains that ROAs would incorporate Practice Standards and mitigation measures from appendix F that are appropriate to the activities and resources on each ranch, including measures related to the protection of vegetation and wildlife. NPS would have the authority to monitor and enforce mitigation requirements included in lease/permits and ROAs. Lease/permits would require compliance with San Francisco Bay RWQCB regulations, such as TMDLs and the associated grazing waiver for the Tomales Bay watershed.

ID	Concern Statement	Response
98	One commenter expresses concern that allowing ranchers to provide overnight accommodations is a violation of concessions policy and recommends NPS consider a general public competitive bid process for overnight accommodations in ranch complexes to ensure current lease holders are not given an unfair and unjustifiable business opportunity in the park.	The leasing authority found in the Point Reyes and Golden Gate enabling acts allows NPS to lease ranch lands for agricultural, ranching, and dairying activities and to lease structures on ranch lands for related purposes. The enabling acts also authorize NPS to add restrictive covenants to the leases to protect park resources and values. Overnight accommodations and tours that relate to learning about ranching and dairying practices in the park (i.e., farm stays and farm tours) fall within the scope of the Point Reyes and Golden Gate leasing authorities. Another form of diversification that could be authorized under these authorities is horse boarding, which constitutes a related use. If ranchers were to seek authorization to conduct such activities, NPS would include provisions in the lease or ROA to protect natural and cultural resources.
99	Commenters question the adequacy of the analysis for implementing additional visitor opportunities such as camping, trails and overnight stays and provide additional recommendations to consider related to camping, notably the boat in camping proposals at Drakes Estero	As noted in chapters 1 and 2 of the EIS, the programmatic analysis of this EIS is not considered adequate for immediate implementation of development proposals such as camping and trails. Additional site-specific review and compliance would be needed and conducted prior to implementing any of these proposals. The proposal to offer boat-in camping has been removed from the EIS.
100	Commenters suggest that as a GMP, the draft EIS needs to assess transportation development intensities that routinely affect road health and public enjoyment and use of the seashore, specifically the emissions associated with agricultural-related transportation and visitor circulation and transportation patterns, systems, and modes.	Marin County, NPS, and the State of California would continue to maintain the existing basic transportation network in the planning area. No new roads or significant changes to circulation patterns are envisioned. Marin County and the State of California would continue to serve as leads for roads within their respective jurisdictions in the planning area. NPS would continue to cooperate with Marin County on maintenance and improvements for Sir Francis Drake Boulevard (the current road improvement project in the park is identified in the cumulative impact section of the EIS), which is a county road, and with the State of California on Highway 1, which is part of the California State Highway System. Pierce Point Road is a park road and is included in the federal lands highway system. NPS works closely with the Federal Highway Administration on the maintenance and upkeep of roads in the federal lands highway system. The “air quality” section of chapters 3 and 4 addresses visitor emissions and accounts for agricultural related transportation emissions.
101	Commenters provide additional suggestions for park education materials and interpretive programs, notably related to non-ranching themes. Commenters also suggest historic ranches should be repurposed for scientific research.	Comments that provided additional, site-specific and/or program-specific suggestions for interpretive materials are beyond the scope of the planning effort. The GMP Amendment establishes a long-range vision to guide future public use and enjoyment and notes many strategies and recommendations would be accomplished over time. These suggestions have been noted and will be considered in future interpretive planning projects and programs. The comment about repurposing historic ranches for scientific research is already considered in the EIS as a potential adaptive use. This consideration is captured in the first two bullets under “Potential Use of Unoccupied Ranch Complexes and Historic Structures” in the description of alternative B in chapter 2 of the EIS.

ID	Concern Statement	Response
102	Commenters provide numerous recommendations for clarifying and enhancing opportunities related to bicycle use including e bikes as well as specific bike route suggestions. Commenters indicate: ▪ the bicycle trails in the park have limited loop trail options and do not provide adequate connectivity between trails. ▪ it is not clear what type of bicycle is legal on the trails. ▪ expanding bicycling opportunities in the park and opening areas developed specifically for single-track trails to improve the quality of trails, increase environmental stewardship, and provide opportunities for multiple modes of safe transportation throughout the park. ▪ the existing bicycle routes are too dangerous for riders and suggest a gravel route that is closed to cars; they also recommend widening Highway 1 to two lanes so that cars can more safely pass bicyclists. ▪ the multi-use trails should be wide, not too steep, and have safe sight lines that are a minimum of 50 feet to accommodate hikers, bicycles, and equestrians. ▪ Modifying the park permitting process to allow for larger-scale bicycling and trail events, birding events in and around historic ranching areas, and Class A e-bicycles ▪ Designate days which allow mountain bike riders through issued permits. Commenters also provide recommendations for improving other types of visitor access and safety. Commenters request more detailed information about the locations of expanded visitor opportunities as noted in alternatives B, D, E, and F, and the differences between the alternatives.	Comments that provide additional, site-specific and/or program-specific suggestions for bicycle use are beyond the scope of the planning effort. The GMP Amendment establishes a long-range vision to guide future public use and enjoyment and notes many strategies and recommendations would be accomplished over time. These suggestions have been noted and will be considered when NPS evaluates specific projects for improving bicycle access in the planning area. The Superintendent's Compendium identifies where bicycles and electric bicycles are allowed in the park, including the planning area. Concern ID 153 also addresses additional comments regarding bicycle routes. As noted in the response to Concern ID 100, Highway 1 is part of the California state highway system. NPS does not have jurisdiction over Highway 1.

ID	Concern Statement	Response
103	Commenters note that the draft EIS does not discuss environmental impacts from the expansion of hiking, biking, and equestrian trails; parking lots; overnight camping areas; trail building; trail maintenance; and the potential for destruction of park and cultural resources and trails cutting through sensitive habitat. Commenters suggest that an increase in visitors would increase management problems.	The impacts associated with expanded recreation opportunities are captured in several sections in chapter 4, with impacts discussed in the "Public Use and Enjoyment" sections of the following impact topics: Soils; Water Resources; Vegetation; Tule Elk; and Visitor Use, Experience and Access. Impacts are also addressed in the "Cultural Landscapes," "Historic Districts and Historic Structures," "Socioeconomics," and "Air Quality" sections as well, but not under a separate heading. This analysis is programmatic in nature, and additional site-specific analysis would be required before implementing any recommendations for expanding or constructing new trails, camping, and parking. Generally, every effort would be made to use existing or already established/disturbed areas and to avoid sensitive habitats. Where impacts could not be avoided, mitigation measures would be implemented to minimize impacts as much as possible. In addition, appendix I: Indicators, Thresholds, and Visitor Capacity Details provides a framework for managing visitation and potential visitor caused issues in the planning area.

Table 21. AL2900 – New Alternatives or Elements

ID	Concern Statement	Response
104	Commenters made multiple suggestions for additional reduced ranching alternatives including: ▪ Retiring A Ranch and extending the Chimney Rock and the Lighthouse visitor and interpretation center to this area to alleviate ongoing issues of traffic congestion and provide expanded visitor services in this location. ▪ Gradually phasing out ranching based on attrition, restoring the lands to a natural habitat that can support local native plants and animals. ▪ Drastically reducing the number of authorized dairy cattle ▪ Expanding the area available for cattle grazing into forested areas to reduce impacts to grasslands; ▪ Remove cattle from all but one ranch and allow for expansion of elk throughout the park;	As noted in the 2015 NPS NEPA Handbook, alternatives are distinguished based on differences in their approach to resolving the purpose and need for action and the environmental impacts of implementing them, not on mere differences in cost or technical elements. Specifically, alternatives should represent substantively different options for the decision maker to consider as opposed to simply representing different designs of a substantively equivalent option. The suggested elements all fit within the existing range of alternatives presented in the draft EIS, therefore additional alternatives have not been analyzed in the final EIS.

ID	Concern Statement	Response
	▪ Commenters suggest ranch structures in the park be preserved and include interpretive exhibits like those at Pierce Point Ranch, with a small number of cattle in a small area present so that visitors can understand what an active ranch is like. ▪ Removing ranching operations where there are the biggest impacts to natural resources, namely C, D, and E ranches due to the presence of tule elk. ▪ Remove cattle on the east side of Drakes Beach Road to reduce elk/cattle conflict on D Ranch and provide an enhanced elk viewing experience for park visitors.	
105	Commenters suggested that restoration of natural values should be an integral part of the alternatives and the Draft EIS is insufficient in exploring restoration of public lands from the impacts of ranching. Another commenter suggested that alternatives A-E should include restoration plans for coastal prairie, wetlands and riparian and dune areas to benefit native and wildlife as described under alternative F.	As noted in table 2 in the EIS, restoration is identified as a preservation strategy for achieving desired conditions on all lands in the planning area and is applicable to all action alternatives.
106	One commenter requests a recreation alternative that would maximize public access for wildlife viewing, photography, birdwatching, educational programs, and hiking; another commenter requests additional rationale for dismissing the alternative to manage all park land for natural resources, suggesting that using historic ranching buildings for visitor interpretation would meet cultural resource management requirements.	Alternative F is consistent with the alternative elements suggested by the commenter. The dismissal statement noted, located in the “Alternatives Considered but Dismissed from Further Analysis” section of the EIS, is accurate and sufficient as written.

ID	Concern Statement	Response
107	Commenters request that the draft EIS consider alternatives that look at how to manage lease renewals in a manner that reduces GHGs and sequesters carbon, including introducing new grazing practices and reducing cattle numbers.	GHG emissions would be reduced under three of the five action alternatives. Alternatives were developed to meet the purpose and need for taking action and are not focused solely on GHG emissions; however, implementation of methane digesters or other technologies proven to reduce GHG emissions from ranching operations is consistent with the Ranch Core subzone and would be supported by NPS. Future proposals would be evaluated on a case-by-case basis to ensure their implementation is consistent with resource management goals. It should be noted that all action alternatives reduce livestock numbers and reduce potential emissions from current authorizations analyzed under alternative A.
108	Commenters suggest that the EIS consider the sale of live elk to individuals or entities as a means of managing herd size in the park.	NPS does not have the authority to sell wild animals.
109	Commenters suggest the draft EIS be withdrawn and a revised document be issued that follows Secretary Salazar's November 29, 2012, decision memo to create 20-year agreements for ranchers, relocate the Drakes Beach herd to the fenced area in the wilderness, and defer to or partner with ranchers on all matters related to rangeland management.	The range of action alternatives in the EIS includes authorization of 20-year leases. The proposed ranching alternatives would create a framework for collaboration between NPS and ranchers, including development of ROAs and annual meetings. To protect park resources and values, ranching on NPS land has different requirements than on private land. The "Alternatives Considered but Dismissed from Further Analysis" section of the EIS provides rationale for dismissing elk management strategies related to relocation of the Drakes Beach herd in the park and fencing elk into the wilderness.
110	One commenter suggests the park should partner with a non-profit to provide day to day oversight and management of the ranchers, following the model used at Cuyahoga National Park for its Countryside Initiative.	See response to Concern ID 112, which provides additional detail regarding NPS collaboration with other agencies.
111	Some commenters state that carbon farming practices such as compost application on rangelands should not be allowed until carbon dioxide offset impacts are proven. Other commenters request that the EIS consider the beneficial impacts of carbon farming and allow this practice to be implemented as part of the GMP Amendment. They suggest the EIS include language that explicitly allows for lease holders to work with qualified resource professionals, including the Marin Resource Conservation District (Marin RCD), the Marin Carbon Project and/or USDA-NRCS to complete conservation plans or carbon farms plans for their lease, with the objective of appropriately mitigating activities authorized throughout the planning area.	Many carbon farming practices are included in the authorized Management Activities identified in appendix F. Additional review and compliance would be necessary for carbon farm plans that exceed the scope of the analysis in the EIS. Although the use of compost as a soil amendment may have benefits for soil health, importing compost would increase the risk of importation of weed seeds, pathogens, physical contaminants, and certain persistent chemicals, such as those contained in herbicides (see response to Concern ID 86 for additional details). The EIS allows for use of compost that has been generated on the farm. With respect to working with other range resource professionals, in addition to park range staff, NPS works closely with other farm service agencies, including the Marin RCD and USDA-NRCS. The park is currently working with the Marin RCD for assistance with management and RDM monitoring of interim leases in the planning area.

ID	Concern Statement	Response
	Commenters suggest NPS should engage with the Marin Carbon Project, including the Marin RCD, to discuss carbon farming in Marin County.	

Table 22. AL3000 – Alternatives Considered but Dismissed: Ranch Management

ID	Concern Statement	Response
112	Commenters request that an agricultural advisory committee be established under the Federal Advisory Committee Act that includes local agriculture and natural resource conservation groups to assist the park with agricultural management topics and mitigation measures. One commenter suggests that if a formal advisory committee is not created, the park should create an advisory group to consult with on a regular basis.	NPS already coordinates and collaborates regularly with local agriculture and natural resource conservation groups, making the establishment of a formal federal advisory committee unnecessary. NPS staff have collaborated with UC Extension staff on the analysis and publication of water quality information (e.g., Lewis et al. 2019) and work closely with the Marin RCD on several projects and grants. The park and Marin RCD have entered into a Cooperative Agreement allowing for Marin RCD staff to assist NPS with project coordination and monitoring of park ranchlands under the interim leases (through June 2022). Further, the park collaborated with Marin RCD on past grant applications and collaborated in the most recent 319 grant application for funding through the San Francisco Bay RWQCB. The establishment of a formal federal advisory committee would be a time-consuming process and could impede the regular collaboration that is already happening with local agriculture and natural resource conservation groups. In addition, the establishment of a new, non-statutorily required committee would be inconsistent with the goals of Executive Order 13875, which seeks to reduce the number of federal advisory committees in the federal government. For these reasons, NPS is not pursuing the establishment of a federal advisory committee. Please see the response to Concern ID 124 regarding annual reporting.
113	One commenter requests reuse of ranches that are no longer operational, such as the Horick (D) Ranch, Rancho Baulines (Wilkins Ranch), and/or the Jewel Ranch.	The reestablishment of ranches and grazing in areas where ranching was previously discontinued was considered and dismissed from full analysis. The dismissal statement in chapter 2 of the EIS has been expanded to provide additional detail.
114	Commenters note that by dismissing prioritizing management of all park lands for the protection, restoration, and preservation of natural resources from further analysis, the park is ignoring the Organic Act and provisions in the Point Reyes and Golden Gate National Recreation Area enabling legislation.	As explained in the “Alternatives Considered but Dismissed from Further Analysis” section in chapter 2, NPS believes it was appropriate to dismiss from full consideration an alternative solely focused on maximizing the protection of natural resources. Neither the Organic Act nor the Golden Gate enabling legislation requires NPS to prioritize the management of natural resources over cultural resources. While the Point Reyes enabling legislation contains language regarding the maximum protection of natural resources, a correct reading of the entire provision and the rest of the statute reveals that Congress did not direct natural resource protection to prevail in all cases.

Table 23. AL3500 – Alternatives Considered but Dismissed: Elk Management

ID	Concern Statement	Response
115	Commenters suggest the draft EIS violates NEPA by not including an alternative that would allow tule elk to expand into Golden Gate National Recreation Area. Additionally, commenters suggest retiring J Ranch to expand the tule elk herd range so that the herd would have access to adequate water sources year-round. Commenters suggest granting nature-based easements across ranch complexes and pastures to allow tule elk to migrate to water.	Not allowing tule elk to move onto Golden Gate or private lands is consistent with the tule elk management objectives approved under the 1998 *Point Reyes National Seashore Tule Elk Management Plan and Environmental Assessment* (Tule Elk Management Plan/EA). While several smaller ponds consistently go dry at Tomales Point in the fall and summer months, water is still available at the larger Lower Pierce Ranch pond, McClure Creek, and many seeps and springs scattered across the peninsula. There is no evidence that elk at Tomales Point did not have access to water during the drought. Furthermore, a contingency plan has been put in place for the southern portion of Tomales Point in the event of another severe drought. For these reasons, there is no need to retire J Ranch or develop nature-based easements to allow elk to have reliable access to water.
116	Commenters note that recreational hunting as a method of elk population management is dismissed without adequate consideration. Commenters state that regulated recreational hunting has been a safe, successful, and cost-effective approach to ungulate management on other national park system lands and could be implemented in accordance with the park's enabling legislation.	Recreational hunting was dismissed from full consideration for the reasons explained in chapter 2 of the EIS. This discussion has been revised for clarity in the final EIS. While NPS did reject an open, recreational hunt, the use of qualified volunteers working under NPS supervision to carry out a management culling operation is specifically noted in chapter 2 as a possible means to achieve the annual elk reductions proposed in several alternatives analyzed in the EIS.
117	Commenters indicate that constructing a fence to separate elk from the ranchlands is dismissed without adequate consideration. Commenters suggest that the costs of building the fence should be compared with other elk management options and the cost of repairs to ranch fences damaged by elk. Commenters also state that construction of additional fencing would resolve issues with elk on ranchlands, including damage to ranch infrastructure, and would benefit other resources such as visitor use, experience, and access.	The construction of a fence to keep elk within portions of the Phillip Burton Wilderness near Limantour to separate elk from ranch operations was thoroughly explored during the development of the EIS. NPS has discussed the fence concept with other biologists and CDFW on several occasions and has hosted field trips to where a fence would need to be built. From the beginning, experts have agreed that an elk fence would not be effective in these locations and that elk would have no difficulty going around the fence. This would be particularly true for any elk that were translocated from ranches to the wilderness given their strong instinct to return to places of capture. CDFW's comment letter in response to the draft EIS, dated September 23, 2019, reads in part: > The Department agrees that translocation of elk from one area of PRNS to another to reduce conflict is not a viable management option. The short distances over which elk could be moved within PRNS could easily be covered by elk in a day or less and therefore are too small to biologically justify translocation. The Department is not aware of data that indicate that short-distance translocations of large, highly mobile ungulates, such as elk, are successful. In contrast, CDFW knows of several instances where ungulate translocation across distances exceeding the extent of PRNS in which translocated animals returned, or attempted to return, to their place of origin. > The Department also agrees that fencing of elk along the boundary of the Phillip Burton Wilderness Area at PRNS would be exceedingly difficult and prohibitively

ID	Concern Statement	Response
		expensive to construct and maintain and would result in negative impacts to wildlife. For these reason[s], the Department concurs that the likelihood of successfully excluding elk from neighboring lands with fencing in the Phillip Burton Wilderness area would be low. Any benefits of such an approach would be exceeded by negative impacts to a variety of wildlife. Comments regarding the costs of building an elk fence compared to other elk management options do not have merit considering that the elk fence would not effectively contain the elk. The EIS has been revised to further clarify the rationale for dismissal of fence construction at the wilderness boundary to resolve elk conflicts.
118	Commenters suggest that elk translocation within the park is dismissed without adequate consideration.	Additional language has been added to chapter 2 of the EIS regarding the dismissal of this alternative element, including information from CDFW that concurs that translocation of elk within the park is not a viable management option.
119	Commenters suggest that elk fertility control is dismissed without adequate consideration based on incomplete or outdated information. Commenters state that more recent information regarding the effectiveness of specific contraceptives and newer methods for surgical sterilization are available and should be included in the EIS.	The dismissal has been revised to provide additional context for this determination. It also notes that currently, USEPA does not have an approved product for fertility control in elk.
120	Commenters suggest that introducing natural predators to control elk population is dismissed without adequate consideration. Commenters state that the claim that the park cannot support viable populations of wolves, which is part of the rationale for dismissal of this concept, is not correct according to gray wolf habitat modeling conducted by USFWS.	The dismissal has been revised to note that introduction of predators would not meet the goals of the plan. Predators exist in the park; however, they do not have a population level effect on elk. Introducing new predators would not meet NPS management goals for population reduction and would have widespread implications for the park. As a result, predators are not the right tool for targeted population reduction. Please see “Alternatives Considered but Dismissed from Further Analysis” section in chapter 2 of the EIS. Gray wolf introduction to Point Reyes at levels that would provide elk population control would be inconsistent with the historical occurrence of gray wolves in California (CDFW 2011; Kovacs et al. 2016) and would therefore be inconsistent with NPS *Management Policies*. The comment regarding gray wolf habitat modeling is not applicable. References: CDFW. 2011. *Gray Wolves in California: An Evaluation of Historical Information, Current Conditions, Potential Natural Recolonization and Management Impacts*. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=76636&inline Kovacs, K. E., K. E. Converse, M. C. Stopher, J. H. Hobbs, M. L. Sommer, P. J. Figura, D. A. Applebee, D. L. Clifford, and D. J. Michaels. 2016. *Conservation Plan for Gray Wolves in California*. California Department of Fish and Wildlife, Sacramento, CA. 329 pp.

ID	Concern Statement	Response
121	Commenters suggest that improving elk habitat in the wilderness area to reduce elk/cattle conflicts on ranchlands is dismissed without adequate consideration. Commenters also question the rationale for dismissal. Commenters suggest that the EIS should be expanded to assess how wilderness conditions affect elk herds to inform methods of controlling the elk in the pastoral zone. Commenters also requested that the final EIS study the need for vegetation management in the Limantour wilderness area, as well as an emergency elk evacuation plan in the event of a catastrophic fire and complete loss of forage in the Designated Elk Range, requesting NPS evaluate the reduced fire danger and fire impacts to local communities the wilderness area as a result of vegetation management.	The dismissal regarding improvement of elk habitat in wilderness in the EIS appropriately dismisses this alternative from full consideration. Planning for emergency procedures related to fire and elk is outside the scope of this EIS.
122	Commenters suggest that complete removal of elk on ranchlands is dismissed without adequate consideration and, given the overall size of the park, should be considered as an alternative. Commenters disagree with the statement that the roughly 50 individual elk that move onto ranchlands from the Limantour herd do not affect the forage availability or RDM for ranches in that area and request further examination of elk impacts on ranching operations.	The explanation provided in the EIS supports the dismissal of complete removal of all elk from park ranchlands. The NPS response to Concern ID 117 explains the reasons why fencing elk from ranchlands is also infeasible. In addition, RDM monitoring to date has not documented significant loss of forage as a result of elk that have migrated onto ranches from the Limantour area. Monitoring would continue under alternatives B and C with specific scrutiny of areas frequented by elk.

Table 24. AL4000 – Mitigation Measures

ID	Concern Statement	Response
123	Commenters state that the final EIS and ROD must include binding commitments and funding to assure enforcement of all the standards and mitigation measures in the draft EIS.	Additional text has been added to chapter 2 and appendix F (previously appendix D in the draft EIS) regarding Practice Standards and mitigation measures and responsibilities for ensuring that mitigation measures are carried out for all ranch Management Activities. Should an alternative be selected that includes issuance of agricultural lease/permits, mitigation measures would be incorporated into individual ROAs for all applicable activities and would be binding. NPS is committed to identifying funding and hiring staff to implement and enforce all aspects of the plan.

ID	Concern Statement	Response
124	Commenters suggest that the EIS add reasonable milestones for completion of mitigation measures and BMPs as well as a transparent process that allows the public to be informed as plans are developed and implemented. One commenter suggests that a webpage displaying a map of the zoning framework and a list of mitigations be developed so the public can follow progress on mitigation projects and milestones.	Appendix F includes many of the Practice Standards and mitigations that would be required for activities proposed under the action alternatives for ranching. NPS would develop an annual reporting process incorporating benchmarks such as results of relevant monitoring, reviews, and activities authorized, including Management Activities, Practice Standards, and mitigation measures completed.
125	Commenters state that both practices and mitigation measures change over time and the EIS should include the flexibility to update appendix D periodically to keep up with current science and industry standards.	Text has been added to chapter 2 and appendix F to clarify that mitigation measures may be added in the future if new information becomes available that would result in better protection of park resources, or due to changes in law, policy, or regulatory agency standards.
126	Commenters question the use of Marin County RCD and NRCS best practices and standards in the EIS since NPS must address appropriate mitigation measures for these actions to be carried out in a national park, consistent with the direction provided in NPS law and policy.	NPS agrees that adapting the Management Activities, Practice Standards, and mitigation measures from other local, state, and federal agencies does not relieve NPS of its duty to meet its own mandates. Mitigation measures from other agencies were incorporated as appropriate and supplemented with additional NPS requirements. In addition, the zoning framework presented in the EIS is based on site-specific information and creates spatial constraints to protect park resources and identify where particular ranching activities could be conducted. NPS would work with the ranchers to make site-specific determinations on how best to avoid, minimize, and reduce impacts of any particular activity using the general principles, Practice Standards, and the mitigation measures outlined in appendix F.
127	Commenters state that mitigation measures are either missing or inadequate to address the following issues: ▪ minimizing or avoiding ranching conflicts with wildlife, which will increase due to the allowance for diversification; ▪ mitigation measures to strive for restoration of native coastal prairie plant communities; ▪ impacts from grazing cattle and dairy ranching to streams and sensitive water source areas; ▪ impacts to nesting birds from vegetation management activities; and ▪ impacts to western snowy plovers related to fence maintenance and disposal of dead livestock and afterbirths.	Impacts on wildlife, including birds, from diversification, Fencing, and Vegetation Management activities are addressed in the wildlife section in chapter 4. Impacts on water resources from livestock grazing are addressed in the "Water Resources" section of chapter 4. Table 2 of the EIS includes management strategies for preservation of resources, including identifying areas for restoration. Through the ROA process, NPS would work with ranchers to prioritize restoration activities on each ranch, which would be monitored under an adaptive management framework. The Resource Protection subzone also identifies priority areas for protection of sensitive resources. Management Activities, Practice Standards and mitigation measures (appendix F) are intended to minimize impacts on resources; they are not a means by which to achieve restoration goals.

ID	Concern Statement	Response
128	One commenter expresses concern about the measures proposed in the draft EIS to mitigate overgrazed ranges, particularly about the potential for using non-native forage plants instead of better mitigation measures like reducing livestock numbers, restricting seasons of use, or better range practices.	The RDM standard would apply to all grazed subzones, regardless of whether seeding is an authorized activity in the Pasture subzone. If the RDM standard was not being met, adjustments would be made to timing, duration, and intensity of grazing, which could include a reduction in stocking rates to meet objectives. A mitigation measure was added to appendix F stipulating that seeding for erosion control would require grazing exclusion until restoration goals have been met. A new appendix (appendix E) summarizes results of RDM visual mapping and monitoring since 2015. This indicates that, excluding extreme drought events, a high percentage of the ranched lands have met the RDM standard in recent years with current management. Under alternatives that continue agricultural lease/permits, the updated process including annual ROA meetings will enhance the ability of the park and ranchers to proactively identify areas or seasons of concern and make meaningful adjustments to protect resources.
129	One commenter suggests NPS commit to installing small-scale methane digesters to reduce methane emissions, while other commenters question whether NPS will require the dairy operations to install methane digesters.	Under any of the alternatives involving the issuance of agricultural lease/permits, implementation of methane digesters or other technologies proven to reduce GHG emissions from ranching operations would be consistent with the Ranch Core subzone and supported by NPS. Future proposals would be evaluated on a case-by-case basis to ensure their implementation is consistent with resource management goals.
130	One commenter indicates that although management practices of the Marin RCD Permit Coordination Program are included in the draft EIS and appendices, additional practices from the program that were excluded or modified should be included because they would maintain consistency among programs and provide environmental benefits. The practices excluded or modified in the draft EIS are mulching (484), hedgerow planting (422), silvopasture (381), conservation cover (327), and windbreak and shelterbelt establishment (380). Commenters recommend that non-pathogen, weed-free mulch be allowed because weed-free straw usually contains herbicides, which are prohibited for organic farms.	Mulching (484) is authorized as a mitigation measure to protect from erosion (see appendix F). Mulching with compost generated on site is covered under Nutrient Management (590) for dairies in the planning area. Mulching with imported compost on beef ranches is not authorized because of concerns regarding the potential for import of weeds, pathogens, and other substances contained in improperly managed compost (see response to Concern ID 86). The dense linear design of Hedgerow Planting (422), Windbreak and Shelterbelt Establishment (380), and Silvopasture (381) are generally not compatible with NPS policy of preserving and restoring the natural abundances, diversities, dynamics, distributions, and habitats of native plant populations and the communities and ecosystems in which they occur. The stated purposes of these two practices for natural resource conservation such as wildlife habitat and food sources for pollinators could be met with targeted restoration of native species in a less intensively managed fashion if appropriate, based on site-specific objectives and conditions. In the case of Silvopasture, the removal of trees as a product is generally not authorized on NPS lands, which is why this practice is not proposed in this EIS. Windbreak and Shelterbelt Establishment (380) is included in the analysis specific to maintenance of historical features as per NPS *Management Policies*, section 4.4.2.5 (see appendix F). According to NRCS, Conservation Cover (327) is “establishing and maintaining perennial vegetative cover to protect soil and water resources on land retired from agricultural production or other lands needing permanent protective cover that will not be used for forage production.” This practice would be authorized for promotion of wildlife habitat, restoration, reduction of erosion, and reduction of water quality degradation using species approved by NPS, as per the criteria for establishment of other permanent vegetation covered under the “Vegetation Management” section in appendix F. Periodic removal of products would not be allowed.

ID	Concern Statement	Response
131	Commenters request specific revisions to appendix D to clarify the following concerns: ▪ Provide a definition for "individual project" ▪ Requirements for covering crops/soil and for tilling activities are too restrictive and prescribed dates for these activities do not allow enough flexibility to respond to changing conditions.	Appendix F of the EIS has been revised to incorporate the suggested changes.
132	Commenters suggest that the impacts associated with diversification activities have not been fully considered in the draft EIS and that the BMPs or mitigation measures identified in the draft EIS to reduce impacts from these activities may not be technically or financially feasible or adequate to mitigate impacts.	NPS has revised chapter 2 of the EIS to more clearly identify the diversification activities that are considered in detail in this EIS and those that would require additional review and compliance. Chapter 2 and appendix F have also been updated to provide greater clarity regarding the specific mitigation measures that apply to diversification activities. Analysis of the impacts of diversification activities considered in detail has been reviewed and, in some cases, expanded in chapter 4 of the EIS. This analysis indicates that the required mitigation measures would adequately mitigate impacts. Moreover, all applicable mitigation measures would be included in ROAs and would be enforceable through the lease/permit. For diversification activities considered at a conceptual level in this EIS (e.g., irrigated crops), project-specific mitigation measures would be developed once a detailed proposal has been submitted, and the project would then be reviewed by NPS and complete all required compliance.
133	Commenters note that the draft EIS does not clearly link the impact analysis with a specific mitigation measure and suggests the final EIS and ROD provide these linkages. They note that without specifically linking mitigation measures to impacts, the measures seem more like intentions and less like concrete mitigation. One commenter notes that appendix D is confusing and does not further the public understanding of which measures are going to be implemented to protect natural resources.	The order of ranch Management Activities presented in the EIS was reorganized to better align with the structure of appendix F, and additional text was brought forward from the appendix to clarify the connection. The mitigation table in appendix F was also reorganized, directly linking specific ranch Management Activities to mitigation measures. Tables F-11 through F-13 in appendix F includes a column that highlights which natural resources are expected to be protected by each mitigation measure. Text was also added to the EIS and appendix F that indicates who is responsible for carrying out mitigation measures. Should an alternative be selected that provides for the issuance of agricultural lease/permits, mitigation measures would be incorporated into individual ROAs for all applicable activities and would be binding.

ID	Concern Statement	Response
134	One commenter indicates concern about the subjectivity of the wording in the management activity standards in appendix D and the feasibility of oversight as it relates to activities listed in appendix D. For example, the commenter notes that the two statements “ground and vegetation disturbance would not exceed the minimum area necessary to complete the project” and “removal of native trees and shrubs would be minimized and only occur when necessary to meet project objectives” are subjective and question who would define “minimum area necessary” and “necessary to meet project objectives.” One commenter asks who would design the site-specific design plans that show the maximum extent of grading and requirements to protect sensitive environmental resources during construction and maintenance activities, including sediment control measures, as noted in appendix D. One commenter asks how “as needed” is defined when the draft EIS states that, as needed, ranchers will seek technical assistance from the local USDA, NRCS, or Resource Conservation District offices.	Changes were made to appendix F to clarify responsibilities and requirements. Numeric limits were included when applicable; however, in some cases, design requirements would be project-specific based on site conditions and the overall size. Should any action be proposed that is not consistent with the Practice Standards and mitigation measures detailed in appendix F, then additional review and compliance would be required prior to authorization of the activity.
135	One commenter expresses concern that mitigation measures for listed plant species rely on adherence to RDM standards, which have been problematic at the park. They also express concern that beneficial effects from cattle grazing on native plants is highly dependent on the season, intensity, and duration of grazing and requires highly managed grazing operations that NPS and ranchers have not proved capable of conducting.	Appendix N contains numerous mitigation measures by species for listed plants as well as general mitigations for activities in table 3-2. NPS currently manages listed plant species with targeted grazing (e.g., see appendix N) and would continue to work with ranch operators to conduct targeted grazing based on best available science for management towards desired conditions. Over the past two decades NPS has worked with ranchers to manage listed plant species with strong success, as noted in appendix N.

ID	Concern Statement	Response
136	A commenter notes that while the EIS states targeted grazing is a proposed mitigation measure for weed control, it only compacts the soil more and is not an appropriate mitigation measure for invasive species.	An IPM framework would be used to address invasive species (see appendix F), which could include targeted grazing. Targeted Grazing is an established tool used for weed management (e.g., Bailey et al. 2019; Launchbaugh and Walker 2006). Grazing can cause soil compaction depending on site conditions and timing, duration, and intensity of grazing (Jackson and Bartolome 2007). The potential for soil compaction is analyzed in chapter 4 of the EIS. Bailey, D. W., J. C. Mosley, R. E. Estell, A. F. Cibils, M. Horney, J. R. Hendrickson, J. W. Walker, K. L. Launchbaugh, and E. A. Burritt. 2019. "Synthesis Paper: Targeted Livestock Grazing: Prescription for Healthy Rangelands." *Rangeland Ecology & Management* 10.1016/j.rama.2019.06.003. Launchbaugh K., and J. Walker. 2006. "Targeted Grazing—A New Paradigm for Livestock Management." In: Launchbaugh, K. ed. *Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement* 2–9. Jackson, R. D., and J. W. Bartolome. 2007. Grazing Ecology of California Grasslands. California Grasslands: Ecology and Management 197-206.
137	One commenter notes that daily inspections for sheep and goats are not a function of a Ranch Core subzone because sheep and goats are authorized on pastures without a Ranch Core subzone.	This comment is not accurate. As indicated in chapter 2, diversification with sheep and goats in the Pasture subzone would only be allowed under alternatives B, C, and D for the 18 operations that include a developed residential complex. The text of the EIS has been revised to make it clear that the daily inspections are required if these species are authorized in the ROA of any of the 18 residential ranch operations.

Table 25. IS1000 – Issues and Impact Topics: Soils

ID	Concern Statement	Response
138	Commenters request that the EIS provide a history of soil impacts from ranch operations, that discusses the level and extent of impacts on soils, including erosion, compaction, and stream incision. Commenters suggest the management activity standards and mitigation measures identified in the draft EIS do not clarify if they would reduce impacts to soils with high erosion potential or high compaction potential to less than significant levels. Commenters request a description of how the overall impacts on soils can be reduced to less than significant levels, including a description of past and future soil restoration efforts that identifies costs and responsible parties. Commenters suggest the impacts of the ranching alternatives on soils are described as being reduced, when compared to existing conditions (alternative A) in the draft EIS, but not in absolute terms when compared to legal standards; therefore, commenters request an additional assessment of all significant adverse impacts in absolute terms compared to all existing State and Federal standards They also note that the statement “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” is an understatement with no baseline for describing the current condition or long-term trend.	NPS added information to chapter 3 to better characterize the existing condition of soil resources in the planning area, taking into account previous adverse impacts as well as the restoration efforts shown in Figure 4 of the EIS. Based on the information in chapter 3 and analysis in chapter 4, no significant adverse impacts to soils were identified. See response to Concern ID 231 regarding how significance is determined for purposes of NEPA analysis.
139	Commenters note that the soils section of the draft EIS uses the USDA-NRCS Soil Survey interpretations incorrectly, specifically when characterizing compaction resistance, erosion hazard, and wind erodibility. They also question the scale at which the data was used and request an explanation of how the data was aggregated.	The commenter correctly notes that the soil compaction resistance parameter from the USDA-NRCS Soil Surveys does not account for soil moisture, which influences soil compaction potential. NPS revised the EIS to note that soil moisture is an important factor for both soil compaction and erosion potential. The compaction resistance parameter is an appropriate metric for analyzing impacts on soils because it represents the overall potential for compaction based on soil characteristics. The commenter also correctly notes that USDA-NRCS erosion hazard ratings do not account for vegetation cover or management practices. However, the analysis in the EIS accounts for vegetation cover, describing areas lacking sufficient vegetation cover to prevent wind erosion (e.g., livestock trails and concentration areas and agricultural fields) as high-intensity-use areas. As described in “Chapter 4: Environmental Consequences, Soils,” the erosion hazard

ID	Concern Statement	Response
		map was overlaid onto the zoning framework map and the analysis considered both erosion hazard ratings and changes in land management to determine the impacts of the alternatives on soil erosion compared to existing conditions. The EIS states that implementation of mitigation measures, and appropriate ranching and management practices, would limit adverse impacts. The analysis also considers areas where bare soils are located adjacent to high-intensity-use areas such as stock ponds, cattle trails, salt licks, and feeding areas. The EIS notes that these areas comprise approximately 150 acres (less than 1% of the planning area). Estimates of bare soil, high-intensity-use areas, and other soil features in the planning area are based on desktop mapping of aerial imagery, not the soils survey, and form an appropriate basis for analyzing impacts of the alternatives compared to existing conditions. These estimates have not been scaled up to misrepresent existing conditions or overstate impacts as the commenter suggests. The commenter argues that the EIS analysis treats cattle trails differently than other types of trails. The EIS focuses heavily on agriculture because ranching is a central focus of the GMP Amendment. However, the EIS discloses that many types of anthropogenic land features and activities can cause erosion and modify stormwater runoff patterns, causing soil instability and furthering erosion. The analysis considers various non-ranching land features and activities, including hiking, biking, and equestrian trails; parking lots; roads; and camping areas. All sources of potential impacts on soils are considered in the analysis of impacts. Furthermore, the commenter questions the applicability of wind erodibility to livestock trails based on their assertion that wind fetch is low in the planning area. As described in the EIS, high-intensity-use areas, including livestock trails and other types of trails, are susceptible to wind erosion because they lack sufficient vegetation cover. The fact that these areas are susceptible to wind erosion does not necessarily mean that erosion will occur, but rather that it could occur depending on other factors, including precipitation patterns, soil type and moisture content, and wind speed and direction. There is no evidence that wind fetch in the planning area is persistently low to the degree that it precludes wind erosion. However, wind fetch is variable and may be more intense during certain times of year and during storm events. The EIS was revised to clarify this fact. Overall, the EIS appropriately considers potential impacts on soils from wind erosion. Lastly, the commenter claims that there is no evidence that careful grazing practices in California lead to adverse soil impacts. While certain practices can limit impacts, they are not eliminated entirely and adverse impacts of cattle ranching on soils are well-documented in California and elsewhere. Therefore, it would be neither appropriate nor accurate to state that ranching does not affect soils. Impacts of ranching under the alternatives are appropriately characterized in the EIS analysis and incorporates the mitigation measures, described in appendix F.

ID	Concern Statement	Response
140	Commenters express concern about the impacts of crops on soil, stating that crops have the potential to increase soil erosion and discharge of sediment to streams; increase nutrient runoff from manure or compost application; increase the need for invasive plant control as conditions for invasive plant germination and dissemination are improved; increase soil compaction; alter stormwater flow paths; and increase runoff leading to a decrease in groundwater recharge and altered stream hydrology (low and high flow). The commenters state that the draft EIS should clarify allowable crop activities and their impacts, along with harvest methods. Additional concerns regarding the limited effectiveness of mitigation measures are noted, specifically that mulching and seeding have variable success at erosion control depending on factors such as slope, wind, soil moisture, and temperature.	Impacts on soils related to diversification activities have been expanded in chapter 4 of the EIS. While crops would be authorized, only 2.5 acres per ranch with a developed complex could potentially be used for this purpose, limiting impacts to only 45 acres of the 28,700-acre planning area, as noted in the EIS. Impacts would further be limited by siting crops in the most appropriate location in the Ranch Core subzone on already disturbed lands and using standard mitigation measures, including filter strips and buffers from any other sensitive resources of concern (appendix F). Proposals for crops requiring irrigation would require additional site-specific review and compliance.
141	Commenters note that soil fertility has historically been treated similarly on all ranches, and it would be inconsistent to allow added fertility on only dairy pastures where soil organic matter is the highest and to prohibit added fertility on beef ranches.	Authorization for manure spreading with an approved nutrient management plan is a water quality control measure and would not be implemented for the sole purpose of improving soil fertility. Manure management plans are required to ensure excess nutrients that could be subject to runoff are not applied. Please see response to Concern ID 81.

Table 26. IS1100 – Issues and Impact Topics: Water Resources

ID	Concern Statement	Response
142	A commenter expressed concern that the objectives in the San Francisco Bay Regional Water Quality Board's Water Quality Control Plan (Basin Plan) are not addressed in the draft EIS and suggests the statement on page 67 of the draft EIS reading, "Only half of the freshwater quality parameters (e.g., bacteria, pH, and dissolved oxygen) have established objectives put in place by San Francisco Bay 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)", is not correct because the Basin Plan does include objectives for these parameters. The commenter also suggests site-specific data is necessary to analyze potential impacts from outflow from Abbotts Lagoon and other waterways into adjacent ocean waters.	The "Water Resources section of chapters 3 and 4 have been updated based on public comment. Further, analysis of water resources was completed on a watershed-level scale, which is appropriate for the planning area covered by the EIS. When appropriate, the analysis makes distinctions about whether the watershed is under a TMDL or supports threatened and endangered species. The results from the 1999-2000 USGS study on Abbotts Lagoon (Scientific Investigation Report 2005-5261) resulted in the construction of a loafing barn on I Ranch to address water quality concerns. Improvements have been made throughout the planning area to reduce water quality impacts and, as noted in the EIS, long-term trends demonstrate a decrease in water pollution. Please refer to the response to Concern ID 143 regarding fecal indicator bacteria. Please refer to the response to Concern ID 147 that addresses nitrate and turbidity. Regarding the Basin Plan, the commenter correctly notes that it contains objectives for temperature, turbidity, and nitrates, and has an objective for surface waters designated for use as agricultural supply. The EIS has been updated accordingly; please see chapter 3.
143	Commenters state that the draft EIS does not provide adequate detail on concentration levels of pollutants from agricultural operations in the park discharging to Tomales Bay, a 303(d) impaired waterbody, and adjacent ocean waters, especially those parameters for which Tomales Bay is listed as impaired. The commenters expressed concern that only discussing regulatory options with regards to the pollutants does not adequately assess the actual environmental impacts of the pollutants on the waterbodies.	Two new reports, *Temporal Water Quality (E. coli, Fecal Coliform, and Turbidity) Analysis for Kehoe, Abbotts, and Drakes Estero Watersheds at Point Reyes National Seashore* (appendix L) and *Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters* (Lewis et al. 2019), provide additional information that has been incorporated into the final EIS. Lewis et al. (2019) present trend analysis of a 19-year dataset to assess long-term microbial water quality responses in the Olema Creek watershed, which is part of the Tomales Bay watershed. They found a 95% reduction in fecal indicator bacteria concentrations during the monitoring period, concurrent with the implementation of 40 grazing BMPs. Appendix L includes information regarding a systemic water quality monitoring program conducted by NPS between 1999 and 2013 to identify and address water quality concern areas in the Kehoe, Abbotts, and Drakes Estero watersheds. Fecal indicator bacteria concentrations were found to decline over the period of analysis during which 30 BMPs were implemented. Meanwhile, the one monitored watershed with no BMPs and little grazing influence showed a slight increasing trend in fecal indicator concentrations. While turbidity showed no trend, less than 5% of samples exceeded 55 nephelometric turbidity units, mostly during rain events. Information from this report has been used in chapter 4 to update the analysis in the final EIS to include impacts from ranches outside the Tomales Bay watershed. Pollutants discharging to Tomales Bay, are described in chapter 3, and impacts are analyzed in chapter 4. The discussion of environmental impacts of pollutants on waterbodies has been expanded in chapter 3. Based on trend analyses conducted using data collected in the park

ID	Concern Statement	Response
		and similar conclusions from other studies, the management practices evaluated in this EIS are expected to continue to reduce concentrations of pollutants entering waterbodies and their associated environmental impacts on water quality. References: Voeller, D., B. Ketcham, and B. Becker. 2020. *Temporal Water Quality (E. coli, Fecal Coliform, and Turbidity) Analysis for Kehoe, Abbotts, and Drakes Estero Watersheds at Point Reyes National Seashore*. (Included as Appendix L). Lewis, D. J., D. Voeller, T. L. Saitone, and K. W. Tate. 2019 "Management Scale Assessment of Practices to Mitigate Cattle Microbial Water Quality Impairments of Coastal Waters." *Sustainability* 11(5516):doi:10.3390/su11195516.
144	Commenters express concern that the draft EIS does not contain updated quantitative data on water quality. They suggest that more recent water quality data are needed to establish a baseline condition so that the alternatives can be fully assessed against the baseline conditions in absolute terms when compared against legal standards	Analysis of data from 1998–2014 was conducted using data collected by NPS in the Kehoe, Abbotts and Drakes Estero watersheds (see appendix L). Additional recent reports on water quality data collected by NPS include Wallitner 2016; Wallitner and Pincetich 2017; Voeller et al. 2018; and Lewis et al. 2019 (see references). Information from these documents was used to update the "Water Quality" sections of chapters 3 and 4.
145	Commenters suggest that the draft EIS analysis underestimates the water needs of dairy cows and dairy operations, including the amount of groundwater and surface water available during drought years or years with low rainfall, and request an assessment of this in the final EIS. Commenters also indicate that the draft EIS does not adequately address groundwater contamination and depletions that occurred over the last 35 years and requests information on the amount of groundwater extracted, aquifer recharge estimates, and mitigation measures and plans that NPS expects to undertake to remedy impacts on groundwater resources	Analysis of the impacts of dairy operations on water resources is based on the best available science. The sources cited by the commenter are industry publications and were not incorporated into the EIS because more appropriate sources of information were available and used for the analysis. Existing groundwater quality conditions are discussed in chapter 3. There are currently no known issues with groundwater depletion or contamination as a result of ranching at the park. Of the wells sampled by the SWRCB's Division of Water Quality GAMA Program, no wells in Point Reyes were found in violation of nitrate thresholds (GAMA Program 2019). Apart from one ranch where the water supply pond dried and emergency measures required pumping from the adjacent freshwater stream, no operational issues were recorded during the worst drought on record, indicating operations are within the capacity of the groundwater systems. SWRCB. 2017. "Groundwater Information Sheet: Nitrate." GAMA Program, Division of Water Quality, California State Water Resource Control Board. Accessed December 5, 2019. SWRCB. 2019 GAMA, Groundwater Information System. Accessed December 6, 2019. https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/Default.asp
146	Commenters state that the draft EIS does not identify potential impacts from the development of new water supply reservoirs, ponds, or diversions that may be allowed through a state water rights process.	The scope of the EIS analysis is limited to redevelopment of existing water sources, including spring development that moves cattle out of wetlands and provides water through localized systems. The development of a new water source would require site-specific environmental review and compliance. The California state water rights process is independent from the NEPA planning process. The agricultural lease/permits prohibit ranchers from perfecting new water rights.

ID	Concern Statement	Response
147	Commenters suggest the draft EIS does not adequately address water quality and stormwater runoff impacts from manure, antibiotics, hormones, fertilizers, and herbicides for invasive weed control from ranching operations to groundwater, aquatic habitats, and receiving waters. Commenters also suggest the draft EIS does not adequately inform the public about the management actions the NPS has implemented in ranching areas to address water quality impairment from ranching activities. Commenters express concern that the draft EIS does not adequately emphasize the remediation of the water quality impairment in the Tomales Bay watershed attributable to ranching (page 147 of the draft EIS). Commenters recommend that additional emphasis be placed on remediation of the water quality in the draft EIS and refer to the public notices of substandard water-quality available in the area. Commenters also note that manure runoff could affect visitor health due to poor water quality in low water periods	Please see the response to Concern ID 143 regarding water quality in the Tomales Bay watershed and specific NPS efforts to address impacts on water quality from ranching activities. NPS believes the existing analysis is accurate and adequate in its description of water quality and stormwater runoff from ranching operations. While organic dairies do not use herbicides or antibiotics, the IPM framework specifically minimizes the potential for runoff from use of herbicides on non-organic ranches. Dairy ranches have additional mitigation measures and regulatory requirements in place for Manure and Nutrient Management to further reduce the potential for runoff. Regarding potential impacts on visitor health, no issues have been documented in the park as a result of Manure and Nutrient Management, and water quality conditions continue to improve, as indicated by Lewis et al. 2019 and appendix L (see response to Concern ID 143). The protections currently in place are widely accepted prescriptions to manage for human health and potential pathogens. Specifically, manure is concentrated on ranches away from waterbodies in pasture areas where it can be managed to minimize impacts on water quality. Nitrate as N has been monitored at long-term sites in the Tomales Bay watershed by the NPS Inventory and Monitoring program since late 2006. No samples have exceeded the drinking water standard of 10 milligrams per liter (mg/L) (in fact, the maximum recorded was 3.7 mg/L during storm conditions), and less than 5% of samples have exceeded 1.0 mg/L. Similarly, monitoring by the Tomales Bay Watershed Council in water years 2008-2012 observed relatively low nutrient levels and no samples with nitrate as N over the drinking water standard (Carson 2013). SWRCB has a new requirement for ammonia sampling on dairies that will provide an additional metric to monitor water quality moving forward. Carson, R. 2013. *Tomales Bay Wetlands Restoration and Monitoring Program 2007–2012 Final Water Quality Technical Report and Program Summary*. Tomales Bay Watershed Council Foundation prepared for California State Water Resources Control Board SRF Project No. C-06-6926-110.
148	Commenters indicate that appendix A of the draft EIS does not present a clear map showing whether manure ponds are placed at a sufficient distance from surface water drainages, and they recommend that dairy manure management ponds be located away from drainages to prevent overflow during the rainy season. Commenters express concern that NPS's proposals for improving water quality and dealing with the large amounts of manure are inadequate and not specific.	Manure ponds must meet the specifications for retention ponds in the San Francisco Bay RWQCB Waiver of Discharge Requirements for confined animal facilities. Dairy operators with existing ponds must certify that their facility is structurally and operationally in compliance with the prohibitions and waste discharge specifications of the waiver. Any new manure ponds would be required to meet current standards consistent with state regulations. The current required plans are site specific and must include a Facility Monitoring Program, a Waste Management Plan, a Grazing Management Plan, and a Nutrient Management Plan. Minimum requirements for each of these are included in the waiver appendix. The mitigations required by the current waiver are included in appendix F. See the response to Concern ID 149.

ID	Concern Statement	Response
149	A commenter notes that the discussion on page 67 of the draft EIS related to dairy operations operating under a conditional waiver that expires in 2020 either needs a citation or may need updating. On October 10, 2018, the San Francisco Bay RWQCB renewed the Conditional Waiver of Waste Discharge Requirements for Grazing Operations in the Tomales Bay watershed for another five-year term, expiring on October 11, 2023. The commenter also suggests the EIS should clarify what NPS is doing to regulate ranch discharges to the Pacific Ocean that do not fall under the waiver and if ranches are complying with the requirements. A commenter suggests the draft EIS does not describe a systematic ongoing water quality monitoring program and should be updated to include such because most of the ranches are not located in Tomales Bay watershed and are not covered by a Conditional Waiver of Waste Discharge Requirement. Another commenter suggests requiring water quality testing for wilderness and recreational bodies of water so park staff can monitor proposed mitigation measures, as well as enforce ROA terms.	Dairies are regulated as Confined Animal Facilities by the San Francisco Bay RWQCB, and the existing regulations currently include a water quality monitoring component. The text of the EIS was updated to clarify the regulatory framework. Working with the San Francisco Bay RWQCB, NPS will regulate beef ranches in the planning area under the same framework as the grazing waiver for Tomales Bay. Operations would be required to adapt as the RWQCB adopts updated requirements (e.g., when five-year waivers are updated). Analysis of existing water quality data and results from other studies have provided a framework that indicates implementation and maintenance of Management Activities can improve water quality on beef ranches. The management strategy supported by the research and put forward in this EIS places the effort into implementation of Practice Standards for Management Activities, and site-specific monitoring and adaptive management through ROAs rather than requiring another systematic ongoing water quality monitoring program for beef ranches outside Tomales Bay.
150	A commenter notes that the San Francisco Bay RWQCB Waiver of Waste Discharge Requirements stipulates that a copy of each ranch's Water Quality Plan be kept onsite and requests where these plans are kept and how they can be accessed by the public. The commenter suggests that high concentrations of pollutants were measured following improvements to the Kehoe Drainage, Abbotts Lagoon, and Coastal drainages in 2013, and that this indicates the improvements were not effective and thus require a more rigorous water quality monitoring program.	NPS will work with the San Francisco Bay RWQCB to identify a consistent approach for maintaining copies of Water Quality Plans and allowing for their access and availability to the public as appropriate. Water quality monitoring is also already required by the Waste Discharge Requirements for dairies and will be used to adaptively manage operations as necessary (see response to Concern ID 149). It should be noted that information presented in the Coastal Watershed Assessment (Pawley and Lay 2013) relies on and reports water quality data for 1999–2005. Updated analysis of data for those areas extending another decade (through 2014) is included in appendix L and has been incorporated into chapters 3 and 4. This analysis indicates that measured fecal indicator bacteria concentrations have declined at monitoring locations in watersheds where Management Activities were implemented, and that monitoring stations met fecal indicator bacteria numeric targets more often in monitoring data collected after the above referenced studies.
151	A commenter recommends revising figure 45 of the draft EIS in appendix A so that specific types of palustrine wetlands, such as wet meadows, riparian, streams, and seeps, are delineated.	Wetland impacts are analyzed holistically in the EIS, and wetland type is not relevant to the analysis; therefore, the requested information was not added. As noted in the EIS, wetland areas would be surveyed prior to authorization of activities to avoid potential impacts.

ID	Concern Statement	Response
152	A commenter suggests the statement on page 117 the draft EIS, “The Range subzone would contain nearly all the remaining surface water resources in the lands still available for ranching, ”should be clarified to state where the other surface water resources are and why they are not included in the Rangeland subzone.	Subzones were developed based on the location of known surface waters; however, some undocumented surface waters may exist in the Pasture subzone. For known water resources in the Pasture subzone, 35-foot buffers were placed around waters. Where surface waters are identified in the Pasture subzone, the subzone would be revised, and a 35-foot buffer would be instituted. As noted in the EIS, the Ranch Core subzone contains some identified surface waters, so it would not be accurate to state that all known surface waters are in the Range subzone.
153	A commenter suggests that the erosion of trails, particularly by bicycles, causes downstream degradation of water quality; therefore, the draft EIS should include a more complete description of bicycle-permitted trails to evaluate potential impacts of new trails on water quality and other resources.	The analysis of visitor use improvements in the EIS was conducted at a programmatic level, which is consistent with the approach taken in general management planning documents for NPS units. The impacts of additional trail development were analyzed programmatically for both soils and water quality. The EIS also clarifies that site-specific review and compliance (including compliance with 36 CFR 4.30) would be completed before any new bike routes are authorized and that new biking opportunities would be primarily limited to existing public and ranch roads.
154	Commenters suggest the draft EIS does not adequately address all potential adverse impacts on water quality and water resources from proposed land use changes, specifically proposed diversification activities in the Ranch Core subzone. Comments specifically note impacts from waste generation and increased public use facilities. Commenters suggest that the Ranch Core subzone’s potential to increase pollutant loading to streams, groundwater, wetlands, and degrade water quality and sensitive habitat disproportionately exceeds its relative size and may be significant. They also expressed concern that these new activities may lead to altered watershed hydrology, degraded wetlands, and new exceedances of water quality parameters in Tomales Bay and its tributaries. Commenters also express concern that the draft EIS does not clearly indicate if the diversified livestock would be corralled/fenced or free range and does not identify potential impacts of free-range livestock, such as loss of riparian zone and wetlands.	Updated impacts analysis related to diversification activities has been incorporated into the EIS. The types of diversification activities analyzed in detail in the EIS are listed in table 6. All diversification activities, including those in the Ranch Core subzone would, have to comply with all applicable waste management regulations and the mitigation measures outlined in appendix F to be authorized in an ROA. The impacts of diversification activities listed in Table 6 are disclosed in chapter 4. Historically, ranch complexes were established near creeks to facilitate disposal of animal manure and waste into the creeks. Current operations within the Ranch Core have been adapted to meet current regulatory and water quality standards, and any additional diversification proposals would be required to meet current standards. The EIS also recognizes the potential for long-term, adverse impacts on water quantity that could result from increased water usage associated with diversification activities (farm stays, farms tours, small-scale processing of dairy products, sales of local agricultural products, and additional horse boarding) in the Ranch Core subzone. In all cases, rancher proposals for these activities would have to document that sufficient water is available and that the park’s water resources would be protected. Processing of farm products, irrigated crops and horse boarding operations would require additional site-specific review and compliance and NPS approval before being implemented. If authorized, all such activities would have to comply with SWRCB regulations and all applicable laws and requirements. See responses in table 13 of this appendix for more detailed responses regarding diversification activities and associated changes made to the EIS.

Table 27. IS1200 – Issues and Impact Topics: Vegetation, including Federally Listed Species

ID	Concern Statement	Response
155	Commenters recommend that the EIS include additional information about the impacts of tule elk grazing on vegetation resources, including federally listed species in the planning area, and offsetting the adverse impact of biomass increases, as a result of removing cattle grazing under alternative F.	As noted in chapter 4 of the EIS under "Vegetation, including Federally Listed Species, Alternative F," increased elk grazing could potentially offset the adverse impact of the discontinuation of livestock grazing on some federally listed plants by reducing competing vegetation. The EIS has been revised to note that increased tule elk grazing would also partially offset adverse impacts on other vegetation resources associated with the discontinuation of livestock grazing under alternative F. However, any benefits would be very localized based on elk presence and may not result in any benefit to threatened and endangered species.
156	Commenters express concern about impacts of crops on native plant communities and request additional information regarding potential impacts.	NPS revised chapter 2 of the EIS to clarify that proposals for diversification, including crops, would only be considered if they incorporate the practice-specific mitigation measures identified in appendix F. Crops would only be authorized in previously disturbed areas located adjacent to the developed ranch complex and would not be located in areas where sensitive resources, including native grassland plant communities are present. Moreover, crop species that could become invasive would not be authorized. The analysis in chapter 4 of the EIS has also been modified based on these clarifications.
157	Commenters note that the draft EIS does not adequately consider adverse and beneficial impacts of grazing on special-status plant species. Commenters suggest the final EIS analyze impacts on special-status plant species, consider additional methods of invasive plant control in sensitive habitat such as hand-weeding, and cite additional references to support the findings.	The EIS describes the potential adverse and beneficial impacts on each federally listed plant species under the "Federally Listed Plants" heading for each alternative in "Chapter 4: Environmental Consequences, Vegetation, including Federally Listed Species." The analysis is based on the best available science, and the findings are supported by references to scientific literature where appropriate. In some cases, species ecology with respect to grazing is not well understood, and grazing could result in beneficial or adverse impacts depending on grazing intensity and other factors. In these cases, monitoring and adaptive management may be necessary to develop appropriate measures to avoid adverse impacts under the selected alternative. As noted in the EIS, some species rely on grazing and could be adversely affected by cessation of ranching under alternative F. The EIS has been revised to indicate that manual removal of invasive vegetation or targeted grazing would be considered, where appropriate, in areas where listed species are present.

ID	Concern Statement	Response
158	Commenters indicate that the draft EIS does not adequately consider the effects of ranching operations on the spread of invasive species and noxious weeds in the planning area. Commenters recommend the final EIS include an additional analysis of ranching practices, including manure management and feeding paddocks, on the spread of invasive species. Commenters state that the proposed mitigation measures are not sufficient to limit the spread of these species.	The EIS acknowledges that cattle and more intensive Management Activities conducted on ranches, such as Manure and Nutrient Management, may spread weeds. In addition to the Practice Standards and mitigation measures listed in appendix F intended to limit the introduction and spread of invasive species, table 2 describes management strategies that would be used to limit invasive species, including early detection rapid response, IPM, and monitoring and treatment through ROAs. Species are prioritized based on potential threat to resources, with some that are already widespread and well established (e.g., milk thistle, Italian thistle, and Italian ryegrass) ranked lower. Furthermore, the zoning framework is intended to minimize impacts on sensitive resources, including known grassland areas that are high in native species, such as coastal prairie, from these more intensive activities by establishing the Range subzone, where only grazing would be authorized. These areas of native grassland have generally been grazed since before the park was established and continue to support native species. As described in chapter 3, 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. ROAs would allow for adjustments to timing, intensity, and duration of grazing, or other Management Activities that promote native species based on best available science.
159	Commenters indicate that the EIS does not analyze impacts on vegetation based on the best available science. Commenters suggest that the final EIS incorporate more recent data to describe baseline conditions and trends for vegetation. They also recommend that additional surveys be conducted where needed to characterize baseline conditions, and that the park develop Ecological Site Descriptions for monitoring plant communities.	The EIS describes baseline conditions using the best available science and includes long-term trend data where available. The analysis incorporates data from the most recent Natural Resource Condition Assessment. NPS would explore the development of Ecological Site Descriptions in the future and consider using these to inform vegetation monitoring, as feasible. For more information regarding baseline conditions, please see the response to Concern ID 238.
160	Commenters suggest that the EIS include site-specific restoration plans for special-status plant species and sensitive vegetation communities in the planning area, and it should include several state-listed species that were omitted.	The scope of the EIS analysis is limited to special-status and sensitive plant species that would potentially be affected by the alternatives. NPS reviewed the species the commenter suggested were omitted in the EIS and confirmed they either (1) were not within the planning area or (2) would not be affected by the alternatives; therefore, they were not added. Specific restoration plans have not been developed as part of this EIS, but table 2 identifies restoration as a key management strategy for meeting the desired conditions. NPS manages vegetation restoration, monitoring of special-status species, and invasive species removal separately across all park lands. In many cases, the restoration activities that may benefit special-status species are unknown and require further study.

ID	Concern Statement	Response
161	Commenters request additional information about vegetation filter strips, including what species would be planted and how wide the strips need to be to function properly. Commenters question if filter strips have been used in the past in the planning area and if they performed as designed.	Use of a filter strip is a standard practice included as one mitigation tool and in accordance with NRCS recommendations, as noted in appendix F. When filter strips are included as part of a specific proposal, species and widths would be determined based on the site-specific needs of the project.
162	Commenters note that the draft EIS does not adequately analyze potential impacts on coastal prairie bunchgrass communities and recommend that the final EIS include additional information about the ecological role of these communities and describe potential impacts on them under the alternatives.	Rare and native plant communities are protected by the zoning framework under the ranching alternatives and are considered as part of the impact analysis on vegetative communities. Perennial bunchgrass communities are discussed as part of the coastal prairie grassland habitat in the EIS. Throughout the document, vegetation analysis focuses on a habitat-level analysis, which is appropriate for this planning document. Site-specific surveys would ensure no threatened or endangered species exist prior to authorization of new activities.
163	Commenters recommend that the final EIS include maps showing specific locations of sensitive plant communities and coastal prairie, including special-status plant populations.	Applicable laws and policies allow NPS to protect the location of rare plants and listed species from public disclosure. Maps were provided to USFWS for consultation and have informed the zoning presented in the EIS. Figure 45 in appendix A includes coastal prairie as a component of the grasslands vegetation type, and specific locations of coastal prairie were included in the Range subzone when developing the zoning framework for the EIS.

ID	Concern Statement	Response
164	Commenters state that the EIS should consider different metrics for native grass and offer additional protections for native grasslands because of their ecological importance.	Metrics for native grassland and inclusion in the Range subzone would be informed by a native grassland mapping protocol developed by UC Berkeley for Point Reyes (Aoyama et al. 2017). Grassland plots that return native species as dominant or subdominant, obligate wetland species, or rare or sensitive species would be included in the Range subzone. If the plots contain one or more native species (a native component), consideration would be given to the type and number of native species present or a minimum percent cover would be established for inclusion in the Range subzone. Based on pilot data, the UC Berkeley report indicated that minimum percent cover for indicator species was generally lower than in the Manual of California Vegetation (Sawyer et al. 2009) or the most recent park Vegetation Community Key (Keeler-Wolf et al. 2003). In cases where minimum percent cover is utilized, the lowest cover criteria between the grassland mapping protocol report, the Manual of California Vegetation, or the park Vegetation Community Key would be used to ensure protection of coastal grasslands with a native component. Future data collection under this protocol could be used to update the inclusion criteria. A Marin Countywide fine scale vegetation map is also under development that could inform criteria for inclusion. Appendix J has been updated to reflect the information presented above. NPS is considering and testing proactive native grassland restoration projects. Revegetation with native species is included in the practices in appendix F. References: Aoyama, L., J. Bartolome, P. Hopkinson, F. Ratcliff, and L. Waks. 2017. “Native Grassland Mapping Protocol.” University of California, Berkeley, Range Ecology Laboratory Department of Environmental Science, Policy, and Management. Final version – October 11, 2017. 53 pp. Keeler-Wolf, T., P. van der Leeden, and D. Schirokauer. 2003. *Field Key to the Plant Communities: Point Reyes National Seashore, Golden Gate National Recreation Area, San Francisco Water Department Watershed Lands, Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Parks*. Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. *A Manual of California Vegetation*, Second Edition. California Native Plant Society, Sacramento, CA.

Table 28. IS1300 – Issues and Impact Topics: Wildlife, Including Federally Listed Species

ID	Concern Statement	Response
165	Commenters express concern that the EIS does not adequately consider the effects of raven predation on the nests of snowy plovers and other species under the preferred alternative. Commenters recommend that the final EIS include additional measures to avoid or minimize ranching practices that attract ravens. Commenters also question the effectiveness of proposed mitigation measures to protect snowy plovers based on their limited past success.	The EIS acknowledges that impacts of raven predation on snowy plover nests would continue under the preferred alternative. Mitigation measures described in appendix F would limit these impacts but not eliminate them entirely. Under the preferred alternative, NPS would work with ranchers to implement mitigation measures when and where necessary to avoid or minimize ranching practices that attract ravens. In addition, two new resource protection areas would be established on the E and F Ranches, approximately 20 and 70 acres in size respectively, reducing the potential for livestock to access plover habitat. The NPS and ranchers would also implement measures identified in the Biological Opinion to protect plovers.
166	Commenters express concern regarding impacts of silage mowing on ground-nesting birds and other wildlife species. Commenters list species most vulnerable to mowing during the nesting season, including grasshopper sparrows, northern harriers, and California quails. They suggest that the secondary impacts of silage harvesting include attracting common ravens and other scavengers that feast on snakes and mammals that have been exposed or killed during mowing in the area. Commenters request additional information on how mowing would be monitored and additional analysis on the impacts of mowing, specifically as it relates to the raven population. Commenters recommend that the final EIS quantify anticipated bird mortality associated with silage mowing under the preferred alternative to better assess population-level and site-specific impacts. Commenters also suggest that the EIS incorporate additional discussion of potential mitigation measures and evaluate their anticipated effectiveness.	The EIS acknowledges that impacts of silage mowing (Forage Harvest Management) on ground-nesting birds and other wildlife species would continue under the preferred alternative. The EIS describes impacts on birds related to silage mowing, specifically increased numbers of ravens that prey on eggs and chicks of ground-nesting birds, including snowy plover. Mitigation measures including seasonal restrictions, use of flushing bars, and other measures would limit impacts from silage mowing but not eliminate them entirely. DiGaudio, Humple, and Gardali (2015, 2016) assessed the impacts of silage mowing on breeding bird richness, abundance, and nesting. Although this study did not directly quantify bird mortality, it did measure 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. Currently, silage mowing occurs on approximately 1,000 of the planning area's 28,700 acres. The area where silage mowing occurs would not be expanded under any alternative, and NPS would seek opportunities to reduce silage mowing. Additionally, ground-nesting birds and other wildlife would continue to occupy similar habitats in both in the planning area and outside it where mowing is not authorized. Appendix F contains all mitigation measures related to silage mowing under Forage Harvest Management. Overall, bird populations are not expected to decline under alternatives where silage is authorized.

ID	Concern Statement	Response
167	Commenters suggest that the final EIS include additional analysis of the impacts of livestock diversification on wildlife, specifically requesting measures to address conflicts between ranching operations and wildlife, including conflicts with predators. Commenter suggest the Final EIS should describe anticipated impacts of conflicts on wildlife, including direct impacts from all diversification proposals that are likely to be approved, not just from individual proposals. Commenters state that the EIS does include specific measures to protect wildlife from ranching impacts or for mitigating habitat loss; it also lacks a discussion of avoiding wildlife conflicts, assessing and monitoring critical habitat, and adherence to federal and state laws. Commenters note that the park does not have adequate staff resources to manage and enforce diversification activities, specifically in implementing the "no-kill" policy for predators. Commenters are concerned that NPS will comply with requests for predator control because lethal tule elk control is approved.	NPS would not authorize ranchers to engage in the lethal control of predators, which would be an enforceable condition of permits and a violation of NPS regulations. Also, hunting is not authorized in the park and would not be allowed under any of the proposed alternatives. The EIS acknowledges that the magnitude of potential adverse impacts on wildlife from diversification activities could be greater as a result of disturbance from the newly authorized activities; however, livestock diversification could also promote certain wildlife habitats and grassland biodiversity by maintaining a diverse array of grassland species by removing herbaceous vegetation for forage, reducing woody plant encroachment, and controlling invasive and noxious plants. Also, the zoning framework would limit the extent of potential impacts on sensitive species and habitats by limiting diversification activities to the Pasture and Ranch Core subzones. NPS expanded the discussion of potential adverse impacts on wildlife from diversification activities like sheep, goat, and chicken production, and potential impacts from livestock guardian animals in the EIS. Additional requirements regarding the use of livestock guardian animals have also been incorporated. While livestock guardian animals could affect individual wildlife, they are unlikely to adversely affect wildlife populations. There are no documented conflicts associated with diversification activities that are authorized under existing lease/permits. Going forward, requirements related to the use of livestock guardian animals would be outlined in the ROAs, which would include reporting of any wildlife and visitor conflicts to the NPS. Additionally, regarding cumulative impacts of all diversification activities, the EIS has been revised to provide further discussion about the extent to which diversification activities are anticipated in the park. Please see the response to Concern ID 232 for impacts related to diversification.
168	Commenters suggest that the final EIS consider the increased potential for transmission of Johne's disease between domestic livestock and wildlife as a result of livestock diversification under the preferred alternative. They also recommend that the EIS consider the implications of manure management practices for the transmission of Johne's disease.	Johne's disease primarily affects ruminants both domestic (e.g., cattle, sheep, and goats) and wild (e.g., elk and deer) animals. Commenters correctly noted that the disease can be transmitted among species, including from domestic livestock to wildlife species. Livestock diversification, primarily the introduction of sheep and goats, would increase the potential for transmission of Johne's disease, including transmission between livestock and wildlife, because the number of potential carriers would increase. The EIS has been updated to acknowledge this potential impact. However, as noted in chapter 3 under "Tule Elk," Johne's disease is known to be present in tule elk. NPS currently monitors Johne's disease in the park's tule elk population and would continue to do so under all alternatives. Potential for further spread of Johne's disease among wildlife communities is not likely to noticeably affect wildlife populations or community structure in the planning area. This is supported by the fact that the park's tule elk population has continued to thrive despite being infected with the disease (Manning et al. 2003). The most common source of *Mycobacterium avium ssp. paratuberculosis,* the bacterium that causes Johne's disease, is feces or manure. Ingestion of food tainted by manure containing the microbe is likely the most common way animals become infected (USDA APHIS 2008). The disease is now present in over 90% of U.S. dairy herds. Proper manure management

ID	Concern Statement	Response
		practices are important for limiting the spread of Johne's disease among wild and domestic ungulates (USDA APHIS 2010). If future research becomes available regarding how the disease is spread, the lease/permits would be updated to include new mitigation measures for limiting disease spread, including new approaches to Manure and Nutrient Management. The new lease/permit template would require ranchers to report the results of disease testing of their livestock to NPS if the testing reveals the presence or suspected presence of disease. References: Manning, E. J., T. E. Kucera, N. B. Gates, L. M. Woods, and M. Fallon-McKnight. 2003. "Testing for Mycobacterium avium subsp. paratuberculosis infection in asymptomatic free-ranging tule elk from an infected herd." *Journal of Wildlife Diseases 39*(2):323–328. USDA APHIS. 2008. Questions and Answers: Johne's Disease in Cattle. Accessed December 11, 2019. https://www.aphis.usda.gov/publications/animal_health/content/printable_version/faq_johnes_disease08.pdf USDA APHIS. 2010. Uniform Program Standards for the Voluntary Bovine Johne's Disease Control Program. Accessed December 11, 2019. https://johnes.org/wp-content/uploads/2018/11/USDA_Program_Standards_Sept-2010.pdf
169	Commenters suggest that the final EIS consider the potential benefits of dairy ranching operations on tricolored blackbird populations.	As noted in chapter 4 under "Wildlife, Including Federally Listed Species, Alternative A," vegetation grazing in agricultural fields to less than 15 centimeters could improve foraging habitat for tricolored blackbirds. This is true for both dairy and beef operations as well as Mowing and other anthropogenic activities and natural events that maintain vegetation below 15 centimeters in height (Tricolored Blackbird Working Group 2007). Therefore, potential benefits to tricolored blackbirds associated with grazing are not specific to dairy ranching. The EIS was revised to note that changes in the number of grazed or mowed acres under each alternative could improve or worsen foraging habitat conditions for tricolored blackbird.

ID	Concern Statement	Response
170	Commenters note that the draft EIS does not sufficiently analyze beneficial and adverse impacts of the alternatives on wildlife, including on special-status species. Commenters also suggest that the EIS provide appropriate justification for adverse impacts on listed species that would occur as a result of the selected alternative. Commenters suggest that the final EIS analyze impacts on tidewater goby and marbled murrelet critical habitat.	Commenters did not identify specific deficiencies with the impact analysis or provide additional references or information to support suggestions that the impact analysis is inaccurate. The ROD will identify the selected alternative and explain NPS's rationale for adopting it. The descriptions of the current and potential effects on wildlife, including special-status species, are provided in chapters 3 and 4 of the EIS. The special-status species that could exist in the planning area are listed in appendix M. The analysis of potential impacts on wildlife in "Chapter 4: Environmental Consequences" is based on best-available information, including a variety of published studies, agency reports, observations, and opinions of park and agency subject matter experts and consultations with other agencies. Both beneficial and adverse impacts from proposed activities are discussed for the following taxonomic groups: mammals, birds, fish, reptiles and amphibians, and invertebrates, and references are provided to support the analysis. The discussion of impacts thus meets the requirements to use information of "high quality" and professional integrity (40 CFR 1500.1; 1502.24). In cases where information/data are limited, the EIS summarizes existing credible scientific evidence and makes appropriate assumptions to analyze potential impacts based on this evidence (40 CFR 1502.22(b)). In addition, NPS and CEQ NEPA guidance encourages agencies to be focused and concise in their NEPA analyses. NPS provides additional detail about potential impacts on federally listed species in the BAs prepared for section 7 consultation with the USFWS (appendix N) and NMFS (appendix O). The tidewater goby (*Eucyclogobius newberryi*,) was dismissed from analysis in the EIS. The endangered fish is addressed in table 5-1 of appendix N of the EIS, the BA prepared for USFWS, where the text indicates that the species was excluded from analysis because habitat is not available in the planning area. The tidewater goby was also not analyzed during previous ranching-related section 7 consultation with USFWS. Furthermore, adverse, indirect impacts on water quality are not expected in brackish water potentially occupied by tidewater goby, and the EIS was revised to include recent data demonstrating the continued reduction in fecal material in park streams. The marbled murrelet is also addressed in the BA prepared for USFWS and was excluded from analysis because marbled murrelet do not nest in the park; therefore, no potential exists for direct or indirect effects on the species. Table 5-1 in appendix N of the EIS was edited to clarify that the species is not analyzed for this reason, rather than the lack of suitable habitat. Furthermore, the actions being considered in the planning area would not affect old growth forest, which is the same reason that northern spotted owl was excluded from analysis.
171	Commenters indicate that the survey results for Myrtle's silverspot butterfly cited in the draft EIS are 15 years old and therefore do not provide enough data for impact analysis. They recommend that the final EIS include more recent information.	The EIS analyzes impacts on Myrtle's silverspot butterfly based on the most recent available data but acknowledges that there have not been formal surveys for this species in the park in recent years. As noted in the EIS, cattle grazing and other activities considered under the alternatives could have adverse, neutral, or beneficial impacts on Myrtle's silverspot butterfly. In areas where the butterfly may exist, field verification would occur prior to authorization of any new activities, and any identified sensitive habitat areas would be avoided.

ID	Concern Statement	Response
172	Commenters suggest that the final EIS include additional information regarding previous and ongoing impacts of ranching on habitats for salmonids and other special-status fish at the park and describe actions that have been implemented to reduce or mitigate impacts. Commenters note that the draft EIS does not fully identify the impacts of herbicides on groundwater and aquatic habitats that support salmonids and other sensitive species. Commenters also suggest the EIS should detail which reaches of streams and their tributaries are fenced from direct cattle access. Commenters recommend that the final EIS include a figure showing stream reaches that potentially support salmonids in the action area, as described in table 7-1 of the NMFS BA.	Detailed analysis of impacts on threatened and endangered salmonids is provided in the BAs prepared for the section 7 consultation process and is incorporated into the EIS as appropriate. Stream reaches that potentially support salmonids are depicted in figures in the appendices. The figures do not need to be reprinted in the EIS. A map of steelhead and coho salmon critical habitat is provided in figure 47 in appendix A of the EIS. In the NMFS BA, NPS notes that cattle are excluded from most riparian areas adjacent to streams used by salmonids by either Fencing or topographic barriers. During the section 7 consultation process, additional mapping was performed that demonstrates the locations where physical practices have been implemented to exclude cattle access from riparian habitat. All maps were removed from the public version of the BAs due to sensitive information. Maps with non-sensitive information are included as part of the final EIS. Past and present impacts on salmonids are discussed in the "Affected Environment" section in chapter 3 and "Impacts Analysis" section on wildlife in chapter 4. In addition, as part of section 7 consultation with NMFS, additional information was compiled to summarize the conservation practices that have been implemented to protect coho salmon and steelhead in the park. Over the last 20 years, NPS has established more than 980 acres of cattle exclusion adjacent to critical habitat (815 acres on Lagunitas Creek, Olema Creek, and Tomales Bay; 119 acres on Home Ranch Creek; and 48 acres on Schooner Creek) and nearly 60 acres of seasonal grazing adjacent to seasonal tributaries in the Lagunitas and Olema Creek watersheds. More than 170 conservation practices intended to improve water quality have been implemented, including upland watering facilities, exclusion Fencing, controlled Stream Crossings, erosion control, and Road Upgrade and Decommissioning. A map detailing these practices was added to the EIS as figure 4. The NMFS BA has been revised to describe the current status of specific actions that were identified in section 3 of the BA. Furthermore, NPS, and park ranchers as a requirement of their lease/permits, would comply with all "reasonable and prudent measures" and "terms and conditions" specified in the Biological Opinion that apply to the respective activities that they undertake. Regarding the impacts of herbicide use, the topic is discussed in various locations in chapter 4 of the EIS, including the "Water Resources," "Vegetation, including Federally Listed Species," and "Wildlife, Including Federally Listed Species" sections. Under all of the alternatives, NPS would continue to comply with NPS IPM regulations and procedures and applicable state pesticide regulations. Compliance with these regulations and procedures, any applicable handling and disposal laws, and the use of appropriate herbicide application methods (e.g., restrictions on spraying during windy or wet days) would continue to minimize or prevent adverse impacts on federally listed salmonids.
173	Commenters suggest that the final EIS include additional information regarding the potential for restored stock ponds, as well as perennial and seasonal springs and ponds, to provide habitat for the California red-legged frog under alternative F.	"Chapter 2: Alternatives, Alternative F" has been revised to indicate that NPS would develop a restoration plan that would identify California red-legged frog priority habitat in the planning area. Priority habitat areas would be maintained according to the plan. The EIS notes, however, that the NPS's capacity to maintain all documented resource habitat features requiring maintenance would be limited.

ID	Concern Statement	Response
174	Commenters suggest that the final EIS provide additional analysis of previous and ongoing impacts of ranching on marine mammals at the park as a result of water quality degradation.	Research has demonstrated that marine mammals can be at risk of exposure to bacterial pathogens introduced by terrestrial sources through freshwater runoff (Stoddard et. al. 2008; Greig et. al. 2014; Bailey et. al. 2015). Terrestrial sources can include human sewage, livestock operations, and wildlife species, including birds. Studies from the San Francisco Bay Area have demonstrated that marine mammals along more urbanized coastlines and near higher levels of freshwater outflow than at Point Reyes were more likely to test positive for pathogens considered to be markers for fecal contamination (Stoddard et. al. 2008; Miller et. al. 2010). In these studies, infectious diseases and bacterial infections were not identified as significant mortality factors affecting marine mammal populations. At Point Reyes, harbor seals, California sea lions, and northern elephant seals are the most common pinniped species. Both harbor seals and northern elephant seals give birth to pups in the park. Marine mammal exposure risk to poor water quality conditions and bacterial pathogens associated with park ranching operations must consider (1) the prevalence of small coastal watersheds, rather than large riverine systems, in much of the planning area; (2) dilution as runoff enters the ocean system, including the well-flushed Drakes Estero estuary; (3) the transient nature of pinniped species in and out of the park; and (4) the influence of other terrestrial inputs from areas outside the park, particularly in Tomales Bay. In addition, harbor seal pupping season during the spring occurs at a time of reduced run-off conditions, thus reducing exposure risk. Northern elephant seals pup near creeks draining from ranches into Drakes Bay during winter months with higher runoff. However, samples collected at Point Reyes and other locations by Stoddard et al. (2005) found that the presence of zoonotic enteric bacteria was higher in juvenile northern elephant seals that became stranded along the coast of central California than in seals on their natal beaches that had never entered the water. Additional text has been added in chapter 4 that describes the potential impacts on marine mammals related to the actions being considered in the EIS.
175	One commenter requested clarification on the relationship between the EIS and the Biological Assessments (BAs) and the process for agency review and approval and suggested that the EIS clarify Endangered Species Act (ESA)-specific terminology and explain what ESA determinations mean in the context of NEPA. Commenters suggest that ESA section 7 determinations should be included in the EIS, not just the BAs.	The requirements of NEPA and the ESA are guided by separate statutes, wherein the completion of each of the processes may provide information that can be used in the other process, but each has its own definitions and terminology only applicable to the particular statute. ESA terminology was only used in the description of the affected environment and alternative A as it related to prior consultations with USFWS and NMFS. Determinations made under the ESA do not have a direct correlation to a particular level of impact under NEPA. The ESA, together with its implementing regulations and policies, guide the determinations of effect on listed species discussed in the BAs. Under NEPA, considerations of significance in the EIS are based on the criteria included in section 1508.27 of the CEQ regulations.

ID	Concern Statement	Response
176	Commenters note discrepancies in ESA section 7 determinations for coho salmon and steelhead between the tables and text in the NMFS BA and recommends that they be corrected. Commenters also note discrepancies in the way coho salmon status is described throughout the EIS and suggest that this be corrected.	NPS noted the discrepancy between the narrative about effects determinations for coho salmon and steelhead in the text and the information in table 9 of the NMFS BA (appendix O). The BA was revised so the effects determinations consistently read "may affect, is likely to adversely affect" both the Central California Coast coho salmon and the Central California Coast steelhead. NPS is proceeding with formal consultation with NMFS in accordance with section 7 of the ESA.

Table 29. IS1400 – Issues and Impact Topics: Tule Elk

ID	Concern Statement	Response
177	Commenters request that the EIS provide additional information and analysis of the risk of Johne's disease and CWD from domestic livestock to tule elk populations. Commenters request additional information regarding measures that are being taken or would be taken to monitor for and limit the spread of disease. They also request a discussion of the role manure management plays in the spread of Johne's disease. Commenters also express concern about potential impacts of Johne's disease on human health.	See response to Concern ID 168, which addresses potential transmission of Johne's disease among wildlife and domestic livestock, including the role of manure management. CWD is not present in California and is not known to affect domestic livestock. Therefore, there would be no potential for transmission of CWD among wildlife and domestic livestock. Although the bacterium that causes Johne's disease can infect humans, it has not been conclusively linked to diseases in humans (Collins and Manning 2019). *Mycobacterium avium ssp. paratuberculosis* (MAP) or associated immune responses have been detected in humans with various ailments and diseases, most notably Crohn's disease (Collins and Manning 2019). The symptoms of Crohn's disease in humans are similar to the signs of Johne's disease in ruminants. This has led some researchers to hypothesize that MAP causes Crohn's disease in humans. However, no definitive evidence is available proving MAP causes Crohn's disease in humans (USDA-APHIS 2008; Collins and Manning 2019). Although MAP has been documented to infect humans and there are reasonable pathways by which humans could be exposed to MAP through infected animals or animal products, whether or not MAP is a zoonotic pathogen remains unclear. Per the California Department of Food and Agriculture and the USDA Animal Plant Health and Inspection Service, Johne's disease is not a reportable disease and is not managed by these regulatory agencies with regard to human health risks. Collins, M., and Manning, E. 2019. Zoonotic Potential. Johne's Information Center. University of Wisconsin, Madison. School of Veterinary Medicine. Available at: https://johnes.org/zoonotic-potential/. Accessed December 13, 2019.

ID	Concern Statement	Response
178	One commenter recommends that the context for analyzing tule elk impact under alternative C should be limited to the planning area. The commenter indicates that the analysis should not consider the removal of the Drakes Beach herd in the context of the state-wide elk population or CDFW management practices. The commenter also states that tule elk should not be described as a native species because it was reintroduced after having been previously extirpated from the planning area.	The EIS analyzes impacts of the alternatives on tule elk in the planning area. However, because NPS manages tule elk at the park in collaboration with CDFW and because some management actions would have implications beyond the planning area (e.g., removing the Drakes Beach herd), impacts were also considered in the context of the state-wide population. This provides context for the action by considering the population locally and regionally, including the entire range-wide population. The EIS appropriately describes tule elk as a native species because they are native to the Point Reyes Peninsula and the Olema Valley and endemic to California. Although tule elk were reintroduced after having been previously extirpated from the planning area, the species remains native to the park.
179	Commenters indicate that the EIS does not accurately characterize damage to ranching operations caused by tule elk. Some commenters suggest that the EIS underestimates the amount of physical and economic damage to ranch operations (e.g., damage to equipment and infrastructure, consumption of livestock feed, and injury to livestock). Other commenters suggest that claims of tule elk damages to ranching operations are questionable and have not been substantiated with appropriate documentation or other evidence.	Impacts of elk on ranches are discussed in chapter 3 of the EIS, and NPS has updated this section with information observed since publication of the draft EIS. Known elk impacts on ranches are noted to the extent verified by NPS through observations or in reports from park ranchers. At the Drakes Beach area, hay consumption by elk has increased since publication of the draft EIS. However, more information is needed to understand the magnitude of the impact on ranch operations. NPS does not know (1) how much feed is consumed by elk that would otherwise be eaten by cattle or (2) how much extra feed must be given to cattle because of pasture grass consumed by elk. However, alternative B proposes to maintain the population of the Drakes Beach herd within its core area and at 120 animals. The Limantour herd would be managed to prevent new herds from forming in the planning area. As a result, the economic and physical impacts of elk on ranches in this area are expected to remain relatively stable over the life of the plan.
180	Commenters indicate that the EIS does not adequately consider the effects of ranching on tule elk. They note that ranchers may be harassing tule elk in an effort to keep them off ranchlands, causing impacts inconsistent with the goals of the 1998 Tule Elk Management Plan/EA. Commenters note that the draft EIS does not adequately evaluate the positive impacts of tule elk to the environment and the negative impacts of the proposed lethal management practices. Commenters suggest that the EIS include more discussion about the impacts of fencing on tule elk herds, particularly during drought years.	The commenter provides no evidence that existing ranching operations, competition with cattle, hazing, and lethal control are limiting elk population growth. Populations are steadily increasing and are estimated to reach 2,800 elk or more in Point Reyes over the next 20 years if left unmanaged. Wildlife management is the sole responsibility of NPS. Ranchers are not authorized to harass wildlife and could be cited for violating NPS regulations and their lease. Chapter 2 outlines the specific elk management actions under each alternative, including lethal removal. The impacts of these management actions on elk are discussed in chapter 4. There are no fences in the planning area that limit elk to a geographic location. The fenced elk population on Tomales Point is outside the planning area. For a discussion of how the elk herds responded to the recent drought, please refer to the 2013–2014 elk report for Point Reyes (Bernot and Press 2016).

ID	Concern Statement	Response
181	Commenters express concern that the EIS does not accurately characterize the carrying capacity of elk in the park. They recommend that the EIS consider the park's carrying capacity for tule elk in the absence of cattle. Commenters state that additional research and data are needed to accurately determine carrying capacity. Commenters state that the description of baseline conditions for tule elk populations and use of the Tule Elk Management Plan/EA distorts the analysis and impacts of alternatives in the draft EIS because the Tule Elk Management Plan/EA did not consider tule elk populations moving into ranchlands in its analysis. Commenters indicate that relying on the 1998 analysis results in a distortion of the historical elk population and geographic range and violates NEPA.	Alternative F considers a complete phase out of ranching and no interference with continued growth of the tule elk populations in Point Reyes. As noted in the EIS "the existing free-range elk herds at Drakes Beach and Limantour could potentially expand to 2,800 individuals over a 20-year period." NPS's best professional judgement is that 2,800 elk is below the carrying capacity for elk at Point Reyes, thus making a carry capacity analysis unnecessary for the purposes of this 20-year planning effort. The 1998 Tule Elk Management Plan/EA does provide a map (figure 7) on page 48. Although one commenter refers to this map as "the Designated Elk Range that was agreed upon in 1998," the actual title of the figure notes this area as the "proposed area for relocated population." There is no language in the EA suggesting that elk would be restricted to this proposed area, and in contrast, multiple sections of the EA predict that elk may roam outside the area. The EA also states that "The Seashore will not attempt to establish new herds that require permanently fenced, restricted ranges." Although the current number of elk on ranches was not predicted by the 1998 EA, this is the appropriate baseline condition that was described in this EIS in accordance with NEPA guidance. Impacts of elk on ranches are discussed in chapter 3 of the EIS which includes population and distribution information collected after the 1998 Tule Elk Management Plan/EA. The EIS has also been updated to include information on new observations documented since the publication of the draft EIS.
182	Commenters request revisions to figure 2 to label Coast Camp, Glenbrook and Muddy Hollow drainages, and Glen Camp. A second commenter requested the EIS include maps to depict locations where tule elk would be present under the preferred alternative.	Under alternative B, NPS would be committed to maintaining the Drakes Beach herd within the current core use area and to not allowing the establishment of new herds in any portion of the planning area. However, alternative B would allow male elk to wander throughout the planning area; therefore, a map noting where elk would be allowed to occur is not needed. Requested revisions to figure 2 have not been made to maintain consistency in the level of detail provided in all maps.
183	Commenters suggest numerous modifications to the forage model to help the public better understand the impact of elk on ranch forage. Commenters recommend that the model include the impact of other wildlife on ranch forage and refine annual rainfall input data to include early and late segments. Commenters also request clarification on how the forage model was used to calculate forage consumption by elk, quantify economic impact, and calculate forage offsets.	The forage model includes a natural decay rate (Frost et al. 2005), which in part takes into account loss to herbivores. While the commenter is correct that other wildlife consume forage in the ranch pastures other than elk and cattle, NPS does not have data on the population densities and forage consumption rates of other herbivores to incorporate into the forage model beyond using a standard for the natural decay rate. Rainfall is not an input into the forage model. Instead, the output provides a probability of meeting RDM thresholds over the long-term given natural variation in rainfall. The model evaluates varying levels of productivity as a proxy for rainfall. The commenter is correct that early versus late rainfall has an impact on forage availability. Future revisions to the model could explore the variability in the timing of forage availability. Commenters had questions on the elk inputs used in the model for C Ranch forage. NPS used the available GPS collar data and observational data to estimate the number of days male and female elk spend on C Ranch during the year. Based on a literature search, NPS determined that the daily forage consumed by elk is between 20-25 grams of forage per

ID	Concern Statement	Response
		kilogram of body weight. Body weights for male and female elk were determined from necropsies of Point Reyes elk collected from fall 2015 to spring 2016. Male elk averaged 222 kilograms whereas female elk averaged 155 kilograms. The above information was used to estimate annual forage consumption by male elk and female on C Ranch for use in the forage model. Because elk concentrate in certain pastures on C Ranch and C Ranch has a practice of rotating cattle through different ranch pastures, the forage model could be improved over time if forage consumption were modeled at the pasture level rather than for the entire ranch. In addition, continued elk and RDM monitoring on C Ranch would help to determine the validity of the model and suggest areas for improvement. The commenter noted that the model needs to consider the difference between milkers and the heifers run by C Ranch on the D West pastures. The commenter is correct; the model for C Ranch did not include the D West pasture. The D Ranch pasture, where elk also spend time, can be modeled separately. The commenter translates forage consumption by elk to the economic impact to C Ranch. The NPS forage model does not attempt to do this and instead focuses on meeting range management goals that meet the RDM standard of 1,200 lbs per acre at the end of the growing season. The commenter is correct that yearling elk, which are lumped and assumed to be females in the model, consume less forage than adult elk. This assumption affects the forage model output. NPS could explore breaking yearlings into a separate group during future revisions of the forage model. Because the population maximum for the Drakes Beach herd only partly relies on the forage model, no change is necessary at this time. The same commenter is also correct that the model assumes 100% dietary overlap, while there is likely a degree of niche partitioning and reduced competition between tule elk and cattle. However, because the model evaluates RDM, the model output would be the same no matter the degree of dietary overlap that exists.
184	Commenters suggest that the EIS include more discussion of selective culling on tule elk population demographic and genetic fitness. Commenters express concern that the EIS does not adequately consider the effects of limiting tule elk herd size on genetic diversity within the population.	Should an alternative involving lethal removal be selected for implementation, NPS would consult with CDFW biologists, who also use harvest models to determine tag allocations for each of the designated elk hunts throughout the state, to assist with developing a detailed implementation strategy, prior to conducting lethal removal operations. Targeting older animals to lower calving rates, as noted in the EIS, may be an implementation strategy. Since all elk grow older, regardless of genetics, there is no reason to believe that such an approach would affect the genetic diversity of the elk population. It should be noted that genetic diversity among California's tule elk herds is low because of a major genetic bottleneck that occurred in the 1800s as a result of overhunting.

ID	Concern Statement	Response
185	Commenters suggest that the EIS include more discussion about the impacts of hazing on tule elk herds, particularly during drought years. They indicate that hazing is an ineffective method to manage elk herds to specific geographic locations.	Under alternative B, NPS would continue hazing elk off ranch lands to areas that have sufficient water. For example, when on C ranch, elk are hazed toward D Ranch, where NPS has maintained a water source year-round since 2013. During the 2012–2015 drought, the Drakes Beach herd increased in size while being hazed, so there is no evidence that hazing should be a concern in this context. Hazing is not a perfect solution for mitigating all elk grazing impacts on C Ranch, but it would alleviate some effects.
186	Commenters suggest that the draft EIS failed to accurately analyze impacts from grazing under alternatives B and F. One commenter felt alternative B underestimated the benefits of co-grazing and the value that grazed land provides, including improved elk habitat. Other commenters suggest adverse impacts on rangeland could occur from the elimination of cattle grazing and request the final EIS analyze how an expanded elk herd under alternative F would offset or mitigate the adverse impacts on rangeland. Commenters suggest the analysis should include a forage model that calculates RDM in the grazing areas for just tule elk to analyze the impact of increased tule elk grazing and reduced cattle grazing.	The commenter suggests that the grazing pressure of an increasing tule elk population under alternative F is not properly considered with regard to the control of invasive species or the maintenance of coastal prairie land. While the forage model could be run in the absence of cattle and with an increasing elk population, the value of such an effort would be limited because NPS cannot accurately predict the localized densities of tule elk across the planning area as the population increases. In addition, the impact of an expanding tule elk population is difficult to predict because NPS does not know if elk will be increasing at a rate or in the correct areas that could in turn control expanding invasive plant populations or native shrub communities that are encroaching on coastal prairies. In addition, it should be noted that elk control of some invasive plant species, such as wild radish and poison hemlock, would be limited because elk do not feed on these species. Lastly, elk would have no effect on Golden Gate north district lands because elk would be restricted to Point Reyes under all the alternatives. The EIS has been updated to reflect this information.

Table 30. IS1500 – Issues and Impact Topics: Visitor Use, Experience, and Access

ID	Concern Statement	Response
187	One commenter suggests altering the decision sequence proposed for how vacant structures are used, to giving higher priority to uses that create affordable housing.	Alternatives in chapter 2 that propose to reduce or eliminate ranching provide programmatic-level direction on the future adaptive use of structures that would no longer be used by ranch operations. Priority consideration would be given to uses that further NPS operational needs. Structures not needed for NPS operational needs would be considered for adaptive use in a manner compatible with park purpose and desired conditions. Housing for NPS, park partner staff, and ranch workers could fit within either of these criteria. It is also conceivable that adaptive use proposals could include housing for other types of tenants. However, providing affordable housing for the West Marin community at large is not a park purpose or a desired condition in the GMP Amendment. As a result, NPS declines to change the sequencing order presented in the EIS.

ID	Concern Statement	Response
188	Commenters disagree with the analysis that park visitation rates would continue to remain the same over time and note that the population in the surrounding metropolitan areas is quickly increasing, which would affect visitation at the park. Commenters suggest revising the future visitation rate predictions by using the Anza Borrego spring display, considering the population growth of the Bay Area, and including overseas visitors.	The assumptions about visitation levels are based on data collection protocols that are specifically developed for each park unit and can be viewed by the public at irma.nps.gov/Stats. The NPS Social Science Program updated Point Reyes public use counting and reporting in 2017. The report includes the locations of inductive loop traffic counters, person per vehicle multiplies, estimated vehicle counts, length of stay and multipliers for each location. Even prior to the updated counting methodology, total annual visitation at Point Reyes has remained relatively consistent overall, with a slight decrease since a peak in 2013 of 2.64 million visitors to 2.20 million visitors in 2019. Therefore, despite changes in surrounding population growth, visitation to Point Reyes has remained relatively steady. As a result, no changes to the assumptions for analysis regarding visitation numbers were made.
189	Commenters also ask that electric bikes be prohibited on the Estero Trail to preserve the soundscapes. One commenter requests prohibiting bikes on former ranch roads, such as Abbotts Lagoon, Kehoe, Chimney Rock and Estero Trails, and suggests implementing the prohibitions in conjunction with newly opened routes so that there will be no short-term diminution of biking opportunities.	The Superintendent's Compendium identifies where bicycles and electric bicycles are allowed in the park, including the planning area, consistent with US Department of the Interior policy on electric bicycles. Comments about specific uses on individual trails are more detailed than the programmatic guidance in this GMP Amendment. Site-specific decisions would be addressed at the implementation level. Comments are noted and will be recorded for future consideration.
190	Commenters request information about how NPS will perform its mandate of preserving the scenery of the national park on unkempt leased lands and dairy ranches. They ask that scenic resources and value be added to the EIS for several reasons: (1) scenic resources are explicitly called out in the Organic Act and in NPS *Management Policies*; (2) they are strongly implied in Point Reyes' enabling legislation, and (3) they are as important to the value of the park as cultural and historic resources. Additionally, commenters indicate that the final EIS should describe the reasonably expected changes in major vegetation types in the absence of intensive management and that the description should include a rough estimate of the scale of changes and if the anticipated changes would constitute impairment of the park's scenic resources and values. One commenter notes that without major mitigation efforts, much or most of the grassland and prairie would quickly transition to coastal scrub and invasive species, which would have significant impact on the	Consistent with the Organic Act and the park's enabling legislation, the park's foundation document identifies wild beaches, dramatic cliffs, detached coastal formations, and coastal grasslands as the primary scenic resources that NPS seeks to protect in managing the park. The GMP Amendment does not propose any physical changes to detached coastal formations, cliffs, or beaches. Coastal grasslands are a contributing element to both the Olema Valley Dairy Ranches Historic District and the Point Reyes Peninsula Dairy Ranching Historic District. As such, impacts on coastal grasslands are addressed in the "Cultural Landscapes, Historic Districts, and Historic Structures" section of chapter 4 in the EIS. This section also addresses maintenance of ranch structures and the impact of such maintenance on aesthetic qualities such as scenery and setting. The vegetation section of the EIS also addresses impacts to coastal dunes and grasslands. The issue of impairment of fundamental park resources and values will be addressed in the Non-Impairment Determination and released with the ROD. Finally, the GMP Amendment proposes some actions that would improve recreational opportunities, including improved trials and trail connections and additional day-use and overnight opportunities that would enhance the ability of visitors to experience the park's scenic resources. Because scenic resources affected by plan actions are adequately addressed in these sections, a section dedicated to scenic resources is not necessary.

ID	Concern Statement	Response
	park's scenic resources. The commenter notes that this topic needs to be treated explicitly in "Chapter 4, Environmental Consequences" for alternatives D, E, and F.	
191	Commenters note that the draft EIS acknowledges that visitor use and experience would be negatively affected if the Drakes Beach herd were not allowed to expand, but that the draft EIS incorrectly assumes that visitor use and experience would not be affected by the elimination of the herd. One commenter notes that potential adverse effects of lethal elk management include reduced enjoyment by park visitors, reduced public support, and increased costs due to expanded litigations and protests. They indicate that expanded elk herds would allow for increased viewing opportunities. One commenter suggests creating a public opinion survey to quantify the degree to which the public opposes lethal elk management and associated costs. Commenters also express concern that diseased and dying elk infected with Johne's Disease and CDW would negatively affect visitor experience.	NPS analyzes the different impacts of elk management on visitor use and experience in chapter 4 of the EIS. The visitor use, experience, and access impact analysis is organized such that the impacts from elk management actions under the different alternatives are presented under the "Elk Management" subsection in this section. For example, the impacts of eliminating the elk herd under alternative C are described in the "Elk Management" subsection under alternative C. Similarly, the analysis under alternatives D, E, and F state that elk viewing opportunities would be expanded under these alternatives, benefitting the visitor experience. Furthermore, table 7 of the EIS, compares the alternatives and the management actions proposed in each alternative but does not compare impacts. As noted under Concern ID 238, EIS analysis is based on best available data, not public opinions on NPS management actions. Elk in the park already have Johne's Disease; viewing potentially diseased elk would not be a change from existing conditions and would not alter the current visitor experience. CWD has not been detected in the park. For the reasons described above, no changes have been made to the analysis in the EIS.
192	Commenters suggest that the EIS consider educational benefits and enhanced visitor experience opportunities from diversification activities, including the proposed on-farm sales of products produced in the planning area, farm tours, and increased interpretation opportunities. Commenters note that farm tours could teach the public about crops, food production, ranching history, and natural resource conservation; these activities would be of little cost to taxpayers.	Chapter 4 of the EIS describes the range of potential benefits to visitor experience from diversification activities and the elements common to all action alternatives.

ID	Concern Statement	Response
193	Commenters raise concerns regarding impacts on visitor use and experience from diversification activities, including increased traffic, poor road conditions, reuse of buildings not for public use, and detracting from the pastoral scenery. They request mitigation measures for adverse impacts of diversification on visitor use be included in the final EIS. Specifically, commenters are concerned that major access roads are not addressed in the draft EIS because they are outside the planning area. The commenters note that Sir Frances Drake Boulevard was not built for the heavy vehicles that are used for current operations, and impacts would be exacerbated because new ranch uses would cause an increase in maintenance costs. Commenters note that the transportation impacts and public safety issues, including park access, needs to be addressed in the EIS, including analysis that removing dairies would end traffic made by heavy milk and hay trucks and would reduce the wear on Sir Frances Drake Boulevard, ultimately reducing public expense.	One of the goals of the diversification proposals is to provide for improved visitor experiences in the planning area. None of the proposed diversification activities are expected to provide measurable contributions to increased traffic or other factors that may negatively impact visitor experience. Sir Francis Drake is a County Road and is the subject of a multimillion-dollar rehabilitation project to improve the road condition (identified in cumulative projects) to lift and reroute it from the most sensitive riparian and wetland areas. The project is designed to accommodate all current vehicle and truck traffic. Other heavy vehicle uses occur on these roads, including busses for the winter shuttle program. Furthermore, appendix I provides a framework for monitoring and managing the capacity of the planning area and provides indicators, thresholds, and strategies for issues including crowding and congestion, parking, and limited access to the ranches.
194	Commenters recommend considering opportunities for affordable housing for ranch workers to offset visitor impacts. One commenter suggests repurposing historic buildings for public visitation, education, and interpretation instead of vegetable processing facilities, cheese production, and tourist accommodations. Commenters also indicate that NPS must justify new historic building use and provide the costs to the public for any changes in the use of the structures.	NPS appreciates the suggestions for building reuse opportunities in the planning area. The ideas are all included in the range of alternatives for potential reuse of buildings at a programmatic level. Once an alternative is selected for implementation, potential reuse options for vacant structures would be considered, and all appropriate compliance would be completed.

ID	Concern Statement	Response
195	Commenters note that most visitors come to the park to view elk not ranching; therefore, operational ranches do not increase visitation. Commenters request a general survey of the park visitors to determine if they come to view wildlife or ranches. Commenters also suggest that ranching interferes with public enjoyment by restricting access; impacting aesthetic resources with odors, lighting, noise, abandoned agricultural equipment, barbed wire, and trash; and creating unsafe interactions between the public and cattle. One commenter suggests adding ranch aesthetics to the Management Activity Standards and draft lease agreements and requiring higher RDM in poor soil areas, a 100-foot buffer for manure spreading from any public thoroughfare, proactive prescriptive grazing and mowing, humane treatment of cattle and wildlife, and proper storage of personal items out of public view. Commenters also note that public use and enjoyment is analyzed incorrectly under alternative F because most visitors do not come to the park to see ranching, and ranching does not conform to historic standards.	Visitors come to the park for many reasons. The EIS evaluates impacts on all visitors regardless of the experience they are seeking. The EIS analysis notes that while some visitors may appreciate the ranches within the park, other visitors may have a negative experience because of ranch operations (e.g., odors). Elements common to all action alternatives, including improved signage and trail connections, aim to reduce the misperception of restricted access. Similarly, alternative F details both beneficial and adverse impacts from ranch removal. The analysis does not weigh the number of visitors that experience each impact but discloses the potential impacts on any given visitor. Visitors have access to ranchlands but not to the private residences or occupied structures located on them. The lease/permit template includes a provision that addresses the treatment of livestock and management of refuse and has been modified to more specifically address abandoned agricultural equipment and wire. As noted in the zoning discussion, manure spreading and other more intensive activities are limited to the Pasture subzone. Finally, as documented in Concern ID 197, ongoing ranching is an appropriate strategy to preserve the historic districts in the planning area The EIS analysis in the “Visitor Use, Experience, and Access” section of chapter 4, notes “Without active ranching, NPS generally anticipates additional public recreational and visitor opportunities across the landscape, including adaptive use of ranch complexes; however, overall visitation is not expected to change from existing conditions.” It is acknowledged that under alternative F, use patterns may change, and additional visitor opportunities would be available; however, the basis for the expectation that visitation would remain stable is related to long-term visitation trends, which have remained flat over the past decade, as well as road access and other traffic-related factors.
196	A commenter suggests the history of bird watching in the park should be considered a historic cultural resource and the draft EIS should provide measures to protect historic habitat used by vagrant birds to allow for public bird watching opportunities.	NPS acknowledges bird watching as an important recreational activity in the park and covers it as part of trail-based recreation opportunities in the GMP Amendment; therefore, no change to the EIS was necessary. The goal of increasing recreation opportunities in the planning area includes increasing opportunities for birding and protecting the resources that support bird populations.

Table 31. IS1600 – Issues and Impact Topics: Cultural Landscapes, Historic Districts, and Historic Structures

ID	Concern Statement	Response
197	Commenters suggest active industrial ranching operations and activities in the planning area should not be considered cultural resources or features of the park, and they note that the draft EIS does not address how the operations are of historic value or cultural resources and why the park needs to manage human residence and private commercial operations under the National Historic Preservation Act. Commenters suggest the draft EIS discussion of the history of ranching and cultural significance on page 3 and 171-172, should discuss the history of the diversity of farms and agricultural practices across the landscape, which represented a resilient agricultural community and supported the local economy. Commenters suggest the draft EIS does not recognize the working nature of the "continuing" landscape in the pastoral areas of the Seashore, including the current day-uses of the ranches as cultural practices. Commenters suggest the draft EIS does not discuss how the historic districts include both the historic ranch buildings and the ongoing cultural practice of ranching, as part of the overall cultural landscape, and would therefore, be impaired by alternatives E and F. Commenters also suggest the draft EIS should apply guidelines of UNESCO's 2009 World Heritage Cultural Landscapes: A Handbook for Conservation and Management in management of the cultural landscape.	As suggested in these comments, ongoing cultural practices and land use may contribute to the significance of a cultural resource. In the case of the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District, they were both identified as significant under National Register Criterion C for the vernacular landscape and architecture that reflects the broad trends in the development of the dairy industry, the ownership regimes of the ranches, and the climate and natural features of the environment. The land use of ranching clearly plays a role in this aspect of the properties' significance, as this routine practice created, maintained, and reshaped the landscape for a century. NPS policy for properties where land use is a primary reason for their significance, is to balance the perpetuation of use with the retention of the tangible evidence that represents the history. Such uses are still subject to legal requirements, policy, guidelines, and standards for natural and cultural resource preservation, public safety, and special park uses (NPS *Management Policies*, section 5.3.5.2.6). Additionally, NPS documentation of these properties emphasizes the extent to which the continued practice of ranching maintains the critical aspects of the properties' integrity of design, setting, feeling, and association. These aspects of integrity would be extremely difficult to maintain for such a large-scale agricultural property without continued use. The EIS has been revised to clarify this aspect of the properties' significance in the affected environment and in the discussion of environmental consequences for each of the alternatives. It should be noted however, that intangible resources such as the cultural practice of ranching are not themselves cultural resources. They must relate to a tangible property. Although the categories of cultural landscapes recognized by UNESCO and its management framework for cultural landscapes are recognized as a good model for cultural landscape preservation, NPS must follow its own management policies.

ID	Concern Statement	Response
198	Commenters suggest the draft EIS does not disclose the methodology used to maintain historic value at the park, determine the scope of historic value, and balance the value against other needs. Commenters suggest the draft EIS should discuss the definition and applicable concept of what a cultural landscape is because current discussion in the draft EIS reflects approximately 150 years' worth of history but does not explore cultural resources outside ranching and ranching infrastructure, such as indigenous people, Spanish occupation, and whaling. Commenters also suggest NPS policies are inconsistently applied to historic uses. Commenters suggest the historical objects dedicated to ranching should be appropriately proportional to the duration of time it represents, such as limiting it to Pierce Point Ranch. Commenters also suggest the draft EIS does not make it clear if NPS has fulfilled its duties under the National Historic Preservation Act to analyze the impact to cultural resources, such as to the native Coast Miwok and other tribes, and to properly consult with all tribes.	Point Reyes contains a large number of cultural resources associated with Native American history and land use; the Mexican period; maritime history; and a variety of other cultures, historic periods, and themes that are managed by the NPS as archeological sites, historic structures, and/or cultural landscapes. NPS evaluated these resources to determine if the potential impacts related to the range of alternatives under consideration warranted full analysis in the EIS. In general, these resources were not carried forward for full analysis because they occur outside the planning area, are not vulnerable to or could be avoided by the activities being considered, or they are already excluded from ranch activities. For this reason, these important cultural resources are not analyzed in the EIS as extensively as the two ranching historic districts. Compliance with the National Historic Preservation Act is being coordinated concurrently with the NEPA process and includes consultation with the Federated Indians of Graton Rancheria, the sole Tribe culturally affiliated with the lands in the planning area.
199	Commenters note the differences between modern and historic ranching. Specifically, they suggest that because dairy practices have evolved, modern dairy cows require more range compared to other classes of livestock, such as beef cattle, whose protein needs are lower. Commenters suggest the draft EIS analyze the increased infrastructure needs, larger herd sizes, higher nutritional needs, and varying pasture requirements of dairy operations compared to that of grazing beef cattle, in determining the operation and infrastructure historical significance or impacts on historic districts and cultural landscapes. Commenters suggest the park preserve the historical and cultural significance of ranch buildings and infrastructure through park interpretation by retaining fewer cows and demonstrating how ranches historically operated. Additionally, commenters note that preservation of historic practices, tools, and methods of ranching are not discussed in the draft EIS, and no explanation is	NPS believes that the lease of the historic ranches and their continued use by dairy and beef cattle operations is an effective strategy for the preservation of the cultural landscape of the Point Reyes Peninsula Dairy Ranches Historic District and the Olema Valley Dairy Ranches Historic District. Although the requirements of a modern dairy or beef cattle operation have changed since the end of the period of significance of the historic districts, continued ranching is a compatible use that actively maintains the integrity of feeling, setting, and association of the historic districts that would be difficult to maintain under an alternative use. The existence of more recent ranch buildings in these historic districts was considered during the National Register listing process. Although they are identified as non-contributing resources, their existence did not compromise the integrity of the historic districts. Any proposals for new structures or diversification activities would need to consider the effects of the individual proposal on the historic districts and the contributing resources that compose them. Such proposals would need to be reviewed in accordance with the National Historic Preservation Act and would have to be consistent with the rehabilitation standards of the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. Additionally, the continued use of ranch buildings and structures and cyclic maintenance conducted by rancher operators would contribute to the long-term preservation of the district's contributing buildings and structures. The portion of the historic districts that occur in the planning area

ID	Concern Statement	Response
	provided as to why the park does not provide for these exhibits. Commenters also suggest the proposed diversification activities may be inconsistent with the historic designation areas, but the issue is not addressed in the draft EIS. Commenters suggest the ranching buildings in the planning area may be considered cultural resources, but the activities of beef and dairy ranches are not historic because the National Register of Historic Districts (National Register) does not require active ranching as a condition of historic designation and modern ranching structures diminish the historic district. Commenters also suggest that modern ranching and farming operations in the two historic districts conflict with the historic character-defining features of the district from its period of significance, specifically noting the lack of public access to the historic resources of the district as conflicts with the park's historic preservation goal of providing public access and educational opportunities to publicly owned historic resources. Further, commenter suggest the draft EIS should discuss how and why the park's mandate to preserve the historical heritage of ranching in the park was to first offer temporary ranching and grazing leases, to now providing long-term and indefinite commercial ranching leases the entirety of the pastoral zone. Commenters indicate that the need to preserve the cultural landscape in the park is fulfilled by Pierce Point Ranch, a non-working historic ranch; however, a more complete history of the property, including the potential that Johne's disease was present during operations, should be discussed. Commenters suggest the draft EIS explain how alternative F would benefit the public without causing any environmental impacts or public resource losses, similar to Pierce Point Ranch. Commenters note that the draft EIS does not clearly explain why activities under alternative F, including the vacancy of the six dairies, reduction in wear-and-tear, and adaptive use and interpretation of historical ranching structures would have adverse impacts.	includes approximately 73% of the total land area of the district, 156 historic buildings, 54 historic structures, and 30 historic pasturelands. As discussed in alternative F, identifying a compatible use for this large number of facilities would likely be impracticable given the nature of the facilities, their location, and the current amount of deferred maintenance. With this in mind, under alternative F many historic buildings would become vacant for an extended period and fall into disrepair at an accelerated rate, and the integrity of the associated grazing pastures and related features would also diminish over time. NPS can maintain the Pierce Point Ranch as an open exhibit for public interpretation; however, this would not be feasible for all the historic ranches included in the historic districts because of the cost of maintenance.

Table 32. IS1700 – Issues and Impact Topics: Socioeconomics

ID	Concern Statement	Response
200	Commenters note that a community and regional context of the planning area is missing from the analysis in the draft EIS and request a full analysis of how diversification activities could improve local food security, food safety, and relationships with the local gateway communities. They also request an analysis of how diversification activities would allow the ranchers in the planning area to compete with their counterparts outside the planning area, specifically those ranchers that Marin County supports through streamlined permits and approvals for diversification activities, on-farm processing, and on-farm sales.	While the proposed zoning framework would authorize potential diversification activities, NPS cannot assume the extent to which ranchers would adopt these activities and the subsequent effect on local food security and community relationships. As a result, this type of analysis would be speculative. As acknowledged in the EIS, diversification activities could provide an economic benefit, but that impact is likely to be small at both the local and regional scale.
201	Commenters indicate the draft EIS analysis does not consider the economic impact of changes in park visitor use resulting from the removal of tule elk herds from viewing opportunities or improvements to recreational opportunities, including direct and indirect impacts of visitor spending in the local economy; improved and increased trails, campsites, wilderness and tule elk viewing areas; and overnight accommodations. Commenters suggest the draft EIS fails to accurately assess the socioeconomic impacts across the range of alternatives, including the socioeconomic impacts of replacing ranching operations with other opportunities, including visitor activities. Commenters suggest the draft EIS analysis for alternative F does not detail the methodology for which the finding of no expected change in visitor numbers is based on. Commenters also suggest that the draft EIS states that the loss of residents and workers would negatively affect the environment, yet the increase of public use and enjoyment is not expected to offset this impact through increased visitation. One commenter also suggested the EIS does not consider that dairy products, specifically milk production, is produced in greater quantities that can be locally consumed, and because of this dairy farming is less profitable for farmers and ranchers.	NPS does not anticipate a noticeable change in visitation based on a change in elk viewing opportunities or additional recreation opportunities in the planning area. While visitor patterns may be altered to include visitation in different areas, visitation at the park has been steady for the past decade, a trend that is anticipated to continue. Please see response to Concern ID 188 regarding visitation assumptions. Regarding the viability of dairy operations, NPS does not regulate how ranchers elect to run their businesses, beyond operating within the terms of their lease/permits. The EIS notes that total dairy production in the county has been declining for eight years.

ID	Concern Statement	Response
202	Commenters state that the EIS does not consider the effects of continued subsidies, including reduced fees and favorable lease terms, for ranching operations inside the national seashore on other dairy and ranching operations outside the national seashore, which is in violation of NEPA. The EIS should consider these economic impacts both regionally and locally.	As discussed in response to Concern ID 48, the US Department of the Interior AVSO oversees appraisals and makes determinations regarding the fair market value of the ranch operations. Fair market rent typically considers the size and location of the premises, the activities authorized under the lease, and the lessee's obligations under the lease. If an alternative allowing for continued ranching were selected for implementation, lease/permits would require ranchers to pay a fair market rental rate. NPS does not provide subsidies to ranchers, and many lease provisions are more restrictive than would be found in leases outside the park.
203	Commenters suggest the socioeconomic analysis does not acknowledge or discuss the economic role that agriculture and ranching activities hold in Marin County, Sonoma County, and surrounding communities, including dairy and beef products, jobs, housing, primary school enrollment, and quality of regional food. Commenters suggest the socioeconomic analysis in the draft EIS inaccurately characterizes the economic impact of the alternatives to beef and dairy operations in the planning area because the analysis compares the production value of beef and dairy operations within the planning area to the regional economies of Marin and Sonoma Counties, which includes a large wine industry. They indicate that the analysis should compare the revenue from agricultural leasing in the planning area to revenue from visitors to other California national parks, specifically Muir Woods and Yosemite, to show that the economic success of national parks is a function of the natural world and not a result of historically recent cultural considerations. Additionally, commenters note that the draft EIS does not include a thorough analysis of impacts on the economy if agriculture and ranching activities were to be removed from the permitted park activities.	The EIS includes a detailed methodology for assessing potential economic impacts in both Marin and Sonoma Counties. Alternative F provides a thorough analysis of impacts if agricultural and ranching activities were to be removed from the planning area. Please see chapter 4, "Socioeconomics" of the EIS. NPS does not track or determine the income generated by park visits between "natural resource" visits and "cultural resource" visits. Therefore, no change was made to the EIS.
204	Commenters suggest that, under alternative B, a 20-year lease is not economically viable if the permitted area for cattle grazing is shared with tule elk. Commenters suggest that the socioeconomic analysis be revised to discuss this issue and acknowledge the impacts on the livelihoods of beef and dairy producers.	NPS understands that the presence of elk on ranches changes the operational considerations affecting park ranchers. The forage model indicates that it is possible to meet the RDM and other permit conditions on the most affected ranches with the proposed elk management approach. The scale of the socioeconomic analysis is at the planning area scale, not at the individual ranch scale; however, the analysis does recognize that the presence of elk affects each ranch differently. The analysis was updated to reflect this difference and notes the reported impacts from elk.

ID	Concern Statement	Response
205	One commenter notes that the draft EIS analysis discusses the number of jobs but not the quality and type of jobs that would be impacted across any of the alternatives. The commenter suggests that ranch and dairy permit holders are community leaders and members of conservation districts and removing ranching in the park would also affect these community roles.	The analysis presented here is consistent with best practices for economic analysis, which does not consider quality and types of jobs.
206	One commenter suggests NPS should compare the economics of private grazing leases in the park with the economy generated by recreation, per the 2006 NPS Economic Impacts Study.	Impact analysis under NEPA considers how the condition of a resource would change, either negatively or positively, as a result of implementing each of the alternatives under consideration. Because the general types of recreation are not assumed to change under the alternatives presented in the EIS, it is not necessary to analyze the economic impact of recreation in chapter 4 of the EIS. Additionally, visitation is expected to remain steady, and impacts from recreation/visitors would not change across the range of alternatives. The "Tourism and Travel" section in chapter 3 of the EIS summarizes visitor spending data from the most recent NPS Visitor Spending Report for Point Reyes.
207	One commenter indicates that the analysis for the one poultry operation in the planning area is flawed and provides specific suggestions for revisions to the analysis.	NPS has reviewed the data provided by the commenter and updated the EIS analysis accordingly.

Table 33. IS1800 – Issues and Impact Topics: Air Quality

ID	Concern Statement	Response
208	Commenters suggest the adequacy of the General Management Plan Amendment and Final EIS would be improved by reconciling its GHG emissions inventory with that of the Marin County Climate Action Plan, integrating opportunities for carbon offsets and carbon farm plans, which are provided by the Marin County Climate Action Plan and DRAWDOWN: Marin.	NPS understands Marin County is engaged in a planning effort to produce an updated 2030 Climate Action Plan; however, the schedule shows the process may not be complete until November 2020, which is after the expected completion of the EIS process. A summary of the 2019 Interim Community Greenhouse Gas Emissions Assessment has been added to chapter 3 of the EIS to provide additional context (including information on the total county-wide agricultural-related GHG emissions).

ID	Concern Statement	Response
209	Commenters state that the conclusion that alternative F would be "beneficial compared to existing conditions," is an understatement of its impact, given that it would yield a 100% reduction in emissions. They also state that the manner in which the draft EIS presents data is misleading, and instead of comparing emissions to other sources, the document should show how alternative F would eliminate emissions, whereas all other alternatives would continue to contribute to the parks NH3 and VOC emissions.	The beneficial effect that alternative F would have on emissions is appropriately explained in the EIS, including statements such as "virtually all ranching-related emissions of criteria pollutants and GHG emissions would end within five years, and the remaining emissions would eventually also cease." However, a new table has been added to the EIS to further clarify the specific quantity of emissions reduction under alternative F.
210	Commenters state that literature is available that shows that well-managed grazing provides ecosystem services, including a net benefit to the climate by sequestering large amounts of atmospheric carbon.	The EIS includes a qualitative discussion of potential carbon farming practices that could serve to increase carbon sequestration from ranching. Elements of the alternatives, such as riparian buffers, are consistent with carbon farming principles.
211	Commenters request that the final EIS further explain how emissions contribute to visibility impairment and ecosystem impacts from excess nitrogen deposition. Specifically, they request the final EIS explain that the reaction is reversible and the potential for the reaction to occur instead of implying that all NH3 would form particulate nitrate and affect visibility as well as accounting for carbon sequestration in soils relative to emission estimates.	Text regarding NH_3 has been clarified in chapter 3 of the EIS under the heading "Class I Areas and Protection of Air Quality Related Values." The EIS does not imply that all ammonia emissions would form particulate nitrate; nor does it imply that these reactions are not reversible. An exhaustive chemistry discussion of NH_3 is not appropriate for the EIS given the revised DOI NEPA policy and the CEQ requirements that an EIS "shall be concise, clear, and to the point" (1500.2 (b)). The EIS includes a qualitative discussion of potential carbon farming practices that could serve to increase carbon sequestration from ranching. Elements of the alternatives, such as riparian buffers, are consistent with carbon farming principles.
212	Commenters suggest that the EIS did not evaluate and incorporate mitigation measures to reduce GHG emissions, which is a serious omission given the challenges that climate change presents and suggest that phasing out cattle and dairy ranches is the only acceptable alternative to address the elimination of GHGs.	The EIS discusses GHG reduction opportunities in chapter 4, "Air Quality," including alternative manure management and carbon farming strategies. While ranchers may voluntarily implement carbon farming and methane digesters, these strategies are not required as part of the alternatives because they may not be feasible or appropriate for ranches of this scale. Additionally, many carbon farming methods are already included as additional elements of the alternatives or mitigation measures. Appendix F identifies NRCS Practice Standards that have greenhouse gas mitigation and/or carbon sequestration benefits on farms and ranches according to USDA NRCS (http://bfuels.nrel.colostate.edu/beta/NRCS_RankingTools.pdf), including Tree/Shrub Establishment, Conservation Cover, Riparian Forest Buffer, Riparian Herbaceous Cover, Critical Area Planting, Windbreak/Shelterbelt Establishment, Nutrient Management, Solid/Liquid Waste Separation Facility, Residue and Tillage Management, Grassed Waterway, and Filter Strip. Additional responses regarding climate change can be found in the responses to Concern IDs 244 and 129.

ID	Concern Statement	Response
213	Commenters question the scale of the air quality analysis and indicate that specific area impacts are not captured accurately. They state that the draft EIS should include air quality measurement at farm sites in addition to aggregate area levels, which would likely show emission levels that exceed applicable limits, with specific analysis of VOCs, NH3, ozone, and particulate matter (PM2.5) measurements at specific locations near concentrated farming operations and exposure to visitors (drivers, bicyclists or hikers).	The scale of the EIS air quality impact analysis (examining the overall park planning area) is appropriate given the scale of the proposed action. The EIS provides the potential change in emissions in the park under different alternatives, which is an appropriate method to inform decision making about the potential air quality implications of the alternatives. Characterization of localized air quality impacts at specific ranches would be cost prohibitive due to the amount of ranch-specific activity data that would be required to quantify ranch-specific emissions and define source parameters for dispersion modeling. In addition, mobile receptors such as drivers, bicyclists, or hikers would not be on ranch properties and directly exposed to ranch emissions for a prolonged time. The EIS characterization of existing air quality in the park based on available monitoring data is appropriate and consistent with the data used by NPS for air quality planning purposes. NPS participates in numerous national air quality monitoring networks and works cooperatively with other agencies to collect these data. These networks monitor ozone, visibility, particulate matter, and atmospheric deposition of (sulfur, nitrogen, NH_3, and mercury). A summary of in-park and "representative" monitors is available at: https://www.nps.gov/subjects/air/air-monitoring.htm The analysis identifies the pollutants for which Marin County is in attainment with the National Ambient Air Quality Standards (NAAQS) and those for which the area is designated as nonattainment. (NH_3 is not a regulated pollutant under the Clean Air Act, but the state of California considers it as a precursor to PM for planning purposes). There is not a NAAQS for VOC, but it is regulated as a precursor to ozone. In the state of California, the California Air Resources Board, along with local air quality management districts (in this case the Bay Area Air Quality Management District), have the regulatory authority to ensure compliance with the NAAQS, including permitting programs for stationary sources, the establishment of criteria pollutant monitoring networks, and development of plans to attain the NAAQS in nonattainment areas. These are the mechanisms for ensuring compliance with the NAAQS. In this circumstance, a pressing or compelling reason to install additional air monitoring equipment from an air quality perspective does not exist, nor is it required (per NEPA) to move forward with the plan. Furthermore, ranching and dairy operations are ongoing, and emissions are small relative to regional emissions.

ID	Concern Statement	Response
214	Commenters state that the draft EIS does not account for diversified livestock and mobile source emissions related to ranching, including diversification, in the planning area.	The EIS appropriately quantifies the approximate magnitude of current mobile source GHG emissions based on traffic data collected on park roadways. Traffic includes traffic related to existing ranch operations; however, it is not possible to determine the portion of traffic caused by ranch operations from these data. Regarding potential changes in ranch-related traffic as a result of diversification, these emissions are not specifically itemized. However, such emissions are expected to be a very small portion of the overall mobile source emissions given the number of visitors to the park and therefore would not appreciably change the relative comparison of overall mobile source emission between alternatives. The methodology section details how impacts from diversification were analyzed. The analysis accounts for up to 9,000 chickens. Non-cattle livestock would replace authorized cattle AU, and for the purpose of the analysis, the full AU authorization is used.
215	Commenters state that the GHG emissions analysis in the draft EIS is not comprehensive and a more detailed inventory of GHG emissions of all ranch activities is necessary to provide a complete impact analysis.	As noted in the response to Concern ID 214, mobile source emissions associated with existing ranching activities are factored into the analysis to the extent possible. While not quantified, the EIS notes that vehicle trips associated with the ranches would be eliminated, further reducing overall emissions.
216	Commenters state that the analysis of emissions of ranching/livestock GHG emissions compared to mobile source emissions is not correct, noting that the emissions attributed to mobile source emissions do not include emissions from visitors traveling to and from the planning area. Therefore, commenters indicate the analysis grossly underestimates the GHG emissions generated from visitors' automobiles. One commenter also disagreed with the EIS analysis that beef cattle produce more fugitive dust and particulate matter emissions than dairy cattle in the planning area.	NPS revised the EIS to provide additional qualitative discussion acknowledging that additional mobile source emissions would occur outside the boundary of the park and the reasons it is not practicable to quantify these emissions. A discussion of total mobile source emissions in Marin County has been added to the EIS to provide additional context on the relative magnitude of in-park emissions compared with external mobile source emissions in the surrounding region. Visitor use is assumed to remain consistent between the alternatives; therefore, emissions outside the park boundary would be unlikely to substantially affect the relative comparison between the total emissions of each alternative. Emissions outside the park would also be less likely to directly affect the condition of resources in the park. Regarding the comment about the relative fugitive dust emissions and particulate matter produced by beef cattle and dairy cattle, the EIS considers the available emission factors in the relevant literature and applies these emission factors to the cattle population under each alternative. The limitations of the PM emissions factor for beef cattle in particular was appropriately disclosed in the EIS. After considering the public comments on this issue, NPS revised the PM analysis to use the dairy emission factor (4.4 pounds PM_{10} per thousand head per day) for both dairy and beef cattle because beef cattle in the study area are not confined or concentrated in a manner that would generate high levels of dust on a continuous basis.

ID	Concern Statement	Response
217	Commenters express concerns with elements in the draft EIS related to applying compost to rangelands. They state that applying compost to rangelands risks impacts on native species and will ultimately lead to increases in GHG emissions through more cattle being present on the landscape.	Non-commercial (e.g., produced from on-site operations) compost application is identified as a Practice Standard in the EIS. See for the responses to Concern IDs 86, 84, 111, and 130 for further discussion about these practices.
218	One commenter indicates that the Proposed Mitigated Negative Declaration for Sir Frances Drake Boulevard Improvement Project pointed to an average daily traffic rate (calculated in 2014) at 1,369, meaning nearly 500,000 vehicles each year would travel along Sir Frances Drake Boulevard; however, the draft EIS incorrectly estimates the number of vehicles at 400,000.	The source for the traffic data from which the 1,369 average daily traffic rate on Sir Francis Drake Boulevard references in the Sir Francis Drake Boulevard EA is not clear (no backup information is available on the specific time period of the traffic count). The 2018 traffic data used in the EIS is a more reliable source of information because it is based on NPS's continuous traffic count stations that account for seasonal and time of day variations in traffic volumes; therefore, the suggested change has not been made to the EIS methodology. NPS's count data shows a decrease in annual traffic entering the park of appropriately 15.6% on Sir Francis Drake Boulevard between 2014 and 2018, which could also help explain why the EIS number differs from number included in the 2015 EA.

Table 34. IS1900 – Cumulative Impacts

ID	Concern Statement	Response
219	A commenter suggests that NPS resource managers consider modeling of coupled human and natural systems (CHANS) to avoid unforeseen negative consequences.	NPS managers are responsible for considering interactions between humans and nature as part of their daily management of park units. The framework and monitoring prescribed in the EIS sets out a management approach that recognizes the need for ranch operators and NPS staff to work together closely to ensure resource management goals are being met.
220	A commenter questions why there is no comprehensive analysis of the cumulative impacts of grazing on the natural resources within the park and states that the overall cumulative impact analyses are insufficient in explaining the overall impacts of grazing compared to the benefits of removing it. Commenters also suggest analyzing the overall impacts of retaining grazing activities compared to impacts of removing them.	CEQ defines a cumulative impact as an "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." (40 CFR 1508.7). Cumulative impacts are analyzed for each resource topic included chapter 4. The cumulative impact analysis for each resource topic analyzes how the direct and indirect effects of each alternative combine with the effects of past, present and reasonably foreseeable future actions on that resource. Adverse and beneficial impacts were assessed separately, consistent with the direction provided in the 2015 NPS NEPA Handbook (section 4.5). Alternative F analyzes the direct, indirect, and cumulative impacts of removing grazing on the resource topics included in chapter 4. Alternatives B through E analyze the direct, indirect and cumulative impacts of various levels of grazing on the same resource topics.
221	Commenters question what the word "Luckenbach" in the subsection title of page 102 was referring to. They note that if the word is a reference, it should include a publication date and be included in the references section of the draft EIS.	The word "Luckenbach" has been removed from the EIS.

ID	Concern Statement	Response
222	Commenters state that impacts of climate change should have been addressed as a cumulative impact.	Consistent with CEQ's June 26, 2019, "Draft NEPA Guidance on Consideration of Greenhouse Gas Emissions (84 FR 30097–30099), the EIS provides estimates of GHG emissions that are occurring under current conditions and would result from the various alternatives under consideration. These analyses are included in the "Air Quality" section of both chapters 3 and 4. The EIS has been revised to include additional information regarding foreseeable changes to the affected environment where relevant (see chapter 3). This qualitative discussion is sufficient to provide information to assess whether the projected changes in climate would have implications for the alternatives under consideration; a separate cumulative effects analysis is not required.
223	Commenters state that NPS should include a cumulative analysis of all polluters into Tomales Bay, including ranches on park lands.	As noted in chapter 3 of the EIS, park ranches constitute 7% of the Tomales Bay watershed and are not the major contributor of water pollution to Tomales Bay as evidenced by the fact that Olema Creek subwatershed was the second smallest fecal coliform bacteria contributor to the bay, contributing 1% of overall fecal coliform bacteria (Ghodrati and Tuden 2005). All action alternatives would reduce impacts on water quality across the planning area compared to existing conditions, and as noted in the response to Concern ID 143, a recently published 19-year case study, incorporated into the analysis in the EIS, found overall mean reductions of more than 95%-in fecal coliform concentrations in the Olema Creek watershed concurrent with the implementation of 40 grazing BMPs on park ranches. Consistent with CEQ guidance, it is generally not necessary to individually list and analyze the effects of each past cumulative action, and it is appropriate to discuss them in sum (see CEQ guidance: *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*), as was done in this EIS.
224	Commenters state that the draft EIS conducts its environmental analysis entirely by weighing benefits to private commercial operations versus mitigation measures to lessen harm to resources. They indicate that this approach is not appropriate because it results in an incomplete analysis that fails to adequately meet the legal requirements to analyze connected actions, cumulative impacts, direct and indirect effects, and reasonably foreseeable consequences of decisions being authorized in the plan.	The EIS analyzes both adverse and beneficial direct, indirect, and cumulative impacts on resources that could be affected by the range of alternatives described in chapter 2. Please see the methodology section at the beginning of chapter 4 as well as the resource-specific methodology at the beginning of each impact topic for more information on the approach to the impact analysis.
225	Commenters note that the GMP Amendment is proposing new trails, visitor accommodations, and other amenities without providing a cumulative analysis of existing park facilities. Commenters also note that impacts of cumulative actions for the park have changed since 1980.	Please see responses to Concern IDs 99 and 103 that note that analysis related to new trails and amenities are programmatic and would require additional site-specific compliance prior to implementation, including cumulative impacts analysis, as appropriate.

Table 35. CC1000 – Public Participation and Scoping

ID	Concern Statement	Response
226	Commenters indicate that the public participation process was not meaningful because it did not include clear and accessible information regarding project information or provide adequate notice of the upcoming comment period. One commenter states that they submitted a request for a comment period extension and did not receive a response from NPS. Commenters indicate the 45-day public comment period did not provide enough time for the public to review the entire draft EIS.	The 45-day public comment period and associated notices meet CEQ requirements. Specifically, in accordance with 40 CFR 1506.6 – Public Involvement, the public comment period and meetings were announced widely via press release, email, the park website, social media, and Planning, Environment, and Public Comment (PEPC) system beginning on August 8, 2019. The 45-day comment period satisfies the requirements of NEPA and provided ample opportunity for public involvement and comment on the draft EIS.
227	Commenters request that NPS accept emails with attachments and indicate that NPS should count form letters submitted by organizations on behalf of others to fully involve the public as required by NEPA. Commenters also note that the comment form window of the PEPC tool is clunky and removes the formatting from comment documents and deletes footnotes. Additionally, commenters suggest that a public hearing would have been preferred because it provides the opportunity to hear the same information from each presenter and other public participants. One commenter indicates that protestors who attend public meetings only be allowed outside the auditorium and suggest that the inside the auditorium should be neutral territory.	As a matter of policy, NPS does not accept form letters submitted on behalf of others because it cannot verify that the comment was provided by the individual listed on the letter. Additionally, unless unique, substantive comments are added to the form letter, the number of any particular form letter received does not factor into NPS decision-making or influence the EIS process. All substantive comments are given equal consideration and response, no matter how many commenters provide similar comments. NPS appreciates public feedback on the meeting format and public comment approach. While no particular meeting format is required under CEQ NEPA regulations, the open house format allows the public extensive back and forth discussion with NPS staff and resource experts. This format provides a dialogue that can allow attendees to ask questions and get specific, detailed responses. NPS will consider the commenter's suggestion to not allow protesters inside a venue for future meetings and has forwarded the commenter's suggestions on increased functionality of the PEPC program to the group responsible for developing and maintaining the system.

Table 36. CC2000 – Agency Consultation

ID	Concern Statement	Response
228	Commenters state that the draft EIS does not indicate if the National Marine Fisheries Service (NMFS) has reviewed the biological assessment. Comments note that review is required prior to public review of the draft EIS.	There is no requirement to submit the biological assessment prior to public review of the draft EIS. In this case, the biological assessment was submitted to NMFS concurrently with the release of the draft EIS. NPS is working with NMFS to complete formal consultation, which will result in the issuance of a Biological Opinion prior to the implementation of the selected alternative.
229	Commenters note discrepancies in ESA section 7 determinations for coho salmon and steelhead between the tables and text in the NMFS BA and recommends that they be corrected.	The biological assessments have been revised in response to this comment and updated to reflect all other changes that were made between the issuance of the draft and final EIS. The revised biological assessments can be found in appendices N and O.

ID	Concern Statement	Response
230	A commenter notes that the draft EIS fails to analyze alternatives D, E, and F against approved state management programs, such as the Marin Local Coast Program, in accordance with the Coastal Zone Management Act. The commenter suggests alternatives D, E, and F violate the Coastal Zone Management Act's consistency provision and do not comply with Marin Local Coastal Program because they are designed to discourage and/or discontinue the beef and dairy operations at the park.	NPS's federal consistency obligations under the Coastal Zone Management Act are independent of those required under NEPA. A consistency determination for the preferred alternative will be prepared and submitted to the California Coastal Commission. Relevant analysis from the EIS will be used in preparing this determination and analyzing the preferred alternative's consistency with the California Coastal Management Program.

Table 37. ON1000 – Other NEPA Issues

ID	Concern Statement	Response
231	Commenters state that the draft EIS notes the impacts of ranching but does not describe the intensity of the impact, leaving the public to guess at the significance of the documented impact. Commenters further note that the impacts should clearly state and characterize significant impacts, rather than making a statement that impacts are not significant except where noted.	The context and intensity of impacts are described using a number of methods consistent with CEQ's definition of the term significance. For example, quantitative measurements are used when they help demonstrate percentage reductions or the number of acres of increased or decreased impact. Other examples include evaluating actions in terms of the effects they would cause on listed species and properties listed on the National Register of Historic Places. CEQ NEPA regulations do not require the use of impact thresholds or measurable metrics to define the severity of impacts. NPS is applying the CEQ NEPA regulations and taking the "hard look" required by the courts by providing narrative descriptions of direct, indirect, and cumulative effects and considering mitigation associated with the alternatives. Significance was determined by comparing the impacts of the alternatives under consideration to the current condition of the resources. In many cases, the alternatives that authorize ranching to continue would not result in new adverse impacts, rather the change from the existing condition would be beneficial as a result of the implementation of the zoning framework and additional mitigation measures. In instances where there would be a large change from existing conditions as a result of a particular action, CEQ's intensity factors were considered in determining whether the impact would likely be significant and was noted as such in the analysis.

ID	Concern Statement	Response
232	Commenters suggest alternative B should treat ranch operating agreements (ROAs) as Resource Management Plans to consider all foreseeable impacts on park resources before the issuance of the final EIS. Commenters also request that NPS develop detailed maps and geographic locations of proposed new fences, trenches, manure storage ponds, and other ranching activities and provide this information in a supplemental draft EIS to allow for public comment on these elements.	The ROAs described in the EIS are not planning documents. Rather, they are exhibits to agricultural lease/permits that detail the activities authorized on each ranch. ROAs would only include activities that were analyzed in detail in the EIS or a future, site-specific review and compliance effort. In the latter case, a rancher would have to submit a proposal to NPS to be reviewed for consistency with the EIS. If the proposal is consistent with the EIS but not sufficiently addressed at the project scale in the environmental analysis, additional environmental review and compliance would be required before the activity could be included in the rancher's ROA. Future NEPA analyses will require consideration of cumulative impacts; the impacts from this EIS will be included as a past/present action in any future NEPA analysis that would affect the same resources. ROAs are therefore a management tool that will be used to guide day-to-day management of individual ranches. The zoning framework and the Practice Standards and mitigation measures detailed in appendix F provide sideboards that allow for the analysis of routine Management Activities prior to knowing their exact location. Detailed maps of the location of each one of these actions is not necessary to characterize and analyze the impacts. Should any action be proposed that is not consistent with the Practice Standards and mitigation measures detailed in appendix F, then additional review and compliance would be required prior to authorization of the activity.
233	Commenters state that a supplemental draft EIS should be prepared to analyze ranching and livestock grazing alternatives that are consistent with the park's mandate to provide maximum protection, restoration, and preservation of the natural environment.	NPS believes that the alternatives presented for consideration in chapter 2 are consistent with legal mandates. While the alternatives differ in their emphasis on natural and cultural resources, all would meet the purpose and need for the GMP Amendment and further NPS's ability to achieve the desired conditions. Furthermore, there are no substantial changes in the proposed action that are relevant to environmental concerns or significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts in the final EIS (40 CFR 1502.9); therefore, a supplemental EIS is not required.
234	Commenters stated that the draft EIS does not disclose how mitigation measures will be funded or who is responsible for their implementation and that the NPS must demonstrate that it will have sufficient resources and funding to implement or ensure performance of mitigations and sufficient monitoring to ensure mitigations are actually implemented and are effective. Commenters suggested that the EIS identify sources of funding, including NPS funds, to assist lessees with implementation of the mitigation measures.	Appendix F was updated to clarify responsible parties.

ID	Concern Statement	Response
235	Commenters question the adequacy of federal funding to implement the proposed actions in the draft EIS, including strategies in table 2, and highlight the deferred maintenance backlog as evidence of the strain on park budgets. Some commenters request a section outlining the budget or financial overview for GMP Amendment recommendations. Commenters also state that the draft EIS lacks information regarding the portion of the NPS budget that supports the ranches and other ranching-related expenses. They request that the document contain information on the proportion of budget/staff dedicated to ranching relative to other park resources described in the foundation document. They note this analysis would provide information related to the economic impact of increasing support for ranching at the expense of other unmet needs identified for funding. They also note that the GMP Amendment is deficient because it does not provide information on the total costs to implement the plan. They note that costs could be substantial, and the draft EIS should identify if implementing this plan would negatively affect other areas of the national seashore. Without considering the costs, the document does not satisfy NEPA's requirement that an EIS "ensure that agency action is fully informed and well considered." One commenter suggests adopting a parking fee at all large parking lots as a part of the mitigation and monitoring requirements of NEPA. They indicate that the parking fee could be used as funds to implement mitigation measures and avoid budget cuts to existing programs. The commenter notes that under the Federal Lands Recreation and Enhancement Act (16 U.S.C. §§ 6802), parking fees are authorized at the park.	Please see appendix D for estimated costs of the alternatives. A parking fee was considered but was dismissed as parking areas are outside of planning area, and park enabling legislation (16 U.S.C. 459C-6(e)) identifies the park as a no fee park.
236	Commenters state that the draft EIS should analyze how each alternative would or would not achieve the desired conditions.	All the action alternatives considered in the EIS meet the desired conditions described in chapter 1 to some degree. Action alternatives carried forward for analysis should further NPS's ability to achieve the desired conditions; however, some desired conditions may realize greater progress than others depending on the alternative. The framework for the analysis of alternatives in the EIS follows NPS policy guidance and CEQ regulations for evaluating environmental impacts of actions such as those proposed in the GMP Amendment.

ID	Concern Statement	Response
237	Commenters state that the draft EIS fails to identify the environmentally preferred alternative, as required by NEPA.	Per the CEQ regulations, an environmentally preferable alternative must be identified in a ROD and may be identified in EAs, Findings of No Significant Impacts, and draft and final EISs (1505.2(b); 46.450). For this NEPA process, the environmentally preferable alternative will be identified in the ROD, consistent with CEQ requirements.
238	Commenters state that the affected environment section of the draft EIS lacks adequate baseline data for the review and evaluation of impacts under all alternatives, specifically impacts from cattle grazing and ranching activities. They request the park monitor the environmental impacts of livestock grazing and ranching activities in the park to identify long-term natural resource trends and conditions and establish the criteria for which mitigation measures are designed to meet.	The commenters did not provide any specific information or data they believe should be considered in the EIS. The EIS provides baseline data about grazing and ranching activities in both chapter 3 and in the discussion of the no action alternative in chapter 2. The description of the affected environment in chapter 3 was based on best available information and incorporates long-term trend data where available. NPS believes that the EIS describes the existing condition of the resources in sufficient detail to allow for analysis of potential impacts of the alternatives under consideration. Alternatives that allow grazing to continue include an adaptive approach to monitoring that relies on a number of strategies to inform managers whether resource conditions are moving toward desired conditions (see the “Ranching Overview” section in chapter 2 of the EIS). The park would continue to incorporate updated scientific and resource information into the review and monitoring of resources and desired conditions. The implementation of the zoning framework would also allow for future adjustments if additional data indicate the presence of sensitive resources that warrant additional protection.
239	Commenters indicate that the national seashore does not comply with the provisions in 54 U.S.C. § 100502 regarding requirements for GMPs. Specifically, they state that by focusing the draft GMP Amendment on specific issues, the process and document have been segmented by narrowly defining the action to avoid the appearance of significance. Areas identified as concerns include altering the size of the Ranchland zone but not evaluating other areas where the Environmental zone has been decreased, and these areas have not been fully evaluated. Commenters suggest that a full GMP process is required because the 1980 GMP does not reflect the 2006 update to NPS *Management Policies* and an update is needed to understand how management direction.	The GMP Amendment addresses the relevant elements of 54 U.S.C. 100502 for lands in the planning area. These elements include measures to protect resources, indications of allowed types and intensities of development, and implementation commitments for carrying capacity. External boundary modifications are not addressed because NPS has determined that adjustments to the park’s boundary are not needed at this time. In addition to addressing these elements, the GMP Amendment also addresses certain proposals at a site-specific level. Agencies can consider both programmatic and site-specific elements in a single NEPA document. Agencies also have discretion to determine the scope of a NEPA document. NPS’s most important planning need is to provide direction for the future management of lands currently leased for ranching. As a result, the GMP Amendment addresses programmatic options for the management of these lands (e.g., zoning) and specific activities that are consistent with those options (e.g., elk management). Zoning decisions made in the GMP Amendment do not foreclose zoning options for lands outside the planning area that would be addressed in a future planning effort. Finally, the issuance of the 2006 NPS *Management Policies* did not require park units to update their GMPs. The 2006 NPS *Management Policies* provide guidance to park units on when to do a full update to their GMP and when to amend their GMP. NPS believes that amending the park’s GMP is the appropriate approach at this time. The suggestion of preparing a full GMP update for the park has been added to the “Alternatives Considered but Dismissed from Further Analysis” section in chapter 2.

ID	Concern Statement	Response
240	Commenters state that the draft EIS is lacking because there is no wilderness plan, which is required by policy and law. Without this plan, they indicate that indirect and direct impacts on wilderness values cannot be evaluated.	NPS retains discretion over the scope of the EIS. Wilderness planning is outside the scope of this plan. NPS will complete wilderness stewardship planning at a later date. Impacts on wilderness from actions evaluated in this plan are disclosed, see response to Concern ID 12.
241	One commenter states that streamlining the permitting process is incompatible with ensuring protection of natural and cultural resources because streamlining typically reduces public involvement, shortcuts important environmental reviews, makes agency analysis insufficient, jeopardizes public land access, and reduces scientific input.	Streamlining the permitting and compliance process does not absolve NPS of meeting its legal obligations under NEPA, the National Historic Preservation Act or any other statute. This EIS analyzes the impacts of a variety of actions that could occur in the planning area in a full public process consistent with CEQ requirements. In the future, should actions be proposed that are consistent with the direction of the EIS but were not analyzed in detail, additional NEPA compliance would be required (see the "General Assumptions for Assessing Impacts" section in chapter 4 for a list of actions that are covered by the analysis in this EIS). This would also be the case with all other regulatory requirements that the NPS must meet. Public involvement for future environmental reviews would be determined based on the required NEPA pathway.
242	Commenters state that the draft EIS proposes deferred action without enough information to allow for public review. Such deferred actions include those noted for protection of water and wildlife, including a spill prevention and clean-up plan, stormwater pollution prevention plan, and planting NPS-approved plant species. Commenters state that these delayed actions should not be included at this stage because they cannot be evaluated and commented on fully.	The EIS requires site-specific plans, such as nutrient management plans and stormwater pollution prevention plans, as standard mitigation requirements for activities that are authorized and analyzed within the EIS. In many cases these plans are also required by the San Francisco Bay RWQCB as part of that agency's permitting process with ranch operators. These operational plans document how the practices analyzed in the EIS will be implemented to protect water quality and are not proposals to implement new activities or practices. Further, the GMP Amendment zoning establishes where certain practices may occur (such as manure spreading in pasture), based on resource sensitivity, and identified these areas as places where such activities may be appropriate with an approved nutrient management plan. As such, these plans are not a delayed action or segmentation to the plan.
243	One commenter indicates that the draft EIS fails to adequately discuss current scientific evidence under the environmental consequences for alternatives A through E and therefore violates NEPA.	The commenter did not offer specific scientific studies that should have been considered in the development of the EIS, so no changes were made as a result of this comment. Additional data and literature have been added to the EIS where appropriate to clarify and expand on the analysis. CEQ regulations require that environmental information made available to public officials and citizens be of high quality (40 CFR 1500.1(b)). NPS used best available information to analyze the impacts on park resources. All references cited in the EIS are provided in appendix B.

ID	Concern Statement	Response
244	Commenters state that the preferred alternative is inconsistent with the park's Climate Action Plan and question if the 25 percent reduction of 2008 GHG emissions attributed to agricultural operations was met in 2016, since it has not been updated since 2010.	The range of alternatives under consideration in the EIS would result in various levels of GHG emissions, as analyzed and disclosed in chapter 4 of the EIS. In selecting an alternative for implementation, the decision maker will weigh the impacts of the alternatives across all resources, and the decision rationale will be documented in the ROD. The Climate Action Plan set out goals and strategies to reach those goals related to all GHG emissions in the park. Many actions have been taken since the 2009 release of the plan, for example: GHG emissions related to agricultural operations have been reduced by 10% due to a reduction in the number of dairy cows in the park. Other practices, such as the installation of methane digesters are still supported by NPS to further reduce GHG emissions on ranch operations. See response to Concern ID 84 regarding reductions in GHG emissions.
245	Commenters question why climate change and sea level rise is not mentioned in the draft EIS. Some commenters note while climate change is mentioned in the draft EIS, the discussion is inadequate because even incremental changes to climate change should be considered significant, and they express concerns that compliance to measures to address climate impacts are voluntary. They suggest that climate change be addressed as a separate topic.	Consistent with CEQ's June 26, 2019, "Draft NEPA Guidance on Consideration of Greenhouse Gas Emissions (84 FR 30097-30099), the EIS provides estimates of GHG emissions that are occurring under current conditions and would result from the various alternatives under consideration. These analyses are included in the "Air Quality" section of both the affected environment and environmental consequences chapters. The EIS has been revised to include additional information regarding foreseeable changes to the affected environment as a result of climate change where relevant (see chapter 3). This qualitative discussion is sufficient to provide information to assess whether the projected changes in climate have implications for the alternatives under consideration.

Table 38. VS6000 – Impairment Analyses

ID	Concern Statement	Response
246	Commenters indicate that the proposed activities considered under alternatives A–E would impair park natural and cultural resources. Commenters provide specific examples of resource impairment caused by ranching. Commenters state that these impacts would violate the 1916 NPS Organic Act, Point Reyes enabling legislation section 459c-6, and Golden Gate National Recreation Area legislation section 460bb. Commenters suggest the draft EIS analysis does not satisfy NEPA requirements and continuation of permitted ranching would likely make the NPS management of resources inconsistent with the Clean Water Act and violate NPS nonimpairment requirements.	Additional analysis of the impacts of the selected action considering the park's enabling legislation and the NPS Organic Act's non-impairment mandate will accompany the ROD. There is no requirement to include this analysis in a NEPA document. Chapter 4 analyzes the effects of each alternative on water resources and water quality. Under alternatives A–E, ranchers would have to adhere to permitting requirements imposed by the San Francisco Bay RWQCB and comply with multiple mitigation measures designed to minimize or avoid impacts on water quality. Although there would be impacts on water quality from activities on ranches, these measures would protect water quality in accordance with the Clean Water Act.

Table 39. RF1000 – Suggested References

ID	Concern Statement	Response
247	A commenter notes that most scientists recommend the removal of livestock from public lands to improve the ecological conditions and protect the native flora, fauna, and other public resources and provided a list of suggested references.	All suggested references were reviewed. When appropriate, additional content and references were incorporated into the EIS analysis.